1984

The Relationship of Fetal Movement Records to Non-Stress Tests in High Risk Antepartum Patients

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THE RELATIONSHIP OF FETAL MOVEMENT RECORDS TO NON-STRESS TESTS IN HIGH RISK ANTEPARTUM PATIENTS

By

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A Thesis Submitted to the Graduate Faculty
of the School of Nursing in Partial Fulfillment
of the Requirements for the Degree of
Master of Science
April 1984

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ACKNOWLEDGEMENTS

I would like to thank Dr. Dona Snyder, Dr. Karen Haller, and Dr. Linda Janusek for their support and help in preparing this thesis. Their suggestions have been invaluable. Without their confidence, completion of this thesis would have been impossible.

To the staff of the Fetal Assessment Clinic; Peggy Gantes, Vida Bartasius, Jan Frese-Gallo, Alice Henry, and Sue Henry, I wish to thank them for their time and belief in the importance of this project. These women are truly committed to the research process.

Finally, I also wish to thank my husband and family, their psychological support has helped me cope at times I thought impossible. This support system has been crucial in the achievements I have made.

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INTRODUCTION

Perinatology was developed to bridge the gap noted between obstetrics and neonatology. The advent of perinatology, coupled with technological advances, has led to improvement in neonatal morbidity and mortality statistics. For instance, in Illinois, the perinatal mortality rate has markedly decreased since the advances in perinatology called for regionalization of obstetrical and neonatal facilities (Illinois State Health Planning and Development Agency, 1979).

With the development of perinatology, much emphasis has been placed on the antepartum phase of pregnancy. The majority of intrauterine deaths occur before the onset of labor (Liston, Cohen, Gabbe, and Mennuti, 1982). The goal of antepartum monitoring is to identify the fetus at risk who can not tolerate the intrauterine environment.

The inability to have direct contact with the fetus has presented many challenges to the staff involved in perinatal care. Biophysical, biochemical, and electronic monitoring techniques are available to aid in the assessment of the fetus at risk. No one tool can provide unequivocable data, but a combination of the information obtained can aid in identifying the fetus at risk.

The non-stress test is a widely accepted test performed on high risk mothers and employs the electronic fetal monitor. This test was initially proposed in 1969 by Hammacher and Kubli, Kaiser, and Kinselman (1969). Fetal heart rate oscillations are observed in response to fetal movements. The test is relatively easy to perform and requires ten to forty minutes for completion. A

major disadvantage is that trained personnel and costly electronic equipment are required. Another disadvantage is that false positive tests require the use of further equipment and testing.

A new assessment technique has recently been introduced, known as the fetal movement record. Fetal movement has long been associated with life and first was noted during biblical time. In the book of Genesis, Rebecca states that "the children struggled within her." Quickening, or the first time the mother feels the fetus move, is a good indicator for dating pregnancy.

The determination of frequent fetal activity through accurate recording of fetal movements has been shown to be a good indicator of fetal outcome (Sadovsky, 1976). Fetal movement has been studied alone (Rosen, Hertz, Dierker, and Zador, 1979), and in conjunction with other parameters (Spellacy, Cruz, Gelman, and Buhi, 1977 and Sadovsky, Yaffe, and Polishuk, 1974), to identify those fetuses at risk for intrauterine asphyxia and death. In addition, progressive decline in fetal activity as observed on the fetal movement record has been shown to be predictive of impending fetal difficulties (Pearson and Weaver, 1977 and Sadovsky, Weinstein, and Polishuk, 1978).

Fetal movement records can aid in early detection and prevention of problems. Fetal movement records provide continuity of assessment, and may also be predictive of fetal distress in the interim period between non-stress tests. There has not however, been any substantive evidence of a direct relationship between fetal movement records and the results of non-stress tests. Therefore, the purpose of this study was to determine the relationship between fetal movement records and non-stress tests.

DEFINTIION OF TERMS

Two variables were identified for study. They were the independent variable of the fetal movement record result and the dependent variable of the non-stress test result.

Non-stress Test - The relationship between the fetal heart rate as measured by an electronic fetal monitor and the mothers perception of concurrent fetal movement which is also denoted on a fetal monitor tracing.

Reactive Non-stress Test - A test which there are three or more fetal movements in a fifteen minute period accompanied by an increase in the fetal heart rate of 15 beats per minute for 15 seconds (Sampson, Thomason, and Work, 1981).

