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Uterine Contraction Monitoring, Maintenance Tocolysis, and Preterm Birth

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1. Introduction

Uterine contractions occur in runs of 1-3/hr throughout pregnancy from early in the second trimester until full term usually without consequence. Regular uterine contractions are essential in every case of preterm labor (PTL) resulting in preterm delivery at <37 weeks. It has been demonstrated that women are unable to accurately perceive the contractions associated with preterm labor while uterine contraction monitoring can frequently detect these contractions at an early enough time that acute tocolysis can stop preterm labor in most cases and significantly prolong the pregnancy. In women who have cervical shortening, those who have preterm labor symptomatology with multifetal gestations, or patients who have already had an episode of preterm labor, uterine contraction monitoring has been helpful in prolonging the pregnancy by early detection. As an example, women, after receiving tocolysis for true preterm labor, are monitored (tertiary prevention) in the home (whether or not they are receiving maintenance tocolytics) and when a second episode of PTL occurs, the majority reach the hospital for appropriate treatment before excessive cervical dilatation has occurred. Alternatively, following successful acute tocolysis in the hospital, patients may receive maintenance tocolysis with a subcutaneous terbutaline infusion pump and are also managed at home with continued contraction assessment. This chapter will review the available literature regarding the use of contraction monitoring for tertiary prevention as well as subcutaneous terbutaline maintenance therapy for treatment of contractions.

2. Background

2.1 General

The incidence of preterm birth (PTB), or delivery at <37 weeks, continues to increase and accounts for 75% of all neonatal mortality and morbidity.(Hamilton *et al*., 2006) All physicians agree that preterm delivery (PTD) following preterm labor (PTL) involves

frequent uterine contractions which dilate the cervix. In fact, the definition of preterm labor involves uterine contractions ≤5 minutes apart and cervical change (usually ≥1cm dilatation or cervical shortening (or thinning) by ultrasound). Contractions that do not meet that frequency or contractions without cervical change several hours after uterine activity starts are called uterine irritability, irregular contractions, Braxton Hicks contractions, or false labor, but have no effect on the cervix are never called preterm labor. In order to delay or prevent PTD, true uterine contractions should be detected sufficiently early (cervical dilatation <4 cm), to allow reasonable success of tocolytic drugs to result in meaningful pregnancy prolongation.(ACOG Practice Bulletin, 2007) Unfortunately, painful, irregular uterine contractions can also be associated with false labor or uterine irritability and even when they are strong, much less than 50% are perceived by patients.(Beckmann *et al*., 1996; Faustin *et al*., 1997) PTL can be acute (abruptly going from normal contraction frequency of 1-2/hr on average to ≥8 ctx/hr) or gradual (over days). Basal uterine activity is important clinically, since the goal is to detect an increase in contractions in a timely fashion.

2.2 Uterine contraction monitoring

The detection of contractions in asymptomatic patients to rule out true preterm labor for some identified risk factor by uterine activity assessment or palpation alone has meet with variable success.(Faustin *et al*., 1997; Martin *et al*., 1990; Dyson *et al*., 1998) The use of uterine contraction monitoring and patient recorded signs and symptoms is more successful (secondary prevention) but does not yield high enough positive predictive value to be useful as a assessment tool for those with high risk factors.(Dyson *et al*., 1998) Some patients are at extremely high risk for preterm delivery such as those who have already experienced an episode of true preterm labor with cervical dilatation or women with multi-fetal gestations (MFG), or those with a significantly shortened cervix. These patients have all been shown to benefit from uterine activity monitoring (tertiary prevention).(Morrison *et al*., 2001; Katz *et al*., 1986; Watson *et al*., 1990; Kosasa *et al*., 1990) Contraction assessment is particularly important in MFG as the contraction pattern is different from that in singletons. Newman *et al*., *(1986)* demonstrated that twins have statistically more contractions/hr than singletons averaging 2/hr at 29 weeks, 3/h at 33 weeks, and 4/h at 36 weeks. Garite *et al*., (1990) demonstrated a crescendo of contractions in twins, triplets and quads starting approximately 48 hrs prior to PTL (3.5 ctx/hr ± 1.4) and at 24 hrs prior to PTL (5.3 ctx / hr ± 1.3) Hernandez *et al*., (2008) demonstrated that twins who developed PTL with or without early delivery had significantly more baseline contractions compared to twins who never developed PTL. Contractions exceeded 3.5/hr at 29-1/2 weeks in those developing PTL. Newman *et al*., (2006) could not identify a threshold number of uterine contractions that would predict PTL but confirmed that twins have more UC at each gestational age (GA) than singletons and that UC increase with advancing GA and also time of day (1600-0359 hours). Rust *et al*., (1997) compared twins who developed PTL <24 weeks. In this study, 31 patients had been placed on contraction monitoring prior to PTL and 32 were prescribed home contraction monitoring after PTL was arrested. The GA at diagnosis of PTL was similar, but cervical dilation was significantly different, with the twins already on a monitor being less dilated (1.1 ± 0.5 cm vs 2.3 ± 0.8 cm p .0001). The twin pregnancies already undergoing contraction monitoring

delivered at a mean GA 34.7± 2.8 wks compared to 27.6 ± 2.5 wks for those placed on monitoring after PTL was arrested at <24 wks ($p < .001$).

2.3 Higher order multiples

Triplets and quadruplets are referred to as high order multiple (HOM) pregnancies. Preterm labor is confirmed in 80% of triplet pregnancies and 98% of quads, occurs at an earlier gestational age, and the mothers are almost always unaware of the contractions due to increased fetal movement.(Elliott *et al*., 1995) Elliott *et al*., (1995) utilized HUAM to determine a weekly average of contractions/hour for patients with HOM gestation. With two, one-hour monitoring sessions per day the total number of observed contractions were divided by 14 and utilized as an average number (eg 3.9 ctx /hr) that week. In support, Garite *et al*., (1990) reported that patients with singleton pregnancies increased their contractions to 3.5/hr 48 hours prior to PTL developing, while (Elliott *et al*., 1995) found that HOM gestations who were given betamethasone developed increasing contractions and true PTL/delivery statistically more frequently if the baseline number of UC was greater than 3.5/hr compared to those with a baseline contraction frequency that was less than 3.5/hr. Based on this arbitrary number of contractions/hr (3.5 UC/hr) (Elliott *et al*., 1997) started tocolysis prophylactically, utilizing terbutaline pump therapy to attempt to prevent PTL that can result in PTD. The results of this report showed that in 15 sets of triplets and 6 sets of quads only 14% delivered due to PTL; much less than the reported incidence in other series. This underscores the importance of determining uterine contraction frequency and then potentially initiating preventative therapy. Therefore, the rationale of using contraction monitoring for tertiary prevention as well as treatment using subcutaneous terbutaline is supported by various studies but what are the clinical results of such investigations?

2.4 Contraction monitoring with maintenance tocolysis

In general, tertiary assessment results in an earlier diagnosis of recurrent preterm labor at less cervical dilatation, which improves the success of tocolysis and results in greater pregnancy prolongation when compared with standard care even when both groups used maintenance tocolysis.(Morrison *et al*., 2001; Katz *et al*., 1986; Watson *et al*., 1990; Kosasa *et al*., 1990; Smith *et al*., 1994) Furthermore, after tocolysis of the second PTL episode or in pregnancies with advanced cervical dilation (>3-4cm), the combination of continued uterine contraction monitoring along with subcutaneous terbutaline infusion using a programmable pump have resulted in significantly prolonged gestation compared to no treatment or oral maintenance therapy.(Elliott *et al*., 2001; Morrison *et al*., 2003; Lam *et al*., 2001) Both contraction monitoring and terbutaline administration by subcutaneous pump, when used in appropriate patients, significantly increased the length of pregnancy, resulted in fewer low birth weight infants, and reduced neonatal stay as well as neonatal cost.(Martin *et al*., 1990; Smith *et al*., 1994; Morrison *et al*., 2003; Lam *et al*., 2001)

2.5 Purpose

The purpose of this chapter is to review the literature regarding uterine contraction monitoring, when used for tertiary prevention, and to assess studies using subcutaneous terbutaline infusion (when employed in conjunction with uterine contraction monitoring) in women who had previously had an episode of confirmed preterm labor, and those with twins or higher order multiples demonstrating cervical change.

3. Tertiary uterine contraction monitoring

3.1 Method of contraction monitoring

Regarding contraction monitoring for tertiary prevention, only randomized clinical trials (RCT) or cohort studies with appropriate matched controls were considered. A review of the literature revealed seven acceptable trials from 1985 to 2005, using uterine contraction monitoring for tertiary care. There were three additional studies that were eliminated because the HUAM group was not compared to a standard of care control group or because women with current preterm labor as a subgroup were never reported separately. Women using contraction assessment in the home monitored uterine activity for two hours per day (usually once in the morning and once in the afternoon) using a sensitive guard-ring principal monitoring. On a daily basis a nurse initiated a phone call and transmitted the two hours of monitoring to assess the number and quality of the contractions present. During this daily phone call the nurse asked about symptoms of preterm labor, such as pelvic heaviness, uterine contractions, tightening increase in cervical discharge, etc. If signs and symptoms of preterm labor where present or if there were >4 contractions per hour, the patient was asked to hydrate and re-monitor. If these repeat data were not satisfactory, the patient was sent to the hospital. In addition, during the daily phone call, the education regarding signs or symptoms of PTL and patient's specific educational objectives were reinforced. Finally, these women had access to a 24/7 availability toll free calls to a nurse other than the person who made the daily phone call. All women attended a special preterm birth prevention clinic, where cervical assessment digitally or by ultrasound was carried out along with an assessment of preterm labor signs and symptoms and other testing such as, cultures, fetal fibronectin, and a variety of educational techniques at the discretion of the physician. Women in the various cohort or control groups frequently attended the same clinics with the same education, but were taught palpation for uterine activity, which they recorded daily.

3.2 Results of tertiary contraction monitoring

As shown in Table I, the study by Katz revealed an average of 68% reduction in preterm birth when patients using uterine contraction monitoring in the home were compared to the standard care control group.(Katz *et al*., 1986) In the prospective controlled study by Kosasa, preterm delivery rates were not reported, but in women prescribed contraction monitoring after preterm labor was arrested, there was a pregnancy prolongation of 4.6 weeks and an average gestational age of delivery at 36.7 weeks.(Kosasa *et al*., 1990) In addition, there was a cost savings of $21,200.00 in the contraction monitoring group versus the standard care group for such high risk patients. Katz *et al*., (1988) studied 120 women after an episode of confirmed preterm labor. Half of the patients received contraction monitoring compared to self-palpation. Preterm births among monitored patients were significantly less than the control group (15 versus 34%, $p<.05$) and more importantly time gained *in utero* was 7.4 $\pm$ 3.0 weeks in the monitored group versus 4.0 $\pm$ 1.2 weeks in controls.(Katz *et al*., 1988) Morrison *et al*., (2001) found similar results in a Medicaid population where pregnancy prolongation was extended, there were fewer preterm births, and the cost saving was significantly more ($14,459.00) among monitored patients when compared to controls. Morrison *et al*., (2001) Watson *et al*., (1990) in a randomized clinical trial among women discharged on monitoring versus control patients, found that there were 44% fewer preterm births compared to control women ($p<.05$) with a higher incidence of failed

tocolysis also among control women resulting in a longer mean time gained *in utero* for monitored women.

STUDIES INVOLVING CURRENT PRETERM LABOR PATIENTS AND COMMERCIALLY AVAILABLE HUAM SERVICE COMPARED TO THE STANDARD OF CARE							
STUDY	RESEARCH DESIGN	QUALITY OF EVIDENCE	N	PTD RATE REDUCTIONS IN MONITORED GROUP		$ SAVINGS / PREGNANCY	COMMENTS
				<35 WKS	<37 WKS		
Katz et al., 1986	Matched Trial	II-2	120	*	56%	*	Pregnancy prolongation was 7.4 weeks for HUAM group compared to 4.0 weeks
Watson et al., 1990	RCT	I	67	*	44%	*	Greater than 2 weeks improvement in gestational age at birth with HUAM
Kosasa et al 1990	Prospective Cost Effectiveness Study	II-1	43	*	*	$21,200	$24,000 Savings/CPTL Patient - $2,800 cost of HUAM/PT = $21,200. Greater than 4 weeks prolongation of pregnancy. Savings from lower NICU days and reduction in antenatal days
Nagey et al., 1993	RCT	I	56			*	HUAM group had 43% dropout rate which made final sample size too small to detect differences
Smith et al., 1994	Matched Trial	II-2	58	*	39%	*	47% delivered <37 weeks in the control group compared to 8% in the HUAM group
Brown et al., 1999	RCT	I	186	27%	19%	*	11% lower NICU admits, 25% lower NICU days/1000 births, and 37% less respiratory ventilation in the HUAM group
Morrison et al., 2001	Cohort Trial	II-2	100	95%	80%	$14,459	Actual claims data shows a significant savings in the HUAM group
* Not reported in study							

Table 1. Utilization of huam for tertiary care evidence table.

Nagey *et al.*, (1993) studied 28 women who were discharged from the hospital after tocolysis and received HUAM versus 29 women who received routine care. Since there was no daily perinatal contact or 24/7 availability of calling the nurse, there was considerably more non-compliance (26/28) in the monitored group and accordingly there was no difference in pregnancy prolongation or preterm deliveries. Additionally, 4 patients out of the 28 in the monitoring group were never discharged and did not receive monitoring at all. Finally, the authors did not meet their power calculation, as 45 in each group were needed to show a detectable difference for contraction monitoring. Pregnancy prolongation and neonatal morbidity statistics were not reported in this study. Smith *et al.*, (1994) studied women discharged after preterm labor using contraction monitoring versus a like number who served as matched controls. Among monitoring women, pregnancy prolongation, gestational age at birth, and number delivering <37 weeks compared to control patients were significantly improved ($p<.011$). Brown *et al.*, (1999) studied 86 women who were assigned to monitoring compared to 80 in an unmonitored group following effective acute tocolysis. Unfortunately, the number needed to show a significant difference in preterm delivery was 438 and only 162 were enrolled over a 7-year period. Therefore, no differences in preterm delivery or pregnancy prolongation were noted but since daily contact with a nurse was allowed, the number of NICU admissions was reduced in both groups (24%, 27%) compared to other studies.

3.3 Contraction monitoring: Pooled results

When these studies are pooled, the preterm delivery rate (<37 weeks) in the monitored group was 30.6% versus 48.9% among control patients. In the 2 studies reporting data for <35 week deliveries, the monitored group was favored (7.7% versus 22.9%).(Morrison *et al.*, 2001; Brown *et al.*, 1999) This translated into a pregnancy prolongation of 7.8 weeks in the monitored group versus 4.4 weeks in the control group. Two studies reported NICU rates of admission (Smith *et al.*, 1994; Brown *et al.*, 1999) and the pooled data reveals a 7.2% NICU admission rate for monitored patients versus 36.2% among the infants of control women.

Pregnancy prolongation resulted in a total cost savings amongst the studies who collected financial data (Morrison *et al*., 2001; Kosasa *et al*., 1990) of $413,153 or $13,153/per pregnancy compared to control group women. Among secondary prevention studies including patients who had preterm labor in the current gestation, Floyd and Morrison also revealed benefit for these monitored patients versus control subjects with respect to pregnancy prolongation and preterm deliveries.(Floyd *et al*., 1993; Morrison *et al*., 1990) In sum, when patients use contraction monitoring for tertiary care (after discharge from an episode of acute preterm labor in the current pregnancy), there is a significant prolongation of pregnancy and fewer preterm deliveries, which results in fewer NICU admissions and less neonatal morbidity as well as cost among monitored patients compared to controls.

4. Maintenance tocolysis

4.1 Tocolytic choices

The data presented in Table I supports monitoring contractions, particularly to detect recurrent preterm labor after successful treatment of the initial episode of early labor. The therapeutic strategies for such women, however is disparate. Although there is not reliable data because such women are rarely studied, a large number of patients each year who have been successfully treated for preterm labor remain in the hospital until delivery, rather than being sent home. To be sure this appropriately includes some patients with advanced cervical dilatation ($\geq$4cm), others with concominant medical/obstetric problems or women who have geographic difficulties with transportation or patients who are considered to be unreliable. In our clinical experience however, these are the minority and most women remaining in hospital simply do so to reduce medical/legal risks or assuage maternal/physician anxiety. Clearly this is not cost or health effective. Many of these patients would qualify for discharge and monitoring with terbutaline subcutaneous therapy or oral tocolytic treatment in the home. Secondly, many physicians do not prescribe tocolytic maintenance therapy to women who are sent home because studies have shown that oral therapy does not extend pregnancy compare to placebo.(Rust *et al*., 1996) Calcium channel blockers such as nifedipine are also utilized for maintenance tocolysis. There have been two placebo controlled trials with nifedipine and neither have shown any difference in gestational age at delivery, time gained *in utero*, deliveries at term, or composite neonatal morbidity when compared to placebo patients.(Carr *et al*., 1999; Lyell *et al*., 2008) In addition, maternal myocardial infarction, hepatic toxicity, and hypotension with fetal distress, as well as a reduction in uterine artery pulsatility index with fetal death have all been reported with the oral use of nifedipine for preterm labor particularly when the dose is increased.(Abbasi *et al*., 2003; van Geijn *et al*., 2005) Therefore, the choice of oral nifedipine for maintenance tocolysis, similar to oral terbutaline or oral magnesium, does not appear to be solid as its efficacy is questionable and there are significant maternal and fetal side effects. Regardless, women who are discharged after acute preterm labor is stopped, need uterine contraction monitoring whether they use oral tocolytics, the terbutaline pump, or no medication.

4.2 Do oral tocolytics work

It is clear that many patients in the treatment arm of these studies whether it be, oral terbutaline, oral magnesium or nifedipine simply did not receive an adequate dose of the drug due to maternal side effects. For example, there are several studies which show that

when maintenance tocolysis is discontinued, between 30% and 50% of patients deliver within 24 to 72 hours.(Jones *et al*., 2006; Rebarber *et al*., 2009) Teleologically, it seems unlikely that patients who have been on tocolysis for several weeks or months would deliver within 1-3 days (and 70-80% within 1 week) if the tocolytic agent did not cause cessation of uterine contractions. Therefore, it may not be that oral tocolytics don't work when given in a maintenance form, it may just be, that the effective dosage of medications have side effects resulting in poor compliance or discontinuation of treatment. In summary, the issue of maintenance tocolysis is not clear-cut. While it is not cogent to leave all patients in the hospital after an episode of acute preterm labor, if one is not going to use maintenance tocolysis on an ambulatory basis, at the very least, home contraction monitoring with daily nursing calls should be utilized in our opinion to detect recurrent preterm labor at the earliest time.

5. Subcutaneous terbutaline pump usage

5.1 Requirements for terbutaline pump

Another area in which contraction monitoring is essential is during maintenance tocolysis therapy employing a subcutaneous terbutaline infusion pump. When the subcutaneous terbutaline pump was used versus or maintenance drugs (or no oral tocolysis) 46 peer review studies were noted. In each study involving the terbutaline pump, it was required that uterine contraction monitoring was utilized since this end organ response (uterine contraction) was necessary to guide bolus terbutaline dosing. Additionally, it was required that such investigations utilize pharmacy consultation to calculate the volume of distribution in order to give an appropriate basal dose of terbutaline parenterally. Daily nursing contact (usually by phone) was carried out to detect patient reported signs and symptoms as well as two, one hour monitoring periods (usually one in the morning and one in the evening). Of all the terbutaline studies, there were three randomized clinical trials (Level I), 26 observational case control/cohort studies (Level II), and 17 descriptive case series (Level III). Two studies (Wenstrom *et al*., 1997; Guinn *et al*., 1998) were eliminated because they did not allow proper usage of terbutaline treatment (pharmacy consultation to adjust basal dosage, contraction monitoring to adjust bolus terbutaline therapy, daily nursing contact, or emergency patient contact) and in addition both were vastly underpowered (94 enrolled, 320 required by power calculations). In the other studies, the outcomes of interest in both groups under study (tertiary prevention, terbutaline pump treatment), included pregnancy prolongation, preterm delivery rate (<37 weeks/<35 weeks), gestational age at delivery, also NICU admission rate, as well as, the length of stay were noted, and if available, the cost savings per pregnancy. These were compared between the treatment and control group.

In this therapy a basal rate of subcutaneous terbutaline is determined (.045-.075mg/hr) in consultation with a pharmacist so that the patient's volume of distribution is calculated verifying that the constant level of terbutaline is optimized for that patient. Importantly, the basal rate is supplemented by intermittent boluses (usually .25mg terbutaline each) programmed by the patient during the daily nursing call timed to address increased uterine activity detected by contraction monitoring. These bolus doses are critical as each patient's contraction pattern is different. The advantage of the small subcutaneous dosage per day, combining the basal rate and bolus rate (usually 2.5-3.5mg), is that there is less down regulation of beta-agonist receptors and a reduction in maternal side effects when compared to oral maintenance therapy with terbutaline (20-40mg per day).

5.2 Results of terbutaline pump maintenance tocolysis

As shown in Table II, the data for continuous subcutaneous terbutaline infusion is voluminous. There are 46 peer review publications over a 20-year period (1988-2008) involving over 30,000 patients. Of these 46 there are only 2 studies which did not find increased pregnancy prolongation, less NICU admissions and lowered cost.(Wenstrom *et al*., 1997; Guinn *et al*., 1998) Both of these studies had critical flaws. First they were small, only involving 94 total patients of which 39 received the terbutaline pump, but also importantly a fixed basal dosage of terbutaline was used without volume of distribution calculations so that a 150-pound woman received the same dosage as a 350-pound woman. Also, there was no measurement of end organ response as contraction monitoring to determine if changes in bolus dosage were needed, was not allowed. Finally, neither study had enough patients (94 enrolled, 320 in each group required to meet a power calculation) to demonstrate efficacy. Of the other 44 studies, all were positive; demonstrating fewer preterm deliveries, greater pregnancy prolongation, less NICU admission and/or enhanced cost savings.

- Lam et al, 1987
- Lam et al, 1988
- Lam et al, 1988
- McGettigan et al, 1991
- Gianopoulos et al, 1991
- Jones et al, 1991
- Fischer et al, 1991
- Wolfsen et al, 1992
- Allbert et al, 1992
- Moise et al, 1992
- Weinbaum et al, 1992
- Elliott et al, 1992
- Lindenbaum et al, 1992
- Regenstein et al, 1993
- Adkins et al, 1993
- Allbert et al, 1994
- Perry et al, 1995
- Wenstrom et al, 1997
- Elliott et al, 1997
- Lam et al, 1998
- Guinn et al, 1998
- Berkus et al, 1999
- Hamersley et al, 1999
- Lam et al, 2000
- Elliott et al, 2001
- Elliott et al, 2001
- Lam et al, 2001
- Viscarello et al, 2002
- Viscarello et al, 2002
- Elliott et al, 2002
- Hamersley et al, 2002
- Morrison et al, 2003
- Lam et al, 2003
- Fleming et al, 2004
- Ambrose et al, 2004
- Roman et al, 2004
- Rebarber et al, 2004
- Gaziano et al, 2004
- Gaziano et al, 2004
- Brown et al, 2005
- Rittenberg et al, 2006
- Jones et al, 2006
- Mcweeney, 2006
- de la Torre, 2008
- Flick, 2008
- Rebarber, 2008

Table 2. Evidence – Continuous SQ Terbutaline. 46 Peer Review Studies 1988-2008.

Table III, shows the pregnancy prolongation amongst all studies where it was reported. In these 20 studies, pregnancy prolongation ranges from 2.4 to 11 weeks averaging 4.6 weeks in the treatment group. Finally, in a meta-analysis Lam *et al*., analyzed 6 studies with 858 patients using subcutaneous terbutaline and contraction monitoring versus 897 patients who were not treated or received oral terbutaline/nifedipine.(Lam *et al*., 2009) It was noted that in the monitored group there was a 73% reduction in preterm birth <32 weeks and the NICU admission rate was 28.8% versus 40.7%. Overall, there was a $7,100 – $10,500 cost saving amongst studies who reported financial data.

