Effects of Analgesia on the Newborn

Linda Roe

Western Kentucky University

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EFFECTS OF ANALGESIA ON THE NEWBORN

A Thesis
Presented to
the faculty of the Department of Health and Safety
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
Linda Roe
November, 1980
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EFFECTS OF ANALGESIA ON THE NEWBORN

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>List of Tables</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Figures</td>
<td>v</td>
</tr>
<tr>
<td>List of Plates</td>
<td>vi</td>
</tr>
</tbody>
</table>

Chapter

1. **INTRODUCTION**
   - Need for Study ................................................................. 1
   - Purpose of Study ............................................................. 3
   - Null Hypothesis ............................................................... 3
   - Limitations ........................................................................... 4
   - Definitions ........................................................................... 5

2. **A SURVEY OF RELATED LITERATURE** ....................................... 6
   - Physiology of Parturition ..................................................... 7
   - Use of Drugs in Labor and Their Effects ............................... 13-15

3. **Methodology and Design** .................................................... 27
   - Type of Research .................................................................... 27
   - Data Source ............................................................................ 28
   - Variables of Interest ............................................................ 29
   - Statistical Treatment and Data Analysis ............................... 30
   - Null Hypothesis ..................................................................... 30
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. ANALYSIS AND INTERPRETATION OF DATA</td>
<td>32</td>
</tr>
<tr>
<td>5. DISCUSSION</td>
<td>39</td>
</tr>
<tr>
<td>6. RECOMMENDATIONS</td>
<td>40</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>43-5</td>
</tr>
<tr>
<td>APPENDIXES</td>
<td></td>
</tr>
<tr>
<td>A. CODE SHEET</td>
<td></td>
</tr>
<tr>
<td>B. DATA CODING SHEET</td>
<td>41</td>
</tr>
<tr>
<td>C. PERMISSION SHEET</td>
<td></td>
</tr>
<tr>
<td>D. SIGNED PERMISSION SHEETS</td>
<td>46-52</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>vii-viii</td>
</tr>
</tbody>
</table>
LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Criteria For Apgar Scoring</td>
<td>17</td>
</tr>
<tr>
<td>2. Mean Scores of Dependent and Control Variables</td>
<td>32</td>
</tr>
<tr>
<td>3. The Mean Dose of Medications</td>
<td>33</td>
</tr>
<tr>
<td>4. Dependent Variables Compared to High and Low Groups</td>
<td>34</td>
</tr>
<tr>
<td>5. Oxygen Administered to Newborns</td>
<td>36</td>
</tr>
<tr>
<td>6. Respiratory Problems of Mother</td>
<td>36</td>
</tr>
<tr>
<td>7. Respiratory Problems of Newborn</td>
<td>37</td>
</tr>
<tr>
<td>8. Demerol Administered to Primigravidas and Multigravidas</td>
<td>37</td>
</tr>
<tr>
<td>9. Demerol Compared to Number of Times Pregnant</td>
<td>38</td>
</tr>
<tr>
<td>10. Administration Time For Demerol</td>
<td>38</td>
</tr>
</tbody>
</table>

LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total Blood Volume During Pregnancy</td>
<td>9</td>
</tr>
<tr>
<td>2. Lung Capacity During Pregnancy and Nonpregnancy</td>
<td>11</td>
</tr>
<tr>
<td>PLATES</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>1. Anatomy of Neurophysiologic Aspects</td>
<td>12</td>
</tr>
<tr>
<td>2. Placental Circulation</td>
<td>14</td>
</tr>
<tr>
<td>3. Anatomy For Regional Anesthesia</td>
<td>22</td>
</tr>
<tr>
<td>4. Pudendal Block</td>
<td>25</td>
</tr>
</tbody>
</table>
EFFECTS OF ANALGESIA ON THE NEWBORN

Linda Roe

November, 1980

Directed by: Dr. David Dunn, Dr. Charles Wayne Higgins, and Dr. Robert Baum

Department of Health and Safety   Western Kentucky University

Obstetric analgesia and anesthesia is an important concern today. The purpose of this study was to evaluate the effects of analgesia used in labor and delivery on the mother and newborn. The information obtained in this study evaluated the amount, time, and types of analgesia and the effects on the mother and the newborn.

Previous research has indicated adverse effects of analgesia and anesthesia on both mother and newborn, but conclusive results have not been obtained. Depressed respiratory function, increased use of oxygen, and low Apgar scores are among the effects reported for the newborn. Decreased uterine function, decreased satisfaction of the birth process, and risks attendant upon analgesia and anesthesia have been reported regarding the mother.

Apgar scores, oxygen administered, and length of hospitalization for mother and newborn were the dependent variables measured by this study. The independent variables were amount, time, and administration of
medication during labor and delivery. The control variables were the number of prenatal visits, number of previous pregnancies, and the stage of pregnancy at first visit to the physician.

The subjects were grouped according to the amount of Demerol (the most commonly prescribed analgesia) administered, and comparisons were made between the highest and lowest groups. No significant differences were observed between the high and low Demerol groups in any of these variables.

Significant differences were found in the area of Apgar scores and oxygen administration. These findings support the conclusion that analgesia and anesthesia administered during labor and delivery can have adverse effects in the newborn.

Thus, the null hypothesis of no significant differences of effects of analgesia or anesthesia on mother and newborn was partially rejected.