Nonreactive Non-stress Test - A test with less than three fetal movements accompanied by an increase in fetal heart rate of 15 beats per minute for 15 seconds in a fifteen minute period during a forty minute monitoring period (Sampson, Thomason, and Work, 1981).

Fetal Movement Record - A record of fetal movement perceived by the mother in a thirty minute period (Sadovsky, Weinstein, and Polishuk, 1978).

Reactive Fetal Movement Record - A record that reflects a minimum of three fetal movements in a thirty minute period (Sadovsky, Weinstein, and Polishuk, 1978).

Nonreactive Fetal Movement Record - A record that reflects less than three fetal movements in a thirty minute monitoring period (Sadovsky, Weinstein, and Polishuk, 1978).

HYPOTHESES

H_0 There is no relationship between non-stress test results and fetal movement record results.

H_1 There will be a positive relationship between reactive fetal movement records and reactive non-stress tests.

H_2 There will be a positive relationship between nonreactive fetal movement records and nonreactive non-stress test results.

ASSUMPTIONS

I. Fetal monitors will be calibrated and accurately record fetal heart rate.

II. After receiving instruction, patients will use the fetal movement records correctly.

REVIEW OF THE LITERATURE

FETAL HEART RATE

Fetal heart rate patterns are controlled by a portion of the central nervous system. The fetal heart rate is determined by an intrinsic rate with modulation from the two branches of the autonomic nervous system (Parer, 1976). The parasympathetic branch slows the heart rate and is responsible for transmitting variability. Conversely, the sympathetic system speeds up the heart rate. Parasympathetic and sympathetic interactions are mediated through the vasomotor center in the medulla oblongata (Parer, 1976). The input from the autonomic nervous system occurs primarily through the baroreceptors and chemoreceptors with some higher central control (Parer, 1976). There is also some regulatory input from the hormonal mechanisms (adrenal medulla and cortex) and some volume control by hydrostatic and osmotic pressures (Parer, 1976).

Thus, non-stress tests enable us to indirectly identify problems in this system. Frequently, but not always, fetal movements are accompanied by heart rate accelerations of 15-25 beats per minute which last 10-30 seconds (Martin, 1978). Whether fetal activity is spontaneous or provoked by external manipulation, it is often followed by heart rate accelerations. The cause of these accelerations is not clearly understood, but the lack of fetal heart rate accelerations with movement is suggestive of fetal distress (Martin, 1978). Heart rate accelerations are normal but not required or expected with every fetal movement (Martin, 1978).

FETAL MOVEMENT

A number of different researchers have extensively studied fetal movement. Timor-Tritsch (1976) identified four groups of movements present during the second half of pregnancy:

1) Rolling movement - which is sustained and associated with the entire body.
2) Simple movement - a short and easily palpable movement - felt as if it originated from an extremity such as an arm or leg.
3) High frequency movements - short palpable and sometime readily seen movements of the fetus-generalized movements and may be felt over the entire abdomen.
4) Respiratory movements - movements of the fetal chest wall which can be felt by the mother.

Reinhold and Ehrstom (1977) divide movements into two categories - strong and sudden movements and slow and inert movements. Rayburn (1982) found that rolling movements produced sustained accelerations, while simple movements showed shorter accelerations.

Sadovsky, Laufer, and Allcon (1979) examined fetal movements and found that both the type and frequency of movement changed throughout pregnancy. Weak movements were present 100% of the time at twenty weeks gestation and decreased throughout the remainder of pregnancy, while strong and rolling movements increased after twenty weeks and peaked at 36-37 weeks. Rayburn (1982) found that fetal motion of three seconds duration increases heart rate 99.8% of the time.

ASSESSMENT OF FETAL MOVEMENT

Several techniques are available for recording fetal movement. Rosen, Hertz, Dierker, Zador, and Timor-Tritsch (1979) described three methods which are currently available: (1) the electromechanical method requires use of a strain gauge, tocodynamometer, or ultrasound; (2) active recording uses real time or holography; and (3) tactile palpation of fetal movement. Use of the first two methods is limited by the requirement of trained personnel and highly specific equipment. In a study performed by Neldam and Jessen (1978), 90% of fetal movements were not recorded using cardiotocography, while mothers' perceptions were found to be more accurate. Sadovsky (1976) recorded 82% (range 64-100%) maternal accuracy in assessing fetal movements, as compared to electromagnetic recordings. No woman ever reported feeling a movement when one was not present. Ehrstrom (1977) found an accuracy rate of 90.3% (range 71.4-100%). Gettinger's (1978) patients perceived only a mean of 40% of movements (range 0-94%) noted on ultrasound. Pearson (1977) found increased accuracy when fetal movement was recorded by the mother in the supine position.

VARIATIONS IN FETAL MOVEMENTS

The number of fetal movements also vary. Sadovsky (1981) found diurnal variations in fetal movements with an increased number in the evening. Peak periods were 6PM - 9PM and 9PM - 1AM. Goodlin (1974) also noted these peak periods. Spellacy, Cruz, Gelman, and Buhi (1977) found no variations in midday and evening movements, although morning movements were much less frequent. Ehrstrom (1977) also found peak periods to be 8PM - 11PM.

Ehrstrom (1977) found that fetal movements peak at 29-38 weeks

gestation, with subsequent decrease from 38 weeks until delivery. A marked reduction of movements occurs with post-term fetuses. These results are supported by Leader, Baille, and Van Schalkwyk (1982) and Sadovsky, Yaffe, and Polishuk (1974). Rayburn (1982) describes peak fetal activity periods at 28-32 weeks gestation as there is maximal intrauterine volume relative to fetal size. Data shows that movement decreases after 32 weeks gestation due to a decrease in amniotic fluid volume, increase in fetal size, a change in the central venous system, and an increased risk of placental insufficiency.

Maternal characteristics have been found to influence detection of fetal movements by the mothers. Sadovsky (1981) suggests that mothers' character, occupation, use of sedatives, readiness to participate, gestational age, maternal position, placental location, and smoking habits affect perceived movement. Decreased detection of fetal movements may be noted with an anterior placenta (Spellacy, Cruz, Gelman, and Buhi, 1977), increased maternal activity (Rayburn, 1982), psychiatric disorders, and use of sedatives (Sadovsky, 1981). Increased perception of fetal movements are noted with well educated women, eager to participate, and greater than 28 weeks gestation (Sadovsky, 1981). Variations are also noted by occupation; those with more sedentary jobs percieve more fetal movements than those with very active positions (Sadovsky, 1981). Wood, Gilber, O'Conner, and Walters (1979) concur, and add that a decrease in fetal movements can be seen when a true knot appears in the umbilical cord. Minors and Waterhouse (1979) found no correlations of fetal movement with meal times. Most fetal movements are detected with the gravid female lying down, a decreased number while sitting, and least determined while standing. Rayburn (1982) correlated the greatest number of fetal movements with the patient in the left lateral recumbent position. This may be related to the increase in blood

flow to the uterus, placenta, and fetus in this position.

FETAL MOVEMENT RECORDS

A variety of fetal movement counts have been described in the literature. Pearson and Weaver (1977) monitored fetal movements by maternal perception for 12 hours daily (9AM - 9PM) from 32 weeks gestation until delivery. They identified a lower limit of ten fetal movements in 12 hours as normal and found 2.5% were below this level. Fetal movement counts were correlated with urinary estriols. Four groups were determined:

Group	N	Fetal Movement	Urinary Estriol	Outcome
1	100	Normal	Normal	86% 1 minute Apgar greater than 7, 100% 10 minute Apgar greater than 7
2	8	Normal	Decreased 2 samples	7 survived, 1 died 5 elective C-section 3 labor induced 2 emergency C-section
3	10	Decreased	Normal	2 intrauterine fetal demise 1 malformed 5 C-section fetal distress 4 acidosis
4	4	Decreased for 18 days	Decreased for 1 week	4 died 1 liveborn - RDS

These results highlight the importance of the fetal movement record in predicting fetal outcome. Pearson (1977) also used the Cardiff count to 10 method in which the patient begins counting fetal movements at 9AM, and notes the time of the tenth fetal movement of the day. Sadovsky, Weinstein, and Polishuk (1978) use counts for 30-60 minutes three time per day. If any of these counts are less than three, recording continues for a six to twelve hour period. Sadovsky, and Polishuk (1977) defined a "movement alarm signal" in high risk pregnancies as a reduction of fetal movements, up to their cessation, for at least twelve hours while the heart is still audible. This is thought to be indicative of a severely distressed fetus. In a control group of 19 patients in whom no action was taken when a "movement alarm signal" was noted, fetal demise occurred within 1-12 hours. In the experimental group of 17 patients, when the "movement alarm signal" was followed by prompt delivery, only one neonatal death was reported. Fischer, Fullerton, and Trezise (1981) found that 14.2% of their population had movement alarm signals which correlated with the high risk parameters of large for gestational age, small for gestational age, and fetal distress in labor.

Spellacy, Cruz, Gelman, and Buhi (1977) recorded fetal movements for ten minute periods three times daily and found more fetal movements compared to other researchers. An error of movement detection for these short periods may be noted as quiet sleep of the fetus is 23 minutes and active sleep 40 minutes (Martin, 1978).

Sadovsky (1981) found no false negative results in the use of movement records. He also found fetal movement records to be more reliable than estriol levels in predicting intrauterine fetal demise. Consequently he devised a system

of scoring factors, which are to be evaluated with equal importance, given to each factor. This scoring system evaluates such factors as positive oxytocin challenge tests, negative or nonreactive non-stress tests, decreased results in fetal movement records, fetal heart rate changes, estriol levels, and fetal lung maturity.

Daily recording of fetal movement offers several advantages. Accurate fetal movement records can be obtained at no cost with no risk to the patient or fetus. In addition, because the procedure is simple, patient education is easily accomplished and the mother takes an active role in her own antenatal care. Finally, when the patient assumes the left lateral recumbent position, improved uteroplacental circulation is achieved. However, it must be recognized that it is not possible to predict acute fetal distress or the presence of major fetal malformations using this technique. Since weak movements of the fetus cannot always be detected by the mother, records may not be completely accurate.

NON-STRESS TEST

Initial use of the non-stress test was based on observations by Kubli, Kaiser, and Kinselman (1969) and Hammacher (1969). Since these early observations of fetal heart rate monitoring in response to fetal movement, many studies have been conducted. The role of fetal heart rate accelerations in the management of high risk pregnancies has now been more clearly defined (Knuppel, Lake, and Ingram, 1982). Rochard, Schifrin, and Goupil (1976) found that 80% of those babies with reactive non-stress test patterns tolerated labor without distress and 100% survived. This 100% survival rate was reproduced by Flynn and Kelly (1977), Nochimson, Turbeville, and Terry (1978), and Keegan, Paul, and Broussard (1980). Paul (1982) found a reactive non-stress test to be

predictive of fetal well being in 99% of the cases tested.

A problem with the use of non-stress testing is the lack of standard evaluation criteria. Minimum number of accelerations vary from a non specific amount to greater than five in the time period allowed (Knuppel, Lake, and Ingram, 1982). Time period in which reactivity must appear, minimum amplitude of accelerations, and minimum duration of accelerations also vary greatly (Knuppel, Lake, and Ingram, 1982).

Due to the inconsistency of evaluation standards, the number of contraction stress tests required to determine false positive non-stress tests varies greatly. Paul (1982) determined a false positive test to be present in 50% of those with non-reactive non-stress tests.

Reactive non-stress tests have been found to be highly predictive of fetal well being. The integrity of the fetal heart rate control by the reflex mechanism indicates adequate central nervous system control (Knuppel, Lake, and Ingram, 1982). Chronic hypoxia would blunt this control and in turn result in consistent non-reactive non-stress test results.

Correlations of non-reactive non-stress tests with poor outcomes and reactive non-stress tests with good outcomes have been documented by Freeman (1975), Gratacos and Paul (1980), Kubli, Kaeser, and Hinselmann (1969), Ray, Freeman, and Pine (1972), Schifrin, Foye, and Amato (1979), and Schifrin, Lapidus, and Doctor (1975). Evaluation of outcomes included Apgar scores, incidence of fetal distress in labor, the incidence of cesarean section for fetal distress, and the need for prolonged neonatal hospitalization (Knuppel, Lake, and Ingram 1982).

Although the non-stress test is a reliable indicator of fetal well being, .05% of all patients were unable to be monitored due to technical difficulties such as artifact and fetal heart rate averaging. Other factors that limit the usefulness of the non-stress test are expense, the necessity for specialized technicians, the requirements of maternal immobility during the test, and irritation of the monitoring apparatus.

FETAL MOVEMENT RECORDS AND NON-STRESS TEST RESULTS

The correlation of non-stress tests and fetal movement records has not been extensively investigated. Rayburn (1982) found a positive correlation between fetal activity and non-stress test results. In contrast, O'Leary and Andrinopoulos (1981) found no relationship between these two test results. However, data interpretation was limited by the use of uncommon criteria for analysis of the results. A reactive non-stress test required five accelerations or greater as reactive, while reactive fetal movement records required five movments in a 30 minute period three times per day.

During a pilot study conducted in 1983 by Schy, Cascino, and Zage, 31 fetal movement records and corresponding non-stress tests were obtained. Non-stress test results were reactive as well as fetal movement record counts. Due to the limited time for data collection, no non-reactive tests were obtained. The high risk population included patients with diabetes, hypertension, intrauterine growth retardation, and history of stillbrith. Further study to determine the relationship of non-reactive fetal movement records and non-stress tests was determined to be necessary. This study was used as a pilot for the present investigation.

METHODOLOGY

OVERVIEW

This was a descriptive correlational study. Information was obtained and correlations of data were performed. There was no manipulation of the variables by the researcher and the relationship between non-stress tests and fetal movement records was only described.

Non-stress test records and daily fetal movement records were kept on file at a Fetal Assessment Clinic. Data was collected from records on file beginning in August 1983.

SETTING

The setting for the study was the Fetal Assessment Clinic of a high risk perinatal center in a major midwest medical center. The hospital performs approximately 4200 deliveries per year and has a high risk population of more than 50% of its obstetrical clients. All outpatient testing including non-stress tests and oxytocin challenge tests are performed at the clinic. The Fetal Assessment Clinic is run by four nurses under the direction of the Director of Maternal-Fetal Medicine. Physicians are not present at the clinic but can be called for consultation at any time. High risk patients attend this clinic from the time they are at 28 weeks gestation. A good rapport generally develops between the staff and the high risk antepartal patient.

A previous pilot study was conducted at this institution and permission was granted to continue with the study. The proposal was submitted to both the institutional review board and the nursing research committee.

SAMPLE SELECTION

Only the records of patients attending the Fetal Assessment Clinic of this level III perinatal center were used. Weekly non-stress tests were performed on all high risk patients greater than 28 weeks gestation. High risk classification was determined by the physician administering care. Some diagnoses precipitating high risk classifcation were diabetes mellitus, hypertensive disorders, seizure disorders, suspected intrauterine growth retardation, drug abuse and addiction, cardiovascular complications, renal complications, and previous stillbirth.

All patients attending the Fetal Assessment Clinic were asked to keep fetal movement records. Records were chosen from patients who attended the clinic on a weekly basis after August 1983. Inclusion criteria consisted of being 28 weeks gestation or greater, English or Spanish speaking, high risk classification, and having been scheduled for weekly testing.

Two sample groups of patient records were selected. One group consisted of twenty-five fetal movement records that were considered reactive, and the other group of eight fetal movement records that were non-reactive. The corresponding non-stress test and/or oxytocin challenge test was also accessible for each patient record.

Convenience sampling was used to create the two sample groups- reactive and non-reactive fetal movement records. The first twenty five reactive records made up the first group; and only eight non-reactive records were identified during the study preiod. The incidence of non-reactive fetal movement records was .01%

To protect anonymity, all subjects were given a study number. The name and study number were only known to the investigator. Data were presented using the study number and descriptive characteristics such as high risk classification. Because only records were reviewed, no consent was required by both the Hospital Institutional Review Board nor the Loyola University Review Board as these documents are kept on all patients.

INSTRUMENT

Collection of data was done in the antepartal assessment clinic at the patients scheduled weekly appointments for their non-stress tests. The non-stress test involved placement of two transducers on the mother's abdomen. The transducers were placed over the fetus and on the uterine fundus in a position which optimally measures fetal heart rate and uterine activity respectively. Perceived fetal movements were documented on the fetal monitor tracing by the mother via a remote button. The recordings were kept on file in the Fetal Assessment Clinic. Documentation of the test results was done in the outpatient chart.

The electronic monitors were tested daily to assure calibration. Manufacturer specifications indicate that these monitors are accurate within $\pm$ 2 beats per minute. There was also an internal test which is performed daily to assure reliability.

The non-stress tests are read by the staff of the clinic using a measurement tool described by Sampson, Thomason, and Work (1981). The staff demonstrated a mean interrater reliability of 0.95 with expert Bruce Work M.D. during their initial employment period.

The fetal movement record in the Appendix was used by all patients attending the Fetal Assessment Clinic. It was shown to be reliable in the pilot study and has since been incorporated in the clinic routine. Initially validity was ascertained by showing the record to five experts in the field of perinatology. Only those fetal movement records recorded twelve hours prior to or twelve hours after testing were correlated with the non-stress test.

COLLECTION OF DATA

A teaching session was done with all patients on their initial visit to the clinic. During this period the primary nurse records data for one counting session concurrently with the patient. Accuracy of maternal perception of movement was then checked against observer palpation of fetal movement. This was done to determine the patients ability to use the fetal movement record.

The patient was then asked to record fetal movements for 3 thirty minute periods per day. She recorded this information on the fetal movement record she had been given. On her weekly visits to the clinic, she presented her data and received another record for the following week.

Both the fetal movement records and non-stress tests were stored in the Fetal Assessment Clinic. Data was collected on a weekly basis until quotas were met. This was to help minimize loss of data. These records (NST's and FMR's) are part of the permanent patient record. A demographic data sheet was used to record information (Appendix C).

RESULTS

SAMPLE

The population in this study were generally single (table 2), of lower educational background (table 3), and young women (table 4), of white, black, or hispanic origin (Tables 2 - 8 are found in the appendices). Primary antepartum complications varied widely. Gestational age (table 5) was comparable in both the non-reactive and reactive group. The Cesarean section rate (table 6) was higher for this population than the standard rate of 16% at the study institution. The non-reactive group had a much higher rate of primary cesarean section than the reactive group. Apgar scores (table 7) varied only slightly between the reactive and non-reactive group. Three of the non-reactive group had not delivered at the time of the study's completion. This may change the results. Neonatal sex (table 8) was more heavily weighted towards males as compared to the general population.

ANALYSIS OF DATA

Data obtained was nominal level. Sample characteristics such as marital status, educational level, maternal age, gestational age, type of delivery, Apgar scores, and neonatal sex are described in tables 2-8 using the descriptive techniques of frequency, percentage, mean, and median.

While the original intent of the study was to describe the differences between the reactive and nonreactive groups using Chi square, the data collected did not lend itself to this type of analysis.

In group one, 25 reactive fetal movement records were obtained with 25

corresponding reactive non-stress tests. Group two consisted of only eight patients. Of the eight non-reactive fetal movement records obtained seven patients had corresponding non-reactive non-stress test results. In the total sample, fetal movement records predicted non-stress test results 97% of the time. In the reactive group, fetal movement record results corresponded to non-stress test results 100%. While in the non-reactive group, fetal movement records were predictive of non-stress test results 87.5%. There were no reactive fetal movement records corresponding to non-reactive non-stress test results.

Table 1 - Non-stress Tests Versus Fetal Movement Records

Non-Stress Test (DV)	Fetal Movement Records (IV)	
	Reactive	Non-Reactive
Reactive	25	1
Non-Reactive	0	7

Lambda was employed to measure the degree to which one variable may be predicted from the knowledge of another.

$$\lambda = \frac{\Sigma_{fi} - F_d}{N - F_d}$$

λ = Lambda

Σ_{fi} = The sum of the largest frequencies occurring within each subclass of the independent variable

F_d = The largest frequency within the dependent variable totals

N = Total number of observations (Leonard, 1976).

$$\frac{32-26}{33-26} = 0.86$$

The result of 0.86 means that the dependent variable of non-stress test could be predicted with some degree of assurance from the knowledge of the independent variable of the fetal movement record.

Therefore, on the basis of the above data, the null hypothesis postulating no relationship between fetal movement records and non-stress tests was rejected. Hypothesis 1 proposing a positive relationship between reactive fetal movement records and reactive non-stress test results was accepted. Although only a small sample of non-reactive fetal movement records were obtained, a positive relationship between non-reactive non-stress tests and hypothesis 2 was upheld. More research is needed to confirm this finding.

DISCUSSION

During the four month period of data collection only eight patients presented with nonreactive fetal movement records. The Fetal Assessment Clinic completed 1503 non-stress tests during that same time period. Some of these non-stress tests were completed on the same patients as high risk antepartum care includes weekly non-stress tests beginning at 28 weeks gestation. The small number of non-reactive fetal movement records indicates the rarity of this occurrence.

Of the 25 patients with reactive fetal movement records all had reactive non-stress tests. There were no false positive fetal movement records results. The 8 patients who presented with non-reactive fetal movement records were not quite as cohesive. Six of those patients had non-reactive non-stress tests, one had an intrauterine fetal demise after two days of inactivity, and one had a reactive non-stress test. The patient with a reactive non-stress test required induction for a suspicious oxytocin challenge test four weeks after the non-reactive fetal movement record. In the non-reactive group patients were identified to have abruptio placenta, premature labor, intrauterine fetal demise, and uteroplacental insufficiency noted by a late deceleration pattern. Of the three patients who have not delivered two had suspicious oxytocin challenge tests. A single patient had both a non-reactive non-stress test and non-reactive fetal movement record followed by a negative oxytocin challenge test. The gestational age was only 28 weeks and perhaps this attributed to the false test results.

Only one neonate was found to have congenital malformations. Patient 07 who had been in the reactive group was found to have a male child with ambiguous genitalia and other anomalies. Neither the non-stress test nor the fetal movement record reported any abnormalities. The child was alive at this writing but his life expectancy is limited.

Data from this study substantiates the report by Rayburn (1982). Reactive fetal movement records were associated with reactive non-stress test results while non-reactive fetal movement records were associated with non-reactive non-stress tests.

This study augmented the knowledge of, and established theoretical framework for, perinatal nursing and medical practice. The goal of perinatology is to identify the mother and fetus at risk and provide for a timely delivery. The fetal movement record is a tool which can aid the health team in achieving this goal. Nurses and physicians can utilize the information obtained in this study for the planning and provision of care for the high risk, antepartal patients for whom they are responsible.

When fetal movement records are employed during the interim period between non-stress tests, signs of distress and movement alarm signals may alert the medical team of the necessity for medical intervention. This continuity of assessment and opportunity for early recognition of fetal distress could lower the perinatal mortality rate and improve pregnancy outcomes.

Appropriate education of the high risk, antepartal patient may lead to her increased compliance with the prescribed medical regimen. An active role by the high risk antepartum mother leads to a sense of control over a situation which

may seem chaotic at times. The mother learns about activity patterns of the fetus she is carrying and the bonding process is initiated. Involvement of the client in her care, through the use of the fetal movement record, may lead to increased satisfaction with the role she can assume in caring for herself and her unborn child.

With the controversy about the safety of ultrasound during pregnancy the fetal movement record seems a safe alternative. Although no human studies have proven teratogenic effects of ultrasound, there have been many animal studies to substantiate claims of chromosomal damage. This area does need further investigation.

The results of this study may also aid in the reduction of health care costs if it leads to subsequent research which proves that fetal movement records are an acceptable alternative for non-stress tests. In summary, this study has the potential to increase knowledge, improve perinatal care, decrease health costs, and involve patients in their own anternatal care.

LIMITATIONS OF STUDY

Although the data obtained were beneficial there are several limitations to this study.

1. All patients were selected from a single institution.
2. Patients were generally poorly educated and of lower socioeconomic status.
3. There was a loss of followup data as three subjects had not delivered at the conclusion of the study.
4. The study was dependent on maternal perception of fetal movement.
5. The sample population was limited to English and Spanish speaking

patients.

6. The time allotment for data collection of four months was not sufficient to obtain a group of 25 non-reactive fetal movement records.
7. The sample was one of convenience.
8. Findings are not generalizable to all high risk patients.

SUGGESTIONS FOR FURTHER RESEARCH

The investigator proposes the following as suggestions for further research:

1. Repeat the study with a larger N, using the same research design.
2. Repeat the study in heterogeneous institutions to increase the generalizability of the results.
3. Repeat the study and control for variations in patient diagnosis/high risk classification.
4. Repeat the study using a group of normal/low risk obstetrical patients.
5. Measure the effects of extraneous variables on the number of fetal movements perceived by the mother.
6. Correlate the results of fetal movement records with Apgar scores and neonatal outcome.

SUMMARY

The data presented supports use of fetal movement records as predictive tools for use of the non-stress test in spite of the study limitations previously identified. The results demonstrate that the fetal movement records may provide an accurate, cost effective tool in helping assess the high risk pregnancy. The patient may become more involved in assessment of her unborn childs wellbeing and be reassured with reactive test results. Positioning and allowing time for the fetal movement record should improve uteroplacental perfusion. Fetal heart rate testing could be used on a more conservative scale when fetal movement records were non-reactive or the patient noncompliant.

In addition, it appears to be a workable approach since the investigator was able to elicit the cooperation of patients of lower socioeconomic status who are generally considered to be difficult to educate and poorly motivated. No patient expressed concern or increased anxiety while using the movement records. The importance of reporting to the high risk institution once a decrease or non-reactive test is obtained needs to be stressed to prevent intrauterine fetal demise. Although, this study did predict an acute change in uteroplacental insufficiency it is most reliable with chronic changes.

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APPENDIX A

APPENIX A

Daily Fetal Movement Record

University of Illinois Hospital

Weeks Gestation: _____

Comments: _____

Diagnosis: _____ Medications: _____

Time Begun	Time Completed	Position	Time of Last Meal	Number of Movements

APPENDIX B

APPENDIX B

PATIENT INSTRUCTIONS

Rest on your left side or sit comfortably for three 30 minute periods per day. During that time count the number of times you feel the baby kick, roll over, or flutter. These counts shoud be done in the morning after a meal, in the afternoon after a snack or meal, and in the evening after a snack at bedtime. Write this down on the fetal movement record you received in clinic. Also, fill in the rest of the sheet such as date, time counting begins, the number of times the baby moves, your position (left side or sitting), the time of your last meal or snack, and anything unusual that has happened. If you have taken any medication that is not taken daily, please also record this.

If the baby does not move at least 9 times in the 3 periods you are counting or if the baby's movements are much less than usual, call the Fetal Assessment Clinic at 996-8400. If there is no answer, then call 996-4175 and ask to speak to a labor and delivery nurse. Also, if your baby has not moved in a 10-12 hour period, call the Fetal Assessment Clinic or go to the Emergency Room of the hospital.

APPENDIX C

APPENDIX C

DEMOGRAPHIC DATA

Patient Name_____ EDC_____

Unit Number_____ Last grade of school_____

Study Number_____ Phone number_____

Age_____ Marital Status_____

G___ T___ P___ Ab___ L___ Gestational age_____

FMR Result_____ NST Result_____

Preexisting complications:

Obstetrical complications:

Number of hospitalizations during present pregnancy _____

Gestation when prenatal care began_____

Delivery information :

Complications_____

Induction of labor_____

Apgar scores 1___ 5___ 10___

NSVD Cesarean Section Primary low transverse Repeat Classical

Infant complications _____

_____

Infant follow up_____

APPENDIX D

APPENDIX D

DEMOGRAPHIC DATA ANALYSIS:

Table 2 - Marital Status

Married	N=5	15%
Single	N=28	85%

Table 3 - Highest Level of Education

8th Grade or Less	N=7	21%
Some High School	N=11	33%
High School Graduate	N=10	30%
Some College	N=2	6%
College Graduate	N=3	9%

Table 4 - Maternal Age

	MEAN	Range
Total Group	23.9 yrs.	14 - 36 yrs.
Reactive Group	23.68 yrs.	14 - 36 yrs.
Non-reactive Group	23.25 yrs.	16 - 32 yrs.

Table 5 - Gestational Age

	Mean	Range
Total Group	35.6 wks.	28 - 41 wks.
Reactive Group	35.58 wks.	30 - 41 wks.
Non-reactive Group	35.7 wks	28 - 41 wks.

Table 6 - Type of Delivery

Total Group		
NSVD	N = 19	63%
Repeat C-Section	N = 3	10%
Primary C-Section	N = 8	27%
Reactive Group		
NSVD	N = 16	64%
Repeat C-Section	N = 3	12%
Primary C-Section	N = 6	24%
Non-reactive Group		
NSVD	N = 3	60%
Repeat C-Section	N = 0	0%
Primary C-Section	N = 2	40%

Table 7 - APGAR Scores

	1 Min.		5 Min.	
Total Group				
Mean	7.61	7.86*	8.29	8.6*
Range	0-9	4-9*	0-9	5-9*
Reactive Group				
Mean	8.00		8.62	
Range	4-9		5-9	
Non-reactive Group				
Mean	5.6	7.8*	6.6	8.25*
Range	0-8	5-8*	0-9	6-9*

* = excluding IUFD

TABLE 8 - NEONATAL SEX

	Male	Female
Total Group	64.5%	35.5%
Reactive Group	65.4%	34.6%
Non-reactive Group	60.0%	40.0%

APPROVAL SHEET

The thesis submitted by Deborah S. Schy has been read and approved by the following committee:

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The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Science in Nursing.

May 10, 1984
DATE

Dona J. Snyder R.N., Ph.D
DIRECTOR'S SIGNATURE