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The PREEMI as a measure of parent engagement in the NICU☆

Nefeli M. Makris (RN, BSN)[a,b,*], Dorothy Vittner (PhD, MSN BSN)[b,c], Haifa A. Samra (PhD, RNCNIC, FAAN)[d], Jacqueline M. McGrath (PhD, RN, FNAP, FAAN)[b,e]

[a] Connecticut Children's Medical Center Hartford and Farmington, CT
[b] University of Connecticut, School of Nursing, Storrs, CT
[c] Division of Neonatology, Wake-Medical NIDCAP Training Center, Wake- Medical Hospital and Health System, Raleigh, NC
[d] University of South Dakota, School of Nursing, Sioux Falls, SD
[e] University of Texas Health Science Center San Antonio, School of Nursing, San Antonio, TX

What this study adds

- While some research exists about how mothers become engaged with their infants, there is little research exploring differences in parental needs and discerning distinct engagement styles for mothers and fathers. This study provided evidence to better understand parent engagement by examining differences in mothers' and fathers' responses.
- Individualizing the infant's plan of care, can support mothers and fathers to attain the confidence and skills necessary to care and manage their infant's care: which introduces the concept of self-management in the NICU.
- Using the PREEMI instrument to assess engagement has the potential to promote collaboration and communication with the health care team that emphasizes individualized care that is personal, holistic, and comprehensive while at the same time identifying and supporting at risk parents.

1. Introduction

Globally, an estimated 15 million infants are born prematurely every year (World Health Organization, 2017). The National Institute of Child Health and Human Development defines a premature birth as one that takes place before 37 weeks gestation (Ness, Blumenfeld, & Sung, n.d.; Als, Gilkerson, Duffy, & Mcanulty, 2003). Responsible for nearly one million deaths every year, premature birth is the most common cause of infant death and is the leading determinant of short and long-term infant health problems (Ness et al., n.d.; Als et al., 2003). There is an increasing gradient of complications that can arise depending on how prematurely the infant is born. Compared to full term infants, premature infants are at greater risk for neurodevelopment delays, learning impairments, visual disorders, and physical diseases. Infants born prematurely are often admitted into the Neonatal Intensive Care Unit (NICU) (World Health Organization, 2017).

Though essential to the progression of premature infant health, the NICU can be a stressful environment for both infants and their parents (Vittner, Cong, Ludington-Hoe, & Mcgrath, 2017). Over the past few decades, healthcare interventions have been implemented in the NICU to decrease stress and increase positive outcomes for infants (Baley, 2015). Such interventions include enhancing parent participation in caregiving, increasing parental engagement and supporting skin-to-skin contact (SSC) (Baley, 2015). Closely correlated, parent participation in care and skin-to-skin contact have shown to dramatically decrease infant disease symptoms and simultaneously increase infant growth rates (Samra et al., 2015).

Parent engagement is a compelling, newly coined concept in neonatal care that describes the synchronous parental factors influencing preterm infant health (Griffin, 2006). Parent engagement is a dynamic process focused on parent experience; specifically targeting the acquisition of skills for problem solving and provision of appropriate infant care based on the infant's unique needs at a particular time; acknowledging that these needs can change over time (Griffin, 2006). The premise of this concept is that with support from the nursing and medical team and through a parent's self-motivation to set goals and to utilize informational resources about the unique care necessary for their child, parents can increase their engagement while simultaneously improving the progression of their infant's health.

Abbreviations: PREEMI, Parent Risk Evaluation Engagement Model Instrument; SSC, skin-to-skin contact; NICU, Neonatal Intensive Care Unit

☆ Institution: Connecticut Children's Medical Center Hartford and Farmington, Connecticut.

* Corresponding author at: School of Nursing, University of Connecticut, 231 Glenbrook Road Storrs, CT 06269-4026.
E-mail address: nefeli.makris@uconn.edu (N.M. Makris).

