

Title: Maternal-Fetal Medicine physicians' practice patterns for 22-week delivery management

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Short Title: MFMs' 22-week practices

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Objective: To describe Maternal-Fetal Medicine (MFM) physicians' practice patterns for 22-week delivery management.

Methods: Surveyed 750 randomly-sampled members of the Society of Maternal-Fetal Medicine, querying MFMs' practices and policies guiding 22-week delivery management.

Results: 325 (43%) MFMs responded. Nearly all (87%) would offer induction. 28% would order steroids, and 12% would perform cesarean for a patient desiring resuscitation. Offering induction differed significantly based on the provider's practice setting, region, religious service attendance, and political affiliation. In multivariable analyses, political affiliation remained a significant predictor of offering induction ($p=.03$).

Conclusions: Most MFMs offer induction for PPRM at 22 weeks. A noteworthy proportion is willing to order steroids and perform cesarean. Personal beliefs and practice characteristics may contribute to these decisions. While little is known about the efficacy of these interventions at 22 weeks, some MFMs will offer obstetrical intervention if resuscitation is intended.

Introduction

Recent decades have seen substantial advancements in neonatal intensive care and marked improvements in neonatal survival. With these advancements, the threshold for obstetricians to provide antenatal interventions to optimize neonatal outcomes has decreased to earlier and earlier gestational ages.[1-5] In fact, in the recent executive summary reporting the findings of a joint workshop on periviable birth, the definition of ‘periviable’ was broadened to encompass the window from 20 to 25 6/7 weeks gestation age.[6] Though relatively little data are available to inform obstetrical decision-making at the lower limits of viability, increasingly, reports of survival at 22 weeks,[7-9] have led providers in some institutions to consider offering resuscitation and attendant antenatal interventions (e.g. steroid administration) as early as 22 weeks gestation. Such interventions are not without controversy, as many would argue that the chances of survival are too low—and the healthcare costs and pain and suffering of the neonate, too great—to justify the practice, while others might argue that that risk-benefit assessment should be left to individual families to negotiate.

It is unclear how widespread these practices are. Moreover, little is known about the institutional and/or provider characteristics associated with offering these earlier interventions. In an initial effort to fill this gap in our current understanding of periviable practice, we conducted a survey to characterize Maternal-Fetal Medicine (MFM) physicians’ practice patterns for 22 week delivery management.

Methods

With approval from Indiana University's Institutional Review Board, we mailed surveys to 750 randomly sampled members of the Society of Maternal-Fetal Medicine. We included physicians identified through the Society of Maternal-Fetal Medicine's membership mailing list who designated their area of primary specialization as Maternal-Fetal Medicine. Members were excluded from the study population if they indicated that they worked in General Obstetrics and Gynecology, 'Gyn-only' practice settings, or Gyn subspecialties (REI, Uro-gynecology, or Gyn-Oncology). Three mailings were administered, after which, members were considered nonresponders if they had not returned the survey.

Study participants received a self-administered survey instrument comprised of clinical case vignettes and a 3-page physician questionnaire, which covered a range of topics including: physician's knowledge of periviable survival rates; their institutional, professional and personal thresholds for resuscitation and cesarean delivery; and a number of sociodemographic and practice characteristics. Items pertaining to imminent or inevitable 22-week delivery management were specifically developed to determine the physicians' practice patterns with regards to 1) labor induction 2) steroid administration and 3) cesarean delivery for breech presentation (Supplemental Digital Content S1). These three dichotomous response (yes/no) items served as our outcome measures. The questionnaire also included items that queried a number of sociodemographic and practice setting characteristics, including: age, number of years out of residency, practice state, practice setting, race, sex, marital and parenting status,

political views, religion, religiosity, malpractice experience, resident supervision, and consultation practices.

We conducted all analyses with SPSS v. 22 (IBM SPSS Statistics® 22.0, IBM Corp®, Armonk, NY). We computed descriptive statistics with univariate analyses. Bivariate analysis, including Student's t test, Chi² analyses, and Fisher's exact test, were utilized to test the association between physician characteristics and practice settings with steroid, cesarean, and induction practice patterns. Statistical significance was defined at $\alpha \leq 0.05$. Logistic regression was used for multivariable analyses. We utilized a threshold of $p \leq 0.10$ in the bivariate comparisons to determine which physician and/or practice-setting characteristics were included in each outcome model. Then, for each outcome, we constructed a logistic regression model to determine predictors of physician intervention.