This research lends support to findings which suggest adverse effects of medication during labor. These supportive results could serve as a basis for future research investigating the amount of medication given in labor and delivery.
Chapter 1

INTRODUCTION

"In sorrow thou shalt bring forth children"¹

Throughout the ages, the relief of pain during childbirth has stimulated the concern of physicians and consumers. The struggle to alleviate pain is described in mythological writings which indicate primitive man's groping in superstition and early religious mysticism.²

Women have sought relief from childbirth pain and have used any available means. Recordings to this effect have been seen on Babylonian clay tablets, in Egyptian papyri written in the days of the pyramid builders, in ancient Chinese writings, in Hebrew books of the Old Testament which encompass 4,000 years of recorded history before Christ on parchment rolls from Troy, and through all ages, in every civilization, and in every setting are found supplications and exorcisms for the relief of pain.³

¹Genesis 3:16.
³Bonica, p. 1.
The new era of analgesia and anesthesia was initiated in 1772 by Joseph Priestly's discovery of nitrous oxide. The introduction of modern anesthesia belongs to Sir James Y. Simpson, who first used ether in childbirth on January 19, 1847, and chloroform on November 8, of the same year.

These eminent physicians introduced other methods of analgesia and anesthesia to obstetrics including techniques of inhalation and regional anesthesia. Among these were ether, spinal anesthesia, scopolamine and morphine for twilight sleep, synergistic analgesics of hypodermic morphine and magnesium sulfate, and recently the use of paracervical and pudendal nerve block.

Modern analgesia and anesthesia are not without risks. It is necessary for the physician to inform the expectant mother of these risks and benefits. Together they should choose the best method for her needs.

To provide the best obstetric management, it is necessary to know the effects of the drugs or anesthesia on mother and newborn during parturition. Such knowledge requires the attending physician to be aware of normal physiology of the expectant mother and newborn.

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4 Bonica, p. 2.
5 Bonica, p. 377.
6 Bonica, p. 3.
NEED FOR STUDY

Obstetric analgesia and anesthesia is an important concern in America today.7 The ideal analgesia and anesthesia technique should:

1. Produce a desired maternal effect, namely, pain relief and enjoyment of a pleasurable intrapartum experience.

2. Have no, or minimal, undesirable fetal, neonatal effect.8

It is important to recognize and analyze any harmful effects of analgesia. These effects can only be accomplished by comparing clinical and observational data of medication on mother and newborn in labor and delivery.

PURPOSE OF STUDY

The purpose of this study was to evaluate the effects of analgesia used in labor and delivery on the mother and newborn.

NULL HYPOTHESIS

There is no significant difference in the effects on mother and newborn when the prescribed amount, time, and administered analgesia is varied during labor and delivery.

7Lonica, p. 10.

LIMITATIONS

An objective of obstetric analgesia and anesthesia is to minimize or eliminate the undesirable effects of the drugs used during parturition on the newborn, as well as the mother. Drugs used for sedation and pain relief can affect the newborn either directly or indirectly.

The information obtained in this study will evaluate the amount, time, and type of analgesia and the effects on the newborn.

The individuals involved in this sample selection had various backgrounds, middle-class incomes, and were Caucasian. Patients were drawn from the practice of the five obstetricians. Subjects for this study were drawn from the delivery record book of the Bowling Green City County Hospital. Patients who had complications were eliminated.

DELIMITATIONS

The author limited the data to the age group 18 to 34 years of age, in the City-County Hospital, obstetrical unit. The time period extended from February 1, until July 30, 1979.

The study population consisted of 200 delivered patients, selected from the delivery record book.

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9 Bonica, p. 190.

10 Bonica, p. 190.
DEFINITIONS

Acidosis-A disturbance in the acid-base balance of the body in which there is an accumulation of acids, i.e., respiratory acidosis, resulting in retention of carbon dioxide. 11

Asphyxia Neonatorum-Imperfect breathing in the newborn child. 12

Hypercapnia-Excess accumulation of carbonic acid in the blood. 13

Intrapartum-Occurring within pregnancy.

Multigravid-A woman who has borne children two or more times.

Myometrical Activity-Muscular activity of the uterus. 14

Parturition-Act of giving birth of young. 15

Primigravid-A woman during her first pregnancy.

---


12 Taber, p. A-94.


14 Taber, p. M-63.

15 Taber, p. 23.
Chapter 2

A SURVEY OF RELATED LITERATURE

One of the most important aspects in relief of discomfort during labor is the emotional state of the patient just prior to and during her intrapartum course. All concepts and attitudes which the patient develops will influence her behavior at the time of labor and delivery. The patient experiences certain anxieties, fears, and conflicts, and the anticipation of the awaited newborn.

Although the magnitude of these responses vary according to the individual characteristics and antepartal preparation, the pattern involves neural, hormonal, and endocrine mechanisms which create uterine metabolites and cardiovascular alterations.

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17 Bonica, p. 40.

This survey of literature will deal with these two areas:

1. Literature related to normal physiology and anatomy as related to the expectant mother and newborn.

2. Literature concerned with drugs and their relationship and effects in labor and delivery.

**PHYSIOLOGY OF PARTURITION**

The process of pregnancy and labor produces remarkable physiological as well as psychological changes in the mother. McDonald states:

That one of the most important features of pain in labor is often misunderstood by those who have not experienced the actual process of labor and delivery. 20

So the physician or nurse-midwife who manages the obstetrical patient must bear these changes in mind in order to respond to the patient's individual needs.

**Uterine Contractions**

Uterine contractibility is a progressive transition between prelabor and labor. Clinical labor is considered to have started when the cervix has dilated to two centimeters and continues to dilate to ten centimeters. As labor progresses the uterine contractions intensify to a pressure of 80 to 110 mm. hg. or higher. 21

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20 McDonald, p. 491.
21 Bonica, p. 551.
Cardiac Output

The increase in cardiac output and cardiovascular functions is especially important to the obstetrical management and the techniques used for the relief of pain. The management will affect the cardiovascular system.

Morrison states:

Before using any drug during pregnancy and labor, the physician should carefully weigh the benefits of such therapy as to possible detrimental effects to both mother and infant.²²

During the initial phase of contraction, approximately 250 to 300 milliters of blood are rapidly extruded from the uterus into the maternal central venous reservoir. (Figure I, p. 9).²³ Central venous pressure rises rapidly and the heart responds by increasing its rate. Pain, fear, and apprehension can cause additional increase in cardiac output through sympathetic hyperactivity. These emotions cause an increase in the amount of catecholamines liberated by sympathetic nerve endings in the heart and other organs. Cardiac rate and increased stroke volume is seen.²⁴

Respirations

The increase in ventilation noted during pregnancy persists throughout labor as long as the respiration center

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²³ Bonica, p. 86.

²⁴ Bonica, p. 86.
Total Blood Volume During Pregnancy

FIGURE I

Bonica, p. 86.
is not depressed by analgesia, hypnotics, or anesthesia. 25

There is an increase in alveolar ventilation, and further decreases in the function of residual capacity during contraction, resulting from redistribution of blood from the uterus to the central venous pool. 26 There are rapid changes in respiratory blood gas levels and the parturient is prone to hypoxia, hypercarbia, and acidosis. (Figure II, p. 11)

Neurophysiologic Aspects

The uterus is inervated by sensory, sympathetic and parasympathetic nerves. The sensory nerves transmit normal impulses concerned with reflex mechanisms and pain impulses.

A study by McDonald found:

The sympathetic system is activated during periods of stress, it may follow that precipitation of stressful labor pain could activate the maternal uterine blood flow, oxygen, and the well-being of the fetus. (Plate I, p. 12)

Uteroplacental Circulation

The uteroplacental circulation is responsible for bringing nutritive materials and oxygen to the fetus and

25 Bonica, p. 86.
26 Bonica, p. 86.
28 McDonald, p. 492.
FIGURE II

Lung Capacity of Pregnant and Nonpregnant Patient

Total Lung Capacity = 4200

INspiratory reserve 2050
Inspiratory capacity 2500
Residual volume 1000
Tidal Volume 450
Vital Capacity 3200
Functional residual capacity 1700

NONPREGNANT

Total Lung Capacity 4000

Inspiratory capacity 2650
Inspiratory reserve volume 2050
Residual reserve volume 500
Residual volume 800
Elevation of diaphragm
Gravid at Term

PREGNANT

Vital Capacity 3200
Functional residual capacity 1350
10th intercostal nerve
12th sympathetic ganglion
Celiac ganglion and plexus
Least splanchnic nerves
Superior hypogastric plexus
Femoral nerve
Right hypogastric nerve
Sacral splenic nerves
Sciatic nerve
Sacral sympathetic ganglionic
Parasympathetic nerves
Greater splanchnic nerve
Lesser splanchnic nerve
Celiac artery
Superior mesenteric artery and ganglion
Aorticoaortic ganglion
Aortic plexus
Ovarian artery, vein and plexus of nerves
Inferior mesenteric artery, ganglion and plexus
Uterus
Uterine plexus
Fallopian tube
Ovary
Vesical plexus
removing carbon dioxide and other fetal waste products. The two circulations are separated by the placental barriers through which nutrients and waste products pass.\textsuperscript{29}

The uterine blood flow has been estimated to be 500 to 700 millimeters per minute. Of this amount, about 400 to 600 milliters flow through the placenta and the rest by-passes to the uterine muscle.\textsuperscript{30}

**Placental Circulation**

The flow of blood in the umbilical vessels is less than maternal uterine blood flow. The oxygen of maternal blood is one and one-half to twice as rich as fetal blood.\textsuperscript{31}

The rate of oxygen transfer across the placenta is facilitated by the greater affinity for oxygen by fetal blood. If asphyxia develops, the fetal uptake of oxygen is impaired.\textsuperscript{32} (Plate II, p. 14)

**USE OF DRUGS IN LABOR AND THEIR EFFECTS**

There have been various transition periods in the development of obstetric analgesia. These are expressed by McDonald:

1. Early tendency to scorn and reject any type of medication to the mother experiencing childbirth.

\textsuperscript{29}Bonica, p. 120.
\textsuperscript{30}Bonica, p. 120.
\textsuperscript{31}Bonica, p. 123.
\textsuperscript{32}Bonica, p. 131.
PLATE II
Placental Circulation

Umbilical Cord
Umbilical Arteries
Umbilical Vein
Cordona
Branch of Uterine Artery and Vein
Chorion
Intervillious Space
Vesicular Sinus
Mesometrium
Spiral Arteries
Capillaries
2. Overcompensation attitude of heavy medication.

3. Attitude of reduced medication in related circumstances "twilight sleep."33

The perfect method of painless childbirth has yet to be established. The following criteria for the ideal method must ensure that:

1. The health of the mother will not be endangered.
2. No harm will come to the fetus.
3. The agent will have the ability of abolishing or diminishing pain and the memory of suffering.
4. The efficiency of the uterine contractions is not decreased.
5. The ability of the patient to cooperate intelligently with the medical and nursing staff is unimpaired.
6. There should be no need for operative intervention solely because of the analgesia or anesthesia.
7. The method will be reasonably simple to use.34

It is not possible to guarantee complete analgesia and amnesia for the entire labor, so pain must be relieved to conserve strength, maintain control, and relieve apprehension. Other considerations in the use of drugs in labor are the time of injection, quantity of the drug, and the rate of maternal metabolism.35 Each patient must be treated individually.36

33 McDonald, p. 493.
35 Morrison, p. 997.
36 Oxhorn, p. 493.
EFFECTS OF MEDICATION AND APGAR SCORES

The effects of these narcotics discussed may or may not effect the newborn in the first few minutes of life. In 1952, Virginia Apgar and associates originated the Apgar scoring chart.\textsuperscript{37} (Table I, p. 17) The functional rating of the newborn was based on five observations at one and five minutes from birth.\textsuperscript{38} The Apgar has an elaborated method of grading the newborn infant. Infants are rated 0, 1, or 2 for each of the five observed characteristics. The grading done at one minute after birth is repeated at five minutes. A score of ten indicates that the infant is in the best condition, five to nine reflects minimum to mild asphyxia calling for supporting treatment, and a score of four or less is diagnostic of severe asphyxia, necessitating prompt and active therapy.

Narcotics

These drugs not only enhance emotional well-being but also produce a drug-induced rest and sleep. These drugs rarely eliminate severe pain. Meperidine (Demerol 25-250 milligrams) is considered to be the safest obstetric analgesic agent, but it has been associated with infant respiratory depression.\textsuperscript{38}

\textsuperscript{37}Oxhorn, p. 514.
\textsuperscript{38}Morrison, p. 997.
<table>
<thead>
<tr>
<th>SIGN</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate</td>
<td>0: Absent</td>
</tr>
<tr>
<td></td>
<td>1: Slow (below 100)</td>
</tr>
<tr>
<td></td>
<td>2: Over 100</td>
</tr>
<tr>
<td>Respirations</td>
<td>No Response</td>
</tr>
<tr>
<td></td>
<td>Weak Cry</td>
</tr>
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<td></td>
<td>Good Cry</td>
</tr>
<tr>
<td>Muscle Tone</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td>Some Flexion</td>
</tr>
<tr>
<td></td>
<td>Active Motion</td>
</tr>
<tr>
<td>Reflexes (Stimulus to foot)</td>
<td>Limp</td>
</tr>
<tr>
<td></td>
<td>Grimace</td>
</tr>
<tr>
<td></td>
<td>Cry</td>
</tr>
<tr>
<td>Color</td>
<td>Blue; pale</td>
</tr>
<tr>
<td></td>
<td>Body pink; limbs blue</td>
</tr>
<tr>
<td></td>
<td>Completely Pink</td>
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</tbody>
</table>
THE EFFECTS OF DEMEROL ON THE MOTHER

- analgesia effect is good
- transient euphoria and restlessness may occur
- lethargy, impairment, and sleep are less than morphine
- effects seen in 5 to 10 minutes
- adult dosage is 25 to 100 milligrams

THE EFFECTS OF DEMEROL ON THE INFANT

- effect is related to the dosage
- respiratory distress is less than with morphine
- medication should not be administered 2 to 3 hours before delivery (peak action)

A study of obstetric premedication and infant outcome was done by Y. Brackbill in 1974. Meperdine (Demerol) was used in 80 to 90% of all the deliveries. Twenty-five normal term deliveries were chosen at random. Apgar scores were studied and compared against blood gases and their return to normal. The results showed, 1) infants of mothers who had not been premedicated habituated twice as fast, 2) those with no medication performed capably and efficiently, 3) Apgar scores revealed no difference at one minute or five minutes. It could be assumed from this study that obstetric medication does affect both mothers and infants and that Apgar scores are a subjective measure of questionable value in assessing analgesia affects on the newborn.

39 Oxhorn, p. 494.
40 McDonald, p. 497.
41 Oxhorn, p. 494.
42 Brackbill, p. 377.
43 Brackbill, p. 381.
The standard dose of morphine is 10 milligrams or grains 1/6.

THE EFFECTS OF MORPHINE ON THE MOTHER

- the threshold for pain is elevated
- fear and anxiety are replaced with indifference
- lethargy and sleep is induced

THE EFFECTS OF MORPHINE IN THE NEWBORN

- effects depend on the time relationship of administration to delivery
- peak action if intramuscular injection is one and one-half hours
- because of the danger of fetal narcosis, it is prescribed less frequently today during labor

Kay Standley reported a study which examined sixty newborns at forty-eight to seventy-two hours of age. The newborns were born to middle-class white mothers. The drugs of Meperidine up to 150 milligrams or Morphine of 10 milligrams were used. There was little variability in Apgar scores; however, the most alert, least irritable, and the most mature mother behaviors were seen by those who received neither medication.

Muriel Sugarman observed that any alternations of the birth process can produce distortions, deficiencies, or delays on infant attachments. Drugs affecting the central nervous system lead to poor sucking, less responsive behavior, depressed respirations, and possible minimal disabilities.

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44 Oxhorn, p. 494.
46 Sugarman, p. 411.
Ataractic

These medications relieve apprehension and produce tranquility. They potentiate the action of other sedatives. Examples of these include Phenergan or Vistaril, 25 to 50 milligrams. 47

Amnesia

The drug most used is Scopolamine (hysocine) grain 1/250 to 1/100 (0.25 to 0.6 milligrams).

THE EFFECTS OF AMNESICS ON THE MOTHER

- does not effect the pain threshold
- patient becomes drowsy, a degree of restlessness and even delirium can occur
- no after effects
- cause dryness of the mouth and throat
- great individual variation in response to the drug 48

Regional Anesthesia

Most of the literature referred to regional anesthesia, including epidural (caudal), paracervical and local anesthesia.

Paracervical block continues to be the most commonly used form of pain relief in labor and delivery. The occurrence of fetal bradycardia following the paracervical block has been associated with an increase of fetal mortality and morbidity. 49 A local anesthetic is injected

47 McDonald, p. 494.
48 Oxhorn, p. 495.
transvaginally into the posterolateral fornices, blocking the sensory pathways at the junction of the uterosacral ligaments of the cervix. The block gives relief for about two to four hours.

MATERNAL PROBLEMS CAUSED BY REGIONAL ANESTHESIA

- transient paresthesia of one or both legs
- a direct intravascular injection causing shaking movements or convulsions
- hypotension down to 80 systolic
- hematoma at the site of injection

The other type of regional anesthesia was the saddle block, given at the 10th thoracic space. The caudal and epidural blocks are administered to the lower spine.51 (Plate III, p.22) Bradycardia, (under 100 beats per minute), may result from regional anesthesia in which case oxygen is administered immediately.52

A correlation study observed the effects of the paracervical block. The results of this study showed that when maternal and fetal lidocaine levels were increased, uterine blood flow decreased. However, no changes in fetal heart rate were noted.53

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50 Oxhorn, p. 497.
51 Bonica, p. 499.
52 Oxhorn, p. 497.
PLATE III

Anatomy of
Regional Anesthesia

Spinal Cord
Epidural Space
Subarachnoid Space

T-7
T-12
L-2
In Chicago, Illinois, a study was conducted of patients with paracervical block in labor. Correlating Apgar scores and fetal heart changes were observed at the rate of five minutes. Apgar scores failed to record differences when scoring fetal heart rate changes.55

In 1971, Phillips conducted a study of 598 patients. These patients were considered in active labor at four to six centimeters dilatation and were then given epidural block.56 (Plate III, p. 22) There were no adverse effects to mothers or infants.

Lumbar epidural analgesia is frequently used to relieve pain in labor and delivery. At Thomas Jefferson University Hospital and Pennsylvania Hospital, a study involving seventy-two patients examined the effects of epidural anesthesia. The results revealed that hypotension occurred in twenty-eight patients receiving medication.57 Hypotension results from sympathetic blockage which in turn causes vasodilatation, visceral pooling, and decreased resistance. The reduction of cardiac output and uterine flow can cause uteroplacental insufficiency

56 Bonica, p. 500.
which contributes to abnormal fetal heart rate.  

A study from Stanford University Medical Center observed the use of caudal anesthesia in 3,334 live births. There was a relationship between caudal anesthesia and a condition known as perinatal aspiration syndrome (P. A. S.). Thirteen percent of the mothers showed a weak association of caudal anesthesia and P. A. S. The symptoms of P. A. S. include tachycardia, dyspnea, and cyanosis.  

Local Anesthesia

Local anesthesia is a preferred method in obstetrics. The two most widely used are direct infiltration of the perineal tissue and a pudendal nerve block. (Plate IV, p. 25) Advantages are: simple technique, no ill effects and no special after care needed. Disadvantages associated with this procedure are: a blood vessel may be torn during the procedure, and only perineal pain is relieved.

The most important advantage of local anesthesia and pudendal block is that it has no adverse effects on

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58 Wingate, p. 1105


60 Oxhorn, p. 502.

61 Oxhorn, p. 501.
PLATE IV

Pudendal Block 60
the newborn and does not alter maternal respirations, cardiac output, gastrointestinal or other maternal body functions. 62

**Inhalation Anesthesia**

Although general anesthesia has declined in obstetrics today, it is still used in emergency situations. Nitrous oxide and oxygen is the anesthesia of choice at many hospitals. Without exception, all anesthetics depress the central nervous system of the newborn. 63

**THE EFFECTS OF ANESTHESIA ON THE NEWBORN**

- Nitrous oxide is soluble in the tissues and diffuses rapidly so that both induction and recovery are rapid
- It is nontoxic and the patient feels well after the administration is discontinued
- Used as an analgesic, by giving it to the patient with each pain, relief is achieved quickly
- The depth of the anesthesia can be altered quickly
- With safe mixtures of nitrous oxide and oxygen the degree of relaxation is not enough to perform difficult maneuvers such as forceps extractions or versions
- Unless anoxia is produced there is no untoward effect on the circulatory, respiratory, or nervous system
- The disadvantage is that a mixture of 80 percent of nitrous oxide and 20 percent of oxygen is needed to produce first plane anesthesia, deepening the anesthesia by reducing the percentage of oxygen carries the risk of anoxia and is dangerous. 64

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62 Bonica, p. 500.
63 Williams, p. 355.
64 Oxhorn, p. 514
Chapter 3

METHODOLOGY AND DESIGN

The sampling procedures, the research design, and the instrument development are presented in this chapter. The methods needed to address the problem were divided into six sections: a) type of research, b) data sources, c) sample selection, d) variables of interest, e) the statistical treatment and data analysis, and f) the summary.

TYPE OF RESEARCH

The research design was a comparative retrospective study. The subjects consisted of pregnant patients delivered at the Bowling Green City-County Hospital by five obstetricians who utilized the hospital during the time of study. Patients between the ages of 18 to 34 years of age were selected from the hospital's delivery record book. The time, amount, and type of medication administered during labor and delivery were recorded.

According to the 1978 record book, 1,736 deliveries were performed.65 A random sample of 199 patients was

65Delivery Record Book, City-County Hospital, Bowling Green, Kentucky, 1978.
selected for this study accounting for approximately 11.5% of the deliveries which occurred between February 1, and July 31, 1979. The predominant racial status was Caucasian. All patients were considered middle-class. All patients were healthy pregnant women with no history of previous complications.

**DATA SOURCE**

The data for this study was collected from several sources: nursery record book; patients and infants charts; and Apgar scores found on the birth certificates at the Warren County Health Department. Prior permission to access the records was obtained from Charles Hume, Administrator of the Health Department, and Carroll Sumner, Assistant Administrator of the City-County Hospital. Prior permission was also obtained from the obstetricians who had privileges at City-County Hospital. Permission letters can be found in (Appendix, p. 46-52).

The confidentiality of the patient records was protected by the use of code numbers. The information was recorded from the patient record on coded data sheets (Appendix, p. 41). The data were then transferred to coding sheets and keypunched on computer cards.
Apgar scores from birth records were compared with those on the birth certificates and were found to coincide in all cases.

**VARIABLES OF INTEREST**

The following dependent variables were examined in this study: Apgar scores, length of postpartum hospitalization for mother and infant, and oxygen given in the delivery room and nursery. These variables measured anesthetic effects on the mother and newborn. The independent variables were as follows: the amount, time, and administration of medication during delivery.

The control variables consisted of number of prenatal visits, number of pregnancies, and the state of pregnancy at first visit to the physician. These variables were analyzed to determine whether differences among subjects could be attributed to pre-existing differences.

The patients were divided into three categories from the original information code sheet according to the amount of the major analgesia (Demerol administered).

- **0=Low** Demerol 25 milligrams only or no medication
- **1=Medium** Demerol 25 to 49 milligrams
- **2=High** Demerol 50 milligrams and up
STATISTICAL TREATMENT AND DATA ANALYSIS

The question of interest in this study related to the effects of drugs administered during labor and delivery on the newborn at birth or during the postpartum stay. These effects were measured by the following dependent variables: Apgar scores at one minute and five minutes, postpartum hospitalization, complications of mother and newborn, and if oxygen was administered at birth. The patients were divided into three groups according to the amount of medication administered. The high and low groups were evaluated statistically to determine the following: 1) if significant differences on the control variables and, 2) if significant differences on the dependent variables.

NULL HYPOTHESIS

There is no significant difference in the effects on mother and newborn when the prescribed amount, time, and administered analgesia is varied during labor and delivery.
The statistical methods for testing the results of the two groups were the t-test at the .05 alpha level,\textsuperscript{69}

\[
t = \frac{X_1 - X_2}{\sqrt{\frac{(N_1 - S_1^2 + (N_2-1) S_2^2)}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}
\]

and the chi-square at the .05 level for discrete data.\textsuperscript{70}

\[
X^2 = \frac{(O-E)^2}{E}
\]


\textsuperscript{70}Welkowitz, p. 244.
Chapter 4

ANALYSIS AND INTERPRETATION OF DATA

The study population consisted of 199 white delivered patients and newborns. Table II shows the mean age of the patient, the number of prenatal visits, and the stage of pregnancy in weeks at the time of the first visit to the physician. The Apgar score at one minute, five minutes, and the number of days of postpartum hospitalization of mother and newborn are also included.

TABLE II

MEAN SCORES OF DEPENDENT AND CONTROL VARIABLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Visits</td>
<td>199</td>
<td>10.92</td>
<td>±2.59</td>
</tr>
<tr>
<td>Stage of pregnancy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in weeks</td>
<td>199</td>
<td>11.95</td>
<td>±4.64</td>
</tr>
<tr>
<td>Apgar at 1 minute</td>
<td>199</td>
<td>8.10</td>
<td>± .94</td>
</tr>
<tr>
<td>Apgar at 5 minutes</td>
<td>199</td>
<td>9.01</td>
<td>± .67</td>
</tr>
<tr>
<td>Postpartum days of mother</td>
<td>199</td>
<td>3.21</td>
<td>± .82</td>
</tr>
<tr>
<td>Postpartum days of newborn</td>
<td>199</td>
<td>3.27</td>
<td>± .93</td>
</tr>
<tr>
<td>Age of mother</td>
<td>199</td>
<td>24.64</td>
<td>±4.09</td>
</tr>
</tbody>
</table>
The central focus of this analysis was the amount, time, and type of medication administered in labor and delivery and its effects on the delivered newborn. Table III presents the means for the medication administered to the 199 patients studied.

**TABLE III**

**THE MEAN DOSE OF MEDICATION**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Number</th>
<th>Mean</th>
<th>Maximum Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demerol</td>
<td>199</td>
<td>82.79 mg.</td>
<td>200 mg.</td>
</tr>
<tr>
<td>Phenergan</td>
<td>199</td>
<td>4.77 mg.</td>
<td>25 mg.</td>
</tr>
<tr>
<td>Largan</td>
<td>199</td>
<td>18.19 mg.</td>
<td>40 mg.</td>
</tr>
<tr>
<td>Lornan</td>
<td>199</td>
<td>.61 mg.</td>
<td>1-2 mg.</td>
</tr>
<tr>
<td>Scopolamine</td>
<td>199</td>
<td>.01 mg.</td>
<td>10 mg.</td>
</tr>
</tbody>
</table>

(Refer to literature section)

These means fall into the normal range of drugs administered in labor and delivery.

The multiple t-test was used to compare high and low groups with regard to dependent and control variables. The results of Apgar scores at one and five minutes are revealed in Table IV.
TABLE IV

DEPENDENT VARIABLES COMPARED TO HIGH AND LOW GROUPS

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>S. D.</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apgar at one minute</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>71</td>
<td>8.18</td>
<td>0.975</td>
<td>1.5213</td>
<td>Approached</td>
</tr>
<tr>
<td>Low</td>
<td>90</td>
<td>7.95</td>
<td>0.898</td>
<td>1.5363</td>
<td>Approached</td>
</tr>
<tr>
<td>Apgar at five minutes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>71</td>
<td>9.13</td>
<td>0.83</td>
<td>1.8344</td>
<td>S</td>
</tr>
<tr>
<td>Low</td>
<td>90</td>
<td>8.92</td>
<td>0.50</td>
<td>1.9377</td>
<td>S</td>
</tr>
<tr>
<td>Stage in weeks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>78</td>
<td>12.36</td>
<td>4.49</td>
<td>1.0106</td>
<td>N/S</td>
</tr>
<tr>
<td>Low</td>
<td>121</td>
<td>11.68</td>
<td>4.72</td>
<td>.9998</td>
<td>N/S</td>
</tr>
<tr>
<td>Medication Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>37</td>
<td>121.78</td>
<td>93.54</td>
<td>-0.8773</td>
<td>N/S</td>
</tr>
<tr>
<td>Low</td>
<td>121</td>
<td>137.09</td>
<td>90.69</td>
<td>-0.8919</td>
<td>N/S</td>
</tr>
</tbody>
</table>

It is essential to explain the use of Apgar scores in this study. Two physicians did not record Apgar scores for infants on the delivery room record or the newborn's birth certificates. The recording of Apgar scores is the prerogative of the physicians, but this omission reduced the data available for the study. For the infants without Apgar scores, the appropriate space on the answer sheet was left blank. The omitted Apgar scores caused the varied numbers in the above table. The number of subjects with recorded Apgar scores were tested in the analysis. The probability of the t was adjusted for each test in the analysis because the sample sizes and variances were
unequal. Satterthwaite's approximation of $t$ was used for the unequal variances.\textsuperscript{68}

Differences between Apgar scores at one minute in the high and low groups of Demerol administered approached significance. The Apgar score was higher in the group which received less Demerol. A significance difference was found in the Apgar of five minutes. Once again the Apgar score was higher in the group receiving low dosage of Demerol. The fact that the five minute score attained significance was probably attributable to closer observation of Apgar scores at five minutes. There were no significant differences seen in the stage of pregnancy at first visit and the peak action time that the drug was administered.

The chi-square was used to analyze the information in Table V. Oxygen administration was tested. Information regarding oxygen administration was not reported by the physician, but by the nurse in the labor and delivery area. The amount and time of oxygen administration or distress were observed in the newborn, and written observations were recorded by the nurse on the delivery record. When the charts were reviewed, this information was recorded on the data sheets.

More oxygen was administered to the newborns of mothers in the group with high Demerol administration.

**TABLE V**

**OXYGEN ADMINISTERED TO NEWBORNS**

<table>
<thead>
<tr>
<th>Oxygen</th>
<th>Low Dosage Demerol</th>
<th>High Dosage Demerol</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undefined</td>
<td>63</td>
<td>17</td>
<td>80</td>
</tr>
<tr>
<td>Not Administered</td>
<td>6</td>
<td>82</td>
<td>88</td>
</tr>
<tr>
<td>Administered</td>
<td>2</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>104</td>
<td>119</td>
</tr>
</tbody>
</table>

Prob=0.0014

As Table VI and VII reveal there were no significant relationships between the high and low group of Demerol administration with regard to respiratory problems of mother and newborn.

**TABLE VI**

**RESPIRATORY PROBLEMS OF MOTHER**

<table>
<thead>
<tr>
<th>No respiratory problems</th>
<th>Low Dosage Demerol</th>
<th>High Dosage Demerol</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No respiratory problems</td>
<td>78</td>
<td>118</td>
<td>196</td>
</tr>
<tr>
<td>Respiratory problems</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>121</td>
<td>199</td>
</tr>
</tbody>
</table>

Prob=1.1611
TABLE VII

RESPIRATORY PROBLEMS OF NEWBORN

<table>
<thead>
<tr>
<th></th>
<th>Low Dosage Demerol</th>
<th>High Dosage Demerol</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No problems</td>
<td>76</td>
<td>118</td>
<td>194</td>
</tr>
<tr>
<td>Problems</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>121</td>
<td>199</td>
</tr>
</tbody>
</table>

Prob=0.9702

The small number of subjects suffering respiratory problems made evaluation of medication effects difficult. No significant relationships between administration of Demerol and respiratory distress in the newborn were observed.

The amount of Demerol administration was compared in primigravidas and multigravidas. The test results are shown in Table VIII.

TABLE VIII

DEMEROL ADMINISTERED TO PRIMIGRAVIDAS AND MULTIGRAVIDAS

<table>
<thead>
<tr>
<th></th>
<th>Primigravidas</th>
<th>Multigravidas</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Dosage Demerol</td>
<td>41</td>
<td>37</td>
<td>78</td>
</tr>
<tr>
<td>High Dosage Demerol</td>
<td>62</td>
<td>59</td>
<td>121</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td>96</td>
<td>199</td>
</tr>
</tbody>
</table>

Prob=0.8552

There was a tendency for the primigravidas to receive higher doses of Demerol. According to
Yvonne Brakebill, primigravidas have longer labor and are administered more drugs than multiparous women.69

**TABLE IX**

<table>
<thead>
<tr>
<th>Demerol Compared to Number of Times Pregnant</th>
<th>Low Dosage Demerol</th>
<th>High Dosage Demerol</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multigravidas</td>
<td>41</td>
<td>62</td>
<td>103</td>
</tr>
<tr>
<td>Primigravidas</td>
<td>37</td>
<td>59</td>
<td>96</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>121</td>
<td>199</td>
</tr>
</tbody>
</table>

Prob = 0.08552

The chi-square test was used to determine differences between high and low administration of Demerol of the primigravidas and multigravidas. No significant differences between the number of pregnancies and the amount of Demerol were observed.

**TABLE X**

<table>
<thead>
<tr>
<th>Administration Time for Demerol</th>
<th>Low Dosage Demerol</th>
<th>High Dosage Demerol</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not peak</td>
<td>57</td>
<td>46</td>
<td>103</td>
</tr>
<tr>
<td>Peak</td>
<td>21</td>
<td>75</td>
<td>96</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>121</td>
<td>199</td>
</tr>
</tbody>
</table>

Prob = .0001

The peak action of Demerol revealed a significant relationship between the high and low groups. This may be that more patients in the high group were at the peak action at the time of delivery.

---

Chapter 5

DISCUSSION

The limitations of this study include: the subjectivity of Apgar scores and incompleteness of patient's records.

Two physicians did not record oxygen administration of Apgar scores on their patient's records. The omission of scores combined with the small sample size detracted from the ability of the study to statistically compare some of the dependent variables.

The results did not reveal harmful effects on the mother. They did, however, reveal detrimental effects on the newborn. In combination with previous research, these findings suggest that heavy use of analgesia and anesthesia in labor and delivery is undesirable.
RECOMMENDATIONS

1. More accurate information should be charted on the mother and newborn at the time of delivery nursery record and postpartum care.

2. Apgar scores should be recorded accurately on the delivery record sheet, nursery record, and all birth certificates.

3. There should be a more accurate means of recording the administration of oxygen to the newborn and the time of administration in minutes recorded exactly.
<table>
<thead>
<tr>
<th>COLUMN</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Sequential ID Number</td>
</tr>
<tr>
<td>4-5</td>
<td>Age</td>
</tr>
<tr>
<td>6</td>
<td>Pregnancy (1-5)</td>
</tr>
<tr>
<td>7</td>
<td>Physician Code Number (1-5)</td>
</tr>
<tr>
<td>8</td>
<td>Sex of Child (1=male, 2=female)</td>
</tr>
<tr>
<td>9-10</td>
<td>Number of Pregnancy at First Visit</td>
</tr>
<tr>
<td>11-12</td>
<td>Stage of Pregnancy at First Visit</td>
</tr>
<tr>
<td>13-15</td>
<td>Amount of Diamorphine (mg.)</td>
</tr>
<tr>
<td>16-18</td>
<td>Phenergan (mg.)</td>
</tr>
<tr>
<td>19-21</td>
<td>Largan (mg.)</td>
</tr>
<tr>
<td>22-24</td>
<td>Lorfan (mg.)</td>
</tr>
<tr>
<td>25-27</td>
<td>Scopolamine (gr.) (0=no, 1=yes)</td>
</tr>
<tr>
<td>28-30</td>
<td>Morphine (gr.)</td>
</tr>
<tr>
<td>31</td>
<td>Hours Under Drug</td>
</tr>
<tr>
<td>32-33</td>
<td>Minutes Under Drug</td>
</tr>
<tr>
<td>34</td>
<td>Apgar at One Minute</td>
</tr>
<tr>
<td>35-36</td>
<td>Apgar at Five Minutes</td>
</tr>
<tr>
<td>37</td>
<td>Was Oxygen Given (0=no, 1=yes)</td>
</tr>
<tr>
<td>38</td>
<td>Was General Anesthesia Given (0=no, 1=yes)</td>
</tr>
<tr>
<td>39-40</td>
<td>Minutes Under General Anesthesia</td>
</tr>
<tr>
<td>41</td>
<td>Postpartum Hospitalization for Mother</td>
</tr>
<tr>
<td>42</td>
<td>Postpartum Hospitalization for Newborn</td>
</tr>
<tr>
<td>43</td>
<td>Complications for Mother-Respiratory Distress (0=no, 1=yes)</td>
</tr>
<tr>
<td>44</td>
<td>Hemorrhage</td>
</tr>
<tr>
<td>45</td>
<td>Infection</td>
</tr>
<tr>
<td>46</td>
<td>Complications for Newborn-Respiratory Distress</td>
</tr>
<tr>
<td>47</td>
<td>Postmaturity</td>
</tr>
<tr>
<td>48</td>
<td>Jaundice</td>
</tr>
<tr>
<td>49</td>
<td>Anomalies</td>
</tr>
</tbody>
</table>
I. PRENATAL CARE
   A. Number of Prenatal Visits
   B. Stage of Pregnancy at First Visit

II. ANALGESIA/ANESTHESIA DURING LABOR AND DELIVERY

<table>
<thead>
<tr>
<th>Drug</th>
<th>Amount</th>
<th>Time</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demerol</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phenergan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Largon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lorfan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scopolamine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ANESTHESIA

III. APGAR SCORE
   A. One Minute
   B. Five Minutes

IV. POSTPARTUM HOSPITALIZATION (days)
   A. Mother
   B. Newborn

V. COMPLICATION - POSTPARTUM

<table>
<thead>
<tr>
<th>MOTHER</th>
<th>Condition</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maternal Respiratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distress</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Postpartum Hemorrhage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Postpartum Infection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEWBORN</th>
<th>Condition</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neonatal Respiratory</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distress</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Postmaturity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jaundice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anomalies</td>
<td></td>
</tr>
</tbody>
</table>
BIBLIOGRAPHY


Serunian, Sally A. "Relationship of Apgar Score and Bayley Mental and Motor Scores," *Child Development*, XLVI, No. 3, (September, 1975), 698-700.


I, GIVE PERMISSION TO LINDA ROE FOR HER MASTER'S THESIS STUDY TO OBTAIN THE FOLLOWING INFORMATION.

1) APGAR SCORES FROM BIRTH CERTIFICATES.

2) ACCESS TO DISCHARGED OBSTETRICAL PATIENT'S HOSPITAL RECORDS WITHIN THE UNDERSTOOD SCOPE OF STUDY.

THIS PERMISSION IS CONTINGENT ON MAINTAINING TOTAL CONFIDENTIALITY OF THE IDENTIFICATION OF PATIENTS AND PHYSICIANS INVOLVED IN THE STUDY. THE INFORMATION IS TO BE PRESENTED STATISTICALLY AND RECORDS WOULD BE PULLED BY MEDICAL RECORDS PERSONNEL AND WOULD NOT LEAVE THE FACILITY.
I, [Signature], give permission to Linda Roe for her Master's thesis study to obtain the following information.

1) APGAR scores from birth certificates.

2) Access to discharged obstetrical patient's hospital records within the understood scope of study.

This permission is contingent on maintaining total confidentiality of the identification of patients and physicians involved in the study. The information is to be presented statistically and records would be pulled by medical records personnel and would not leave the facility.
I, Carl Dolson, give permission to Linda Roe for her Master's Thesis study to obtain the following information.

1) Apgar scores from birth certificates.

2) Access to discharged obstetrical patient's hospital records within the understood scope of study.

This permission is contingent on maintaining total confidentiality of the identification of patients and physicians involved in the study. The information is to be presented statistically and records would be pulled by medical records personnel and would not leave the facility.
I. Andrew (Signature) give permission to Linda Roe
for her Master's thesis study to obtain the following
information.
1) APGAR scores from birth certificates.
2) Access to discharged obstetrical patient's hospital
records within the understood scope of study.

This permission is contingent on maintaining total
confidentiality of the identification of patients and
physicians involved in the study. The information is
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1) APGAR scores from birth certificates.

2) Access to discharged obstetrical patient's hospital records within the understood scope of study.

This permission is contingent on maintaining total confidentiality of the identification of patients and physicians involved in the study. The information is to be presented statistically and records would be pulled by medical records personnel and would not leave the facility.
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B4, F2