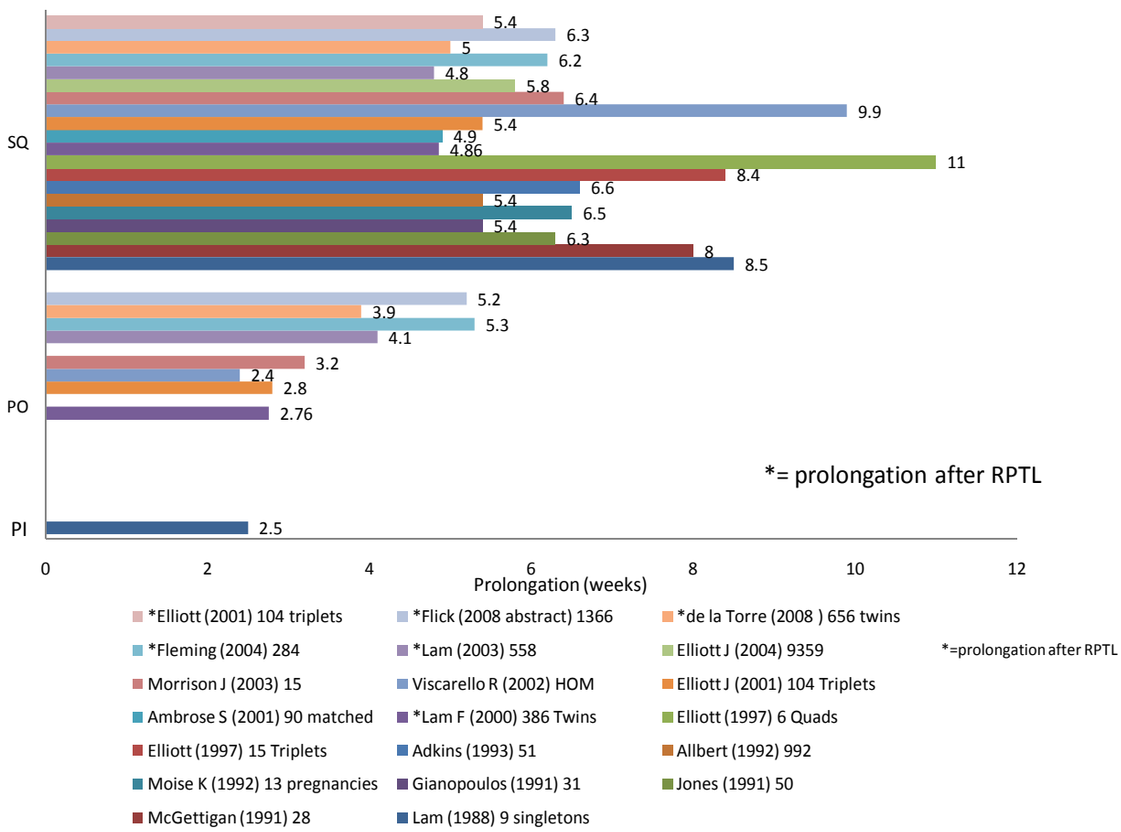

Table 3. Clinical Experience - Pregnancy Prolongation.

6. Summary

Following tocolysis of acute preterm labor, women discharged on maintenance therapy or on no tocolytic agent at all, appear to benefit from tertiary contraction assessment and daily nursing contact. Critical to the contraction-monitoring program, whether subcutaneous terbutaline is used or not, is the daily nursing assessment for signs and symptoms of preterm labor and monitoring of uterine activity. If the program is used correctly as indicated above, patients will experience a greater pregnancy prolongation resulting in fewer preterm births which translates into less NICU admissions and reduced neonatal morbidity and greater cost savings. When uterine contraction monitoring without tocolytics are used in these very high-risk patients the goal is to identify recurrent preterm labor at the

earliest possible time so that advanced cervical dilatation does not occur before tocolysis can be initiated. Among women using the subcutaneous terbutaline pump the goal is to maintain uterine quiescence by giving the appropriate basal dose (calculated on volume of distribution) while using uterine contraction assessment to adjust bolus therapy to extend the gestation as long as possible. Should recurrent preterm labor occur with either of these therapies, then primary or acute treatment with magnesium sulfate is indicated. Since several studies have noted that there is an advantage, if preterm delivery does occur, in treating with magnesium sulfate (decreased cerebral palsy) this should be the drug of choice for acute treatment of any episode of preterm labor. (Elliott et al., 2009)

In summary, it would appear that in appropriate cases (as illustrated above) the use of contraction monitoring in the home is extremely helpful in early detection of recurrent preterm labor and extending the gestation as far as possible. This would seem to benefit the patient, the neonate, and society in general.

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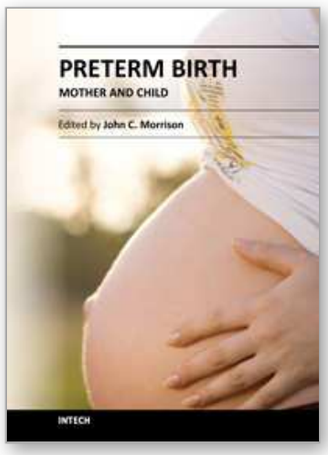

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While there are many studies and books regarding preterm birth, both the obstetric and in the neonatal/pediatric literature, what is missing is the integration of data from obstetrics through neonatal course and into pediatrics as the neonate transverses childhood. A continued dialogue between specialties is essential in the battle against preterm birth in an attempt to relieve the effects or after-effects of preterm birth. For all of our medical advances to date, preterm birth is still all too common, and its ramifications are significant for hospitals, families and society in general.

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