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2. Background and significance

Over the past several years, the rates of premature births have declined to less than 12% of births globally (Ness et al., n.d.; Als et al., 2003). Fortunately, younger premature infants are surviving longer, leading to an increased focus on long-term outcomes. These improved survival rates have led to an increasing acknowledgment of the necessity for increasing parent participation and ultimately, increasing parent engagement to further improve infant health. Family-centered care focuses on the fundamental commitment of families in managing the healthcare of their infants (Provenzi, Barello, & Graffigna, 2015). Successful engagement strengthens family-centered care practices and is achieved through the development of trusting relationships and strong communication between the NICU physicians, nurses and parents. It has been found that parents who actively participants in their infant's care are more prepared during the post-discharge period (Moore, Saylor, & Boyce, 1998). For example, engaged parents learn to identify their infant's distress and pain cues to provide support during painful procedures and use these skills to better understand their infants (Moore et al., 1998).

Previous research has indicated that mothers of preterm infants who are less actively involved with their newborns often engage in more negative interactions with their infants than do mothers of full-term infants (Vittner et al., 2018). Routine use of the Parent Risk Evaluation and Engagement Model Instrument (PREEMI) has the potential to identify parents that are at risk for low engagement. Moreover, when the PREEMI is used routinely in a clinical setting as an assessment tool the composite score and sub-scale scores could provide a means to allow clinicians to better understand the specific caregiving and parenting stressors affecting parents. This tool has not yet been used clinically and only previously tested with mothers (Griffin, 2006). An individual, yet holistic, approach could be established to target parental uncertainties and help implement an individualized plan of care to minimize the apprehensions that parents may feel about caring for their premature infant. This increased engagement during the NICU stay could lay the foundation for the parents to develop self-management strategies for caring for their high-risk infant after discharge. The PREEMI may help to identify supports needed within and outside the NICU, thus joining the infant, their parents, clinicians, and the facility to work toward a goal of comfort and progressive health. In general, health assessments that develop a holistic examination of a patient's concerns, needs, and expectations are of great significance to research and in clinical practice (Griffin, 2006). By addressing all the complex factors that may influence a parent's abilities to care for their premature infant, clinicians can work closely with parents to ensure they receive support and knowledge addressing all their concerns.

The purpose of the previous, larger research study was to examine bio-behavioral mechanisms such as levels of oxytocin and cortisol before, during and after SSC for parents and preterm infants as described in a previous manuscript (Vittner et al., 2018). The specific aims of this current study was to (1) assess levels of parental engagement (low vs high engagement) using the PREEMI and (2) explore possible gender differences by comparing the results of engagement between fathers and mothers in that same population.

3. Design

All participants in this study were also participants in a larger study with a randomized cross-over design study using a 3-day timeframe for bio-behavioral measures during skin-to-skin holding conducted in the NICU (Vittner et al., 2018). In addition to those measures parents and infants participated in a five minute video of mother-infant and father-infant play-interaction just prior to discharge from the NICU. Convenience sampling techniques were utilized to recruit and consent thirty-four stable preterm infants (30 0/7–34 6/7 weeks gestational age between 3 and 10 days old) and their mothers and fathers. Participants were recruited at Connecticut Children's NICU-East and NICU-West in Hartford and Farmington, Connecticut. To participate, parents spoke and read English and were over the age of 18 years. For the purposes of the current study, the Parent Risk Evaluation and Engagement Model and Instrument (PREEMI) was administered to all participating mother and father pairs just prior to the infant's discharge from the NICU in between the assessments mentioned above, while one parent participated in the play interaction the other parent completed the PREEMI survey. The PREEMI was completed independently by mothers and fathers via a paper survey. Exploring parent engagement with the PREEMI was not originally an aspect of the larger study, which focused on bio-behavioral mechanisms of SSC holding between mothers, fathers and infants and as such was not addressed in those research questions or analyses.

The Parent Risk Evaluation and Engagement Model and Instrument (PREEMI) was distributed to mothers and fathers of stable premature infants to determine levels of parent engagement. None of the infants required respiratory support or parenteral nutrition at the time of this study and all were nearing their discharge date from the NICU. The PREEMI instrument is a 45 question survey with a 7 point Likert-type response format to measure parent engagement (1 = never, 7 = always). The instrument focuses on self-efficacy, knowledge, and readiness needed to practice the appropriate means of care for a premature infant post-discharge. There are a total of five sections in the questionnaire: (I) Self-Efficacy; which addresses the parent's ability to act accordingly in response to situational needs and distinguish between an infant's signals to eat, play or sleep, (II) Social Support; ensures the parent has a larger social circle beyond their intermediate family to help them emotionally, (III) Outcome Expectations and Intent; measures how well the parent is able to acknowledge the current situation and ensures they are realistic in their expectations of their infant's progression, (IV) Knowledge; which includes their awareness and education, how to recognize developmental milestones and where they can find reliable resources, (V) Perception of Risk; which measures how well a parent can foresee the potential risks their infant can face (Griffin, 2006).

The instrument's goal is to provide a measure of parental engagement, confidence, and a parent's ability to care for their infant. The instrument's content validity and initial reliability have been previously established with mothers of premature infants; no previous studies have examined paternal engagement or explored differences in engagement between mothers and fathers. A composite score was obtained by adding the responses from each item and this score was used to compare the overall results between mothers and fathers.

4. Analysis

All statistical analyses were conducted using the Statistical Software Package for Social Sciences (SPSS) version 22. A descriptive statistical analysis was completed to examine frequencies, means, ranges, and standard deviations to describe the different levels of parental engagement, indicate the level of risk for low engagement and to compare the engagement differences between father and mother participants in the study. A paired sample *t*-test was completed to compare the responses between mothers and fathers.

5. Results

The demographic sample characteristics are previously reported by Vittner and colleagues (Vittner et al., 2018). A total of 32 mother-father pairs consented to participation yet 4 infants were discharged quickly prior to completing data collection thus 28 mothers and 28 fathers completed the PREEMI survey resulting in a total sample size of 56 participants for this pilot study. The participants were primarily married, college-educated, Caucasian fathers and mothers in their 30's (mean for mothers 32 years, mean for fathers 33 years). A descriptive

Table 1
Parent engagement responses (N = 56).
Means and standard deviations for responses to questions pertaining to the maternal and paternal engagement scores.*

Item	Mothers (n = 20)		Fathers (n = 20)		T	p
	M	SD	M	SD		
2. I can tell if my baby is stressed out	5.95	0.848	5.37	1.832	1.449	0.165
3. I will need help with caring for my baby when my baby goes home	4.39	1.501	3.50	2.121	1.699	0.108
11. I will participate in skin-to-skin care daily	5.89	0.758	5.00	1.680	2.204	**0.042**
12. I know how to fit my baby who was born early in a car seat safely	6.58	0.769	5.95	1.393	1.935	0.069
13. I know what to do if my baby's temperature is too high or too low	6.28	0.669	5.67	1.680	1.684	0.110
15. I want to be involved in my baby's care while she/he is in the hospital	6.94	0.236	6.44	1.042	1.932	0.070
21. I have family members and friends who help me make care decisions regarding my baby's health	4.95	1.311	3.89	1.969	2.416	**0.027**
28. Because my baby was born, I have thought about her/him needing additional time or support to reach his/her developmental milestones	6.53	0.841	6.00	1.247	1.114	0.760
29. I am committed to taking my baby to all her/his appointments after the hospital	6.89	0.315	6.47	0.772	−2.191	**0.042**
43. I realize my baby is at higher risk for poor growth than other infants because she/he was born early.	4.89	1.524	4.79	2.200	0.213	0.834

* Using the Bonferroni adjustment required significance at the $p < .05$ level.
The response format was: 1 = *never*, 2 = *very rarely*, 3 = *rarely*, 4 = *sometimes*, 5 = *usually*, 6 = *frequently*, and 7 = *always*.

analysis was completed to determine the mean, standard deviation and range of each item; a table of that analysis is included below (Table 1). Of the 45 items listed in the survey, four items ranked with the highest mean, in other words, means closest to 7 on the Likert scale which indicated high confidence or commitment. These items were: (1) Parental eagerness to participate in care (mean = 6.95, SD 0.226), (2) Proper use of a car seat (mean = 7.00, SD 0.000), (3) Knowledge of Sudden Infant Death Syndrome (mean = 6.87, SD 0.343) and (4) Knowledge of Shaken Baby Syndrome (mean = 6.92, SD 0.273).

Items that ranked with the lowest means, indicating decreased parental confidence, included (1) Utilizing the emergency room for any health problems (mean = 4.37, SD 1.731), (2) Input from family and friends (mean = 4.42, SD 1.734), (3) Knowledge of an increased risk for poor growth (mean = 4.84, SD 1.868), and (4) Knowledge of an increased risk for learning difficulties (mean = 4.79, SD 2.005). Paired sample *t*-tests within the 28 mother-father dyads were examined to compare the responses between mothers and fathers, there were significant differences in responses ($p \leq .05$) regarding parental engagement, parental confidence and self-management strategies (see Table 1). Mothers were found to be more engaged than fathers however, couples were also noted to have highly correlated scores—that is if the mother scored higher on the scale, fathers scored higher as well. Items that had significant results between mothers and fathers included participating in skin-to-skin care daily (p-value 0.042), including family members in healthcare decisions (p-value 0.027) and taking the infant to hospital appointments post-discharge (p-value 0.042). For these items, mothers had higher mean scores for participating in skin-to-skin care, the desire to involve family members and commitment to bringing the infant to future appointments compared to their partners.

6. Discussion

For most parents, premature birth is an unexpected experience and creates many opportunities for anxiety. The early separation of parents from their infant in the high-risk delivery room to the spiraling of events surrounding the admission of the infant to the NICU, detachment has already taken place (Benzies, Magill-Evans, Hayden, & Ballantyne, 2013). Parents often feel overwhelming stress and uncertainties when presented with the intense visual and auditory stimuli of the NICU. Parents can feel lost amongst all the technology and expert opinions of the NICU health care providers.

Our findings using the PREEMI demonstrate how the instrument can be used to assess where the greatest anxiety exists and where there are missed opportunities for parent education and engagement in the NICU. The majority of parents surveyed reported overall increased confidence while distinguishing between different sources of distress related to the infant's eating or sleeping needs in addition to their reported increased confidence with skills needed to care for their infants—such as feeding, using a car seat and even comforting their infant. Parental eagerness to participate in care (mean = 6.95, SD 0.226) indicated that both mothers and fathers strongly agreed that they would like to participate in care of their infant. It is important to acknowledge that these parents were also participating in skin-to-skin care on a daily basis as a part of the primary study's aims. This increased participation in caregiving may explain why the majority of parents either scored with moderate to high levels of engagement. Skin-to-skin contact has shown to be a strategy for active participation in infant care practices for both mothers and fathers. Results also showed that mothers who scored high engagement also had fathers who scored high engagement. According to the paired sample correlation results, all participants scored high stating they have a supportive significant other (p-value 0.016). These findings speak greatly to the co-regulation that takes place between couples and emphasizes the need to not only support individual parenting needs, but to also support and consider parents as a unit.

Furthermore, for proper use of a car seat (mean = 7.00, SD 0.000), both mothers and fathers felt confident and competent in proper use of car seats. It should be noted that all parents in these NICUs participate in infant care classes prior to the infant's hospital discharge which may have influenced these responses. Also as a part of the standard of care, parents are encouraged to bring in the infant's car seat prior to hospital discharge to assure the parent is comfortable and competent with proper use of car seats.

Items that ranked with the lowest means, indicating decreased parental confidence, included (1) utilizing the emergency room for any health problems (mean = 4.37, SD 1.731), (2) relying on input from family and friends (mean = 4.42, SD 1.734), (3) knowledge of an increased risk for poor growth (mean = 4.84, SD 1.868), and (4) knowledge of an increased risk for learning difficulties (mean = 4.79, SD 2.005). Nurses are the primary health professionals to provide education to patients and have opportunities encourage parental engagement. Based on these findings, it is clear that further education is needed on the short-term and long-term risks of premature birth for parents as well as identifying which resources may be supportive.

The PREEMI instrument is a valid and reliable instrument. However, implementing the instrument in a larger more diverse sample of parents may facilitate a more comprehensive understanding of parental engagement and its impact on premature infant health. This study provides additional insight into the possible gender differences that exist in terms of parental readiness, knowledge, and perceived competence in caregiving tasks.

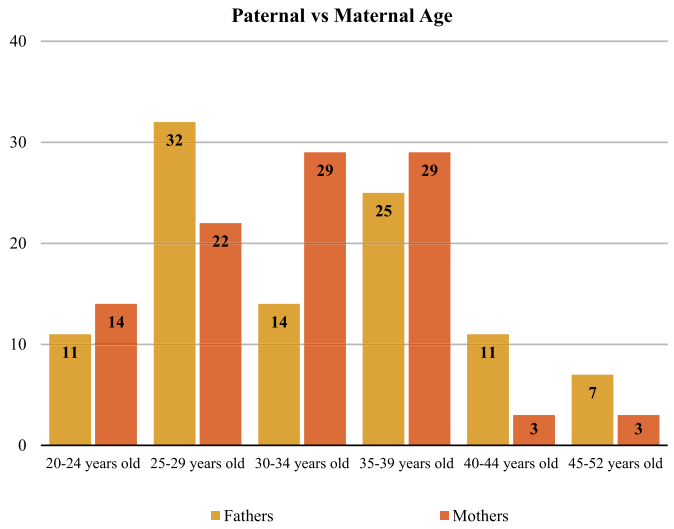

Fig. 1. The above figure displays the comparison of paternal and maternal age from the population sample in the study.

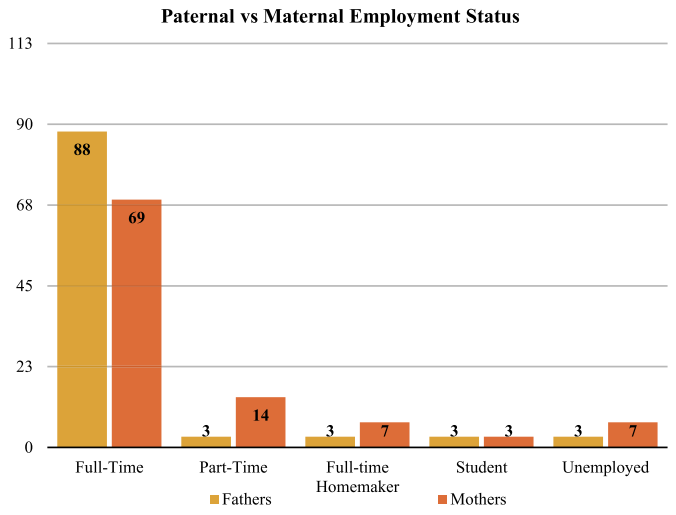

Fig. 2. The above figure displays the comparison of paternal and maternal employment status from the population sample in the study. The majority of both mothers and fathers worked full-time.

When comparing mothers and fathers, specific items showed significant differences between the averages of responses (Table 1). When examining the results, fathers were more hesitant to accept advice from family or friends, scoring with lower confidence for this particular item, compared to mothers (p-value 0.027). Moreover, fathers scored lower on practicing daily skin-to-skin contact compared to mothers (p-value 0.042) however, this can be attributed to the fact the majority of fathers were either employed full-time or part-time and most likely could not visit daily due to their work schedules. Fathers also scored lower on their knowledge about a premature infant's risk for learning disabilities (mean score 4.68), need for possible increased support in school (mean score 5.21), and risk for developmental delays (mean score 5.74) than their partners. Fathers scored slightly lower in regards to confidence with post-discharge infant needs, demonstrating their potential need for greater assistance after the hospital (mean score 3.50) as compared to mothers (mean score 4.40). All mothers and fathers in the study reported high support from their significant other across the board, emphasizing the co-regulation process taking place between each couple while caring for their infant in the NICU.

There is currently little research about the relationship between parental engagement and gender; another research objective is to use the PREMMI to explore this new area of research and open up the opportunity to develop plans of increasing parental engagement specific to gender (Drenkard, 2008). By identifying the predictors of low parental engagement, new interventions can be developed to help decrease the risk of low engagement for parents of premature infants, increasing self-management strategies and improving the quality of life for newborns and their parents.

Furthermore, this instrument seeks to increase our understanding of the connection between efficacy and competence by including items that target a parent's knowledge and self-efficacy as two separate subscales. Determining the extent to which the parents believe they have a strong sense of self-efficacy in taking care of their infant can help clinicians determine what experiences the parent had previously that affected that development of increased confidence. Moreover, parent level of self-efficacy can be correlated with types of involvement activities in which parents participate and with contextual factors that may influence parents. Therefore, increasing participation in caregiving activities increases the potential for increased engagement and serves as a bridge for more strongly linking efficacy and competence together.

7. Implications for practice and research

The results from this research study provide information about the various levels of parent engagement and identify parents who are at risk. Using the Parent Risk Evaluation and Engagement Model and Instrument as an assessment tool could in the future be a way to initiate strategies designed to increase empowerment for parents who are propelled into a sudden and stressful position of learning how to care for a premature infant. Using this instrument to increase communication and clinician understanding has the potential to break down parental barriers of uncertainties and allow them to find comfort in the chaotic environment of the NICU. Including parents more fully in their infant's hospitalization experience and finding ways to create a more comfortable environment are critical components to improving care and emphasizes the practice of holistic support (Strumwasser & Virkstis, 2015).

Parent perceptions of their capability to engage with their infant are integral to the parent deciding to become more involved in caregiving. Parents with a low self-perceived efficacy regarding their ability to help or care for their infant are more likely to let the healthcare team determine how they will be involved than parents with a high self-perceived efficacy (Pediatrics, 2011). A high sense of self-efficacy can have positive effects on individuals so that they are more likely to accept a difficult task and persist until they overcome the challenge. A positive sense of perceived self-efficacy can help a parent survive any challenges they may face.

The entire staff, particularly nurses, can orientate their practice in an effective way when they are more aware and sensitive to changing parental needs in the NICU. Learning the dynamic nature of parental engagement is key to know when and how to integrate it into the NICU environment; thus supporting the family as they move from a chaotic, unexpected moment in their lives toward self-management. The principles of neonatal health and care will be redefined with this newly emerging study and its influential effects on the relationships between clinicians, parents, and infants.

8. Study limitations

It is critical to note that the sample size for this study was small and generally homogenous, thus generalizing the findings must be done with great caution. Additional data are needed in futures studies with more varied demographic characteristics such as wider range of age, multiple ethnicities, varied educational levels and socioeconomic

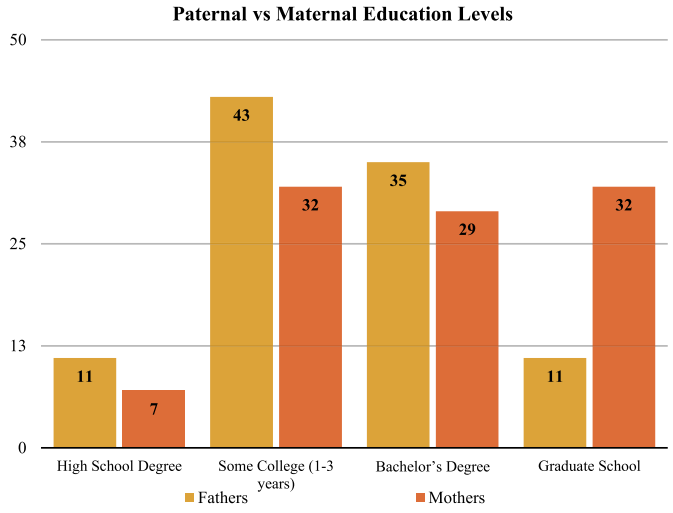

Fig. 3. The above figure displays the comparison of paternal and maternal education levels from the population sample in the study.

backgrounds (see Figs. 1–3). Data were collected from mothers and fathers of premature infants hospitalized in the NICU at only two hospital locations; therefore, the authors recommend using these findings with caution. Data were also collected at only one time point during hospitalization (just prior to discharge). Data collected nearer to admission as well as at other time points for infants who reside in the NICU for higher numbers of days might provide more understanding of how engagement changes over time and how intervention strategies could be implemented earlier in the NICU stay.

9. Conclusion

A growing body of evidence connects an increase in engagement to an increase in patient satisfaction, productivity, and turnover for healthcare professionals (Brewer & Watson, 2015). In the NICU, the framework of family-centered care is built on the positive relationships and engagement between the entire staff and parents in directing the course of care for an infant (Gasparini, Champagne, Stephany, Hudson, & Fuchs, 2015). Continuation of this research will help increase parental engagement screening in clinical settings, encourage patient self-management, discover gender differences in parental engagement and implement a new intervention that specifically monitors parents' preparedness to care for their infant. The PREEMI instrument will increase parent control and input into the infant's overall health and development. The most effective form of care is practiced when health professionals, patients, and their families maintain strong communication and trust in order to personalize the journey to health and promote lasting improvements in the quality of life for all.

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Conflicts of interest

None.

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