ORIGINAL RESEARCH

Preventing cesareans with peanut ball use

Lauren Outland*[1], Yolanda Alvarado[2]

[1] School of Nursing, Nursing Faculty, California State University, Dominguez Hills, United States
[2] Department of Nursing, Nursing Faculty, West Coast University, United States

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ABSTRACT

The Association of Women's Health Obstetrical and Neonatal Nurses (AWHONN) has launched a Peanut Ball campaign to help curb the high rate of cesarean births in the United States. Cesarean births are especially likely in women who receive epidural anesthesia due to immobility and pelvic laxity. The peanut ball (PB) is a birthing ball that when placed between the mother's legs can increase pelvic dimensions and facilitate fetal descent and birth. For PB to increase vaginal deliveries (VDs), nurses on obstetrical wards need to "buy in" to using this innovation. Having "innovator" nurses on the shift helped disseminate the PB intervention and increased the rate of VDs. Using a retrospective study design that uses data collected for non-research purposes saves time and cost. Our retrospective study examined the difference in VDs with patient controlled epidural anesthesia (PCEA) in the first five months of 2016 prior to PB use compared with the same months in 2017 post intervention. Using a paired *t*-test we found a significant difference of successful PCEA vaginal births in 2016 compared to 2017 (p = .008). This relatively inexpensive and easy survey can be done by most obstetrical services and help AWHONN in their campaign to decrease the rate of cesarean sections.

Key Words: Peanut ball, AWHONN campaign, Cesarean birth rate, Vaginal birth rate

1. INTRODUCTION

Cesarean births have increased substantially in the United States from 1996 when the rate was 20.6% of all deliveries to 32.8% in 2018.[1] For the mother, Cesarean Deliveries (CDs) can include serious complications including hemorrhage, uterine rupture, anesthesia complications, shock, cardiac arrest, acute renal failure, assisted ventilation, venous thromboembolism, major infection, wound dehiscence, and hematoma.[2] Cesarean delivery also increases the risks to the neonate including lacerations, gut dysbiosis, and respiratory illness.[3–5]

The number one cause of primary cesarean sections in the US is dystocia (failure to progress).[6] Ambulation and upright posture during labor is linked to shorter labor times and less risk of dystocia.[7] Immobility on the other hand, whether due to protocol, continuous fetal monitoring, maternal choice, or epidural anesthesia, increases the risk of dystocia.[8,9] Failure to progress is often worsened by epidural anesthesia which can cause laxity of the maternal pelvic muscles potentially impairing fetal rotation and descent.[9]

AWHONN's Peanut Ball (PB) Campaign could help reduce the cesarean section rate. While birthing balls have been used by midwives for many years in active patients to help labor progress, a peanut shaped ball is a relatively new intervention able to work in births where women are confined to bed. The Association of Women's Health Obstetrical and Neonatal Nurses (AWHONN) has adopted a Public Health Campaign which includes the use of peanut shaped birthing

*Correspondence: Lauren Outland; Email: loutland@csudh.edu; Address: School of Nursing, Nursing Faculty, California State University, Dominguez Hills, United States.

balls in non-ambulatory women. By placing a PB between the knees, and changing positions frequently, pelvic dimensions increase promoting fetal descent.[10,11] Several studies have shown a decrease in either the length of labor or a decrease in the risk of cesarean birth with use of the peanut ball in non-ambulatory women.

Tussey and colleagues (2015) conducted a randomized controlled study on nulliparous women who received epidural anesthesia. They found that the peanut ball was associated with a shorter second stage of labor by 11 minutes and approached significance in decreasing the length of the second stage of labor by 29 minutes. Additionally, only 10% of those women who labored with a peanut ball had a cesarean birth compared to 21% in the control group ($p < .05$).[12]

Roth and colleagues (2016) also conducted a randomized, controlled study in women whose labors were induced and epidural anesthesia was used. The first stage was significantly reduced in length for nulliparous women ($p = .018$), but not multiparous women. No difference was found in the length of the second stage of labor for either nulliparous or multiparous women.[13,14]

In the most recent study on PB use and labor, Hickey and Savage (2019) found a substantial decrease in cesarean sections among women laboring with epidurals and using the PB. Using multivariate analysis in a quasi-experimental group design, the authors found a 50% reduction in cesareans with use of the peanut ball and positioning.[9]

1.1 Significance of the study

These studies show promise in the peanut ball's ability to facilitate the progress of labor and potentially decrease cesarean rates among women who have had epidurals. While further studies are needed to support the PB as an effective and important tool for increasing rates of vaginal delivery (VD), with increasing evidence, the Peanut Ball could become standard practice for Labor and Delivery units. These units will face challenges including, 1) establishing best practice protocols and guidelines for the use of the PB so that this innovation is optimally disseminated, and 2) verify PB's effectiveness. This paper will discuss our experiences with innovation dissemination and testing the PB's effectiveness. Using a retrospective study design, with minimal time and cost, obstetrical units could assess the effectiveness of PB protocols and add their findings to the growing literature.

While different types of birthing balls have been in use for decades, these balls were more likely used to sit on or bounce on, taking advantage of an upright posture and movement to facilitate fetal descent.[15] A birthing ball shaped like a peanut is better suited for in hospital births complicated by immobility, semi-recumbent position and epidural anesthesia. The peanut shape allows for increasing pelvic dimensions without being mobile or upright–the labors most at risk for cesarean section.[10] More studies need to be conducted to determine if and how the PB can promote vaginal births among laboring women under epidural anesthesia.

Bringing in an innovation may not be enough to achieve changes in the clinical setting. Decreasing the risk of CDs with the use of the PB will depend upon the degree to which the nursing staff adopts this new innovation. Not all innovations are adopted uniformly by nurses despite developing a protocol and providing education and training. The theory, Dissemination of Innovation posits that the decision to adopt or reject an innovation is complex.[16] The degree of dissemination is thought to occur at both the organizational and individual level. In addition to purchasing PBs and developing a protocol, the Labor and Delivery coordinators need to bridge the knowledge-to-practice gap so that individual nurses "buy-in" to the value of using the PB. In fact, research shows that nurses may be reluctant to add an extra activity (innovation), into their patient care activities.[16] This reluctance could be due in part to heavy workload and whether its use is considered "worth it" by the staff.

As promising as these three studies are, they are the result of a controlled research protocol where behavior is closely monitored and verified. Labor and delivery units currently using PB protocols may not necessarily replicate the findings from highly controlled research environments. Obtaining an improvement in VD rates complicated by epidural anesthesia requires the obstetrical staff to buy-in to the benefits of PB use and to adopt this innovation consistently among laboring women. Believing that using the PB is "worth it" is essential. In our study both having innovator nurses in the unit helped with adoption dissemination, as did having nurse midwives promoting PB usage.

1.2 Aims of the study

This study aims to: 1) determine whether this innovation was associated with increased VDs in patients with epidurals, and 2) describe how a busy labor and delivery unit disseminated use of the peanut ball among nurses.

1.3 Research hypothesis

The average number (percent) of PCEA VDs will be significantly greater in cohort 2 (2017 births after intervention) than in cohort 1 (2016 births prior to intervention).

2. METHODS

2.1 Research design

This is a retrospective cohort study that used non-research data to test the effect of introducing an innovation.

2.2 Setting

This study took place in an urban HMO hospital in Southern California that opted to use peanut balls (PBs) among laboring patients under epidural anesthesia. The study setting employs nurse midwives in addition to obstetricians as the delivery staff. The average monthly birthrate over the period under study was 186 births a month. The cesarean rate during the study period was 26.4% which is lower than the national average of 32.8%.[17]

2.2.1 *Innovation/Intervention*

The peanut ball (PB) is on average 45 by 80 centimeters in size and shaped like a peanut (see Figure 1). All laboring patients who were candidates for VD were both shown a PB by their nurse when presenting to labor & delivery and given the choice to use it. A PB was placed and positioned within 30 minutes of initiation of epidural anesthesia in all patients who opted to use one (see Figure 2). This protocol changed slightly with Group B Streptococcus positive patients where offer of the peanut ball was delayed by four hours after the first dose of antibiotics.

Figure 1. Peanut ball

Figure 2. Patient using peanut ball

2.2.2 *Dissemination of innovation*

The theory, Dissemination of Innovation, posits that any new innovation is adopted in stages depending on the open-mindedness and receptivity of the would-be adopter.[18] The innovators are the first to buy in to adoption of a new idea or technology, the early adopters will be next, the early majority sign on with minimal reluctance, the late majority finally opt to adopt after the innovation has gained acceptance, and the laggards sign on last, if at all.[18] In this nurse driven intervention, three obstetrical nurses were charged with implementing this quality improvement program that required dissemination of an innovation, the peanut ball. From November 2016 to January 2017, these "innovator" nurses held teaching sessions with individual nurses or groups of nurses in the labor and delivery unit until all staff nurses were trained. This training involved describing the PB, its purpose, and how to use it. During these sessions, the policy was reviewed, including: 1) documenting the time of placement of PB, position change (every one to two hours and/or per patient request), and time of removal, 2) when to change patient positions using the peanut ball, and 3) descriptions of various positions and how to achieve them. A visual aid was used to increase efficacy (see Figure 2).

Despite receiving the same training some nurses saw the benefit over the disadvantage of using the PB (see Table 1). These findings are consistent with other studies in health care where an innovation is introduced with the goal of being adopted by the staff.[16]

2.3 Ethical considerations

The Institutional Review Board (IRB) of both the HMO hospital and the University reviewed the human subjects submission and determined that this was not human subjects research as defined by 45 CFR 46.102.

2.4 Data collection

Labor and delivery unit administrators kept an ongoing clinical record that tracked various aggregate outcomes. These statistics, compiled by the hospital administrators, included total deliveries, vaginal deliveries (VDs) and cesarean deliveries (CDs) and patient controlled epidural anesthesia (PCEA) deliveries. We chose to track changes in PCEA VDs for two reasons. The first reason had to do with the high number of laboring women undergoing epidural anesthesia in the United States and the second reason was that epidural anesthesia is associated with the risk of dystocia and therefore cesarean section. Due to immobility and pelvic laxity related to epidural anesthesia,[19] we chose PCEA vaginal births as the outcome of interest after disseminating the use of the PB.

Table 1. Anecdotal comments recorded by innovators during dissemination

Comments		
Innovator	**Early/Late Adopters**	**Potential Laggards**
"I want to jiggle the baby out of you with the peanut ball."	"I was not a fan of the PB I thought one more thing to do and will it work? But I was impressed it really does work."	"I'm afraid I'll go on break only to come back and have my patient ready to deliver."
"What was helpful was the midwives, once they heard that a patient delivered using the PB."	"I use the peanut ball on my patients because I want to give them an opportunity to deliver vaginally."	"One more thing to add to our job load."
"We can count on a lot of PB users when the midwife is on."	"My patient was stuck at 6 cm and I was surprised that after a short time she was ready to deliver after using the PB."	

2.5 Statistical analysis

To evaluate the impact of peanut ball use, we created a dependent variable by taking the number of births where epidural anesthesia (PCEA) was used divided by the total number of vaginal births. We then assessed the rate of PCEA VDs for the first five months of 2016 and then compared them to those of 2017 (see Table 2). Apart from the use of the peanut ball, no other protocol or standardized intervention was implemented during this time period (2017).

We then conducted a paired *t*-test to determine if the difference between PCEA VDs in 2016 before the PB innovation, and in 2017 after the innovation, was significant. The Mann-Whitney U test was also conducted.

3. Results

Table 2 shows the raw data we used which was originally obtained by Obstetrical Unit administrators. The average percent of PCEA VDs increased 20% from 2016 to 2017. A paired *t*-test found this difference to be significant (p = .008) and supports our hypothesis. The Mann-Whitney U test results also supported our hypothesis that there was a statistically significant increase in the rate of epidural vaginal births after the PB intervention was implemented (p = .009).

Table 2. Raw data of obstetrical outcomes before and after innovation

Month	2017			2016		
	# VDs	# PCEA VDs	% PCEA VDs	# VDs	# PCEA VDs	% PCEA VDs
Jan	146	131	90	136	90	66.2
Feb	141	108	76	116	83	71.6
Mar	148	122	82.4	155	84	54.2
Apr	116	97	83.6	137	85	62
May	154	124	80.5	140	85	60

To summarize, women laboring with epidural anesthesia were found to be significantly more likely to deliver vaginally after adoption of the peanut ball in 2017 than women in 2016 before adoption.

4. Discussion

The use of the Peanut Ball has been shown to be an inexpensive and effective way to reduce the length of labor and risk of cesarean section in several recent studies. Our findings of a significant increase in vaginal deliveries complicated by epidural anesthesia after introducing the PB protocol are impressive in light of the fact that this HMO obstetrical setting already had a lower than average cesarean rate (26.4%). If our obstetrical unit was able to improve the rate of VDs with a low cesarean rate, then other labor & delivery units with higher cesarean rates could potentially obtain similar if not superior results in PCEA VDs.

A retrospective cohort study design was chosen because it used existing data that was recorded for non-research purposes. This type of study reduces the time and expense involved in collecting data and the time it often takes to obtain human subjects' approval. This study was relatively simple and easy to conduct and can be replicated in almost any obstetrical unit that collects non-research data and opts to disseminate PB usage.

However, we were limited in the outcome variables that could be tested the retrospective design, namely those collected

by the unit adminstrators. For example, we were limited in the outcome variables available to us, namely the aggregate statistics collected by the unit administrators. We were further limited by the fact that the lengths of the first and second stages of labor were not collected, we were not able to test the association of PB use and a shorter length of labor. We were also not able to rule out other factors that might have increased VDs. For example, the increased rate of PCEA deliveries could have been affected by the enthusiasm of the nurse innovators. However, despite these limitations, we believe this study provides evidence that PB use is associated with an increase in VDs when epidural anesthesia is used.

5. Conclusion

This retrospective study found that the introduction of peanut ball use in women laboring under epidural anesthesia was associated with greater numbers of vaginal births. This retrospective study design can be easily replicated in other venues whose results could provide evidence for a simple inexpensive way to promote AWHONN's campaign of preventing cesarean births.

Recommendations

The dissemination of this PB innovation appeared to be influenced by having "innovator" nurses working side by side with the other nurses on the shift. In addition to the three innovator nurses who initiated this study, nurse midwives were found to act as de facto innovators and helped facilitate dissemination and adoption of the innovation.

The following recommendations would likely bolster dissemination of the innovative peanut ball. As there is constant turnover among nursing staff, it is essential to have ongoing in-service training for new nurses. To prevent experienced nurses reverting to previous practice (no use of peanut ball) it would be helpful to also have refresher in-service training that includes evidence for use. The timing would be based on nursing staff turnover and the presence of informal promotion by nurse innovators or nurse midwives. Labor and delivery coordinators and innovators could use video demonstrations, and Pretest/Posttest evaluations on how likely the nurse is to use the PB with their patient. The coordinators could also monitor the percentage of women using the PB compared to those eligible to use the peanut ball.

Placing posters showing PB use in the labor rooms would help adoption among the nurses and the patients. Ideally, an explanation of the peanut ball and its impact on labor could be introduced to the patients by the nurse midwives during the prenatal visit. This could potentially act to turn laboring women into adopters and even innovators.

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Conflicts of Interest Disclosure

Neither author reports any conflicts of interest.

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