Results

325 (43%) MFMs returned surveys. Table 1 describes practice-setting and personal characteristics of the respondents. On average, respondents had been in practice for 22 years. Though a slight majority of respondents lived in the Northeast and South (54%), all regions were roughly evenly represented (21-28%). Furthermore, university-based (43%), hospital-based (25%) and private practice (23%) settings were well represented. Respondents were predominantly white (74%); male (59%); married (83%) and parenting (87%). A noteworthy proportion (10%) of respondents were parents of children with special needs. Half of the respondents identified as Protestant or Catholic, but the majority reported low attendance at religious services (59%) and

placed low importance on religion in their lives (55%). Political views were varied, with the majority identifying as liberal (38%) or moderate (34%).

Table 2 describes institutional policies and personal practices, as reported by the physicians. On average, the MFMs reported that they had managed 13 periviable deliveries in the last 6 months. Most reported that their states and hospitals allowed labor induction at 22 weeks (85% and 75%, respectively). If allowed, nearly all (87%) would offer induction to 22-week patients. Conversely, roughly a quarter (28%) of MFMs would order steroids at 22 weeks, and 12% would perform cesarean at 22 weeks if a patient desired resuscitation.

Table 3 describes bivariate associations between provider characteristics and practice patterns for induction, steroids, and cesarean for 22 week delivery management. Offering induction differed significantly based on the providers' region ($p=.007$), practice setting ($p=.001$), political views ($p=.004$), and religious service attendance ($p=.012$). In particular, those practicing in the northeastern and southern U.S.; those in university-based practice; those with liberal political views; and those with low religious service attendance were the most likely to offer induction. For steroid administration, only religion ($p=.037$) was associated with practice patterns. Specifically, providers identifying as Protestant or Catholic were more likely to order steroids. No significant associations were identified between provider characteristics and willingness to perform cesarean.

After adjusting for covariates, political affiliation remained a statistically significant predictor of offering induction ($p=.029$). Physicians with conservative political views

were less likely to offer induction compared to those with liberal views (AOR=.32, 95% CI 0.12, 0.89).

Discussion

We set out to characterize Maternal-Fetal Medicine (MFM) physicians' practice patterns for 22 week delivery management and found that 87% of MFM's would offer induction to 22-week patients; while 27% would order steroids and 12% would perform cesarean at 22 weeks if a patient desired resuscitation. We found that these practice patterns were associated with provider and practice setting characteristics such as religious service attendance and region of practice. In multivariable analyses, only political affiliation maintained a statistically significant association with induction practice patterns.

Relatively little research, to-date, has explored obstetrical practices at 22 weeks. A previous study of SMFM members revealed that 65% of MFMs would offer cesarean at 23 weeks, despite reporting that they did not believe that there was an evidence base to support this management strategy.[10] It is unclear what accounts for this disconnect between evidenced-based practice and clinical decision-making. Litigation concerns could be argued, though, in our study, we found no association between prior malpractice history and 22 week intervention. Alternatively, previous qualitative work on obstetrical decision-making for periviable delivery management suggests that patient preferences may be prioritized in the setting of insufficient or inconclusive data, particularly in the 23 week window.[11] However, in the 22 week window, national statistics for survival and survival without impairment remain poor, with the most

optimistic estimates of 9% and 5%, respectively.[12] In this setting, it may be more difficult to justify the deferral to patient preference.

With regards to induction, we found that the vast majority (87%) of MFMs were willing to offer induction to patients presenting with PPRM at 22 weeks. This stands in stark contrast to the results of a previous study of generalists, which found that generalists were unlikely to offer induction when presented with a vignette describing PPRM at 22 weeks, even when the patient in the vignette planned to pursue palliation.[13]

Furthermore, generalists were unlikely to offer steroids or perform cesarean delivery, even among patients planning to attempt resuscitation.[13] That study found that generalists' management decisions were primarily driven by gestational age. MFMs may be more attentive to maternal infectious risks, which could explain the difference in induction offerings.

A number of limitations must be considered in interpreting the findings of our study.

Though we aimed to survey a nationally-representative sample of MFMs, we realize that a sample obtained through the Society of Maternal-Fetal Medicine may not be generalizable to all MFMs. Moreover, those willing to respond to the survey may be more interested in research and evidence-based guidelines for care, potentially underestimating the degree of practice variation and early intervention. Furthermore, our methodology was limited to self-report. We cannot know if physician responses accurately reflect their behavior or their institution's policies. Because this was the first time that many of these associations had been explored, we chose not to adjust for multiple comparisons, since this procedure can obscure potential findings in exploratory

contexts.[14] However, we do note that failing to control for multiple comparisons increases our likelihood of type 1 error.

Despite these limitations, our study addresses a novel and clinically important question. With regards to periviable intervention, “*Is 22 the new 23?*” While the large majority of physicians would not perform cesarean for these patients, more than a few would do so upon patient request. Given the poor neonatal survival, long-term maternal morbidity, and implications for future pregnancies, these trends toward earlier obstetrical interventions merit further attention, particularly in light of the lack of data to suggest that cesarean confers a survival advantage at such an early gestation. These data highlight competing ethical and professional duties with regards to patient autonomy and non-maleficence.[15] In general, physicians want patients to be able to receive appropriate interventions upon request if properly counselled. However, it is not clear that obstetricians should offer interventions that increase maternal morbidity with no proven benefit for the neonate, nor that physicians are obligated to accommodate patient requests for such interventions. These issues, along with practical considerations about cost, resource utilization, and patient-oriented outcomes will warrant further study as the field continues to extend the limits of viability to earlier gestations.

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Declaration of Interest

The authors report no declarations of interest.

References

1. Redman, ME and Gonik, B. Cesarean delivery rates at the threshold of viability. *Am J Obstet Gynecol* 2002;187:873-876.
2. Carlo, WA, McDonald, SA, Fanaroff, AA, et al. Association of antenatal corticosteroids with mortality and neurodevelopmental outcomes among infants born at 22 to 25 weeks' gestation. *JAMA* 2011;306:2348-2358.
3. Louis, JM, Ehrenberg, HM, Collin, MF, et al. Perinatal intervention and neonatal outcomes near the limit of viability. *Am J Obstet Gynecol* 2004;191:1398-1402.
4. Wapner, RJ. Antenatal corticosteroids for periviable birth. *Seminars in perinatology* 2013;37:410-413.
5. Smith, PB, Ambalavanan, N, Li, L, et al. Approach to infants born at 22 to 24 weeks' gestation: relationship to outcomes of more-mature infants. *Pediatrics* 2012;129:e1508-1516.
6. Raju, TN, Mercer, BM, Burchfield, DJ, et al. Periviable birth: executive summary of a Joint Workshop by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, American Academy of Pediatrics, and American College of Obstetricians and Gynecologists. *J Perinatol* 2014;34:333-342.
7. Lee, HC, Green, C, Hintz, SR, et al. Prediction of death for extremely premature infants in a population-based cohort. *Pediatrics* 2010;126:e644-650.
8. Stoll, BJ, Hansen, NI, Bell, EF, et al. Neonatal outcomes of extremely preterm infants from the NICHD Neonatal Research Network. *Pediatrics* 2010;126:443-456.

9. Kyser, KL, Morriss, FH, Jr., Bell, EF, et al. Improving survival of extremely preterm infants born between 22 and 25 weeks of gestation. *Obstet Gynecol* 2012;119:795-800.
10. Deutsch, A, Salihu, HM, Lynch, O, et al. Cesarean delivery versus vaginal delivery: impact on survival and morbidity for the breech fetus at the threshold of viability. *J Matern Fetal Neonatal Med* 2011;24:713-717.
11. Tucker Edmonds, B, Krasny, S, Srinivas, S, et al. Obstetric decision-making and counseling at the limits of viability. *Am J Obstet Gynecol* 2012;206:248 e241-245.
12. Tyson, JE, Parikh, NA, Langer, J, et al. Intensive care for extreme prematurity--moving beyond gestational age. *N Engl J Med* 2008;358:1672-1681.
13. Tucker Edmonds, B, McKenzie, F, Hendrix, KS, et al. The influence of resuscitation preferences on obstetrical management of periviable deliveries. *J Perinatol* 2015;35:161-166.
14. Rothman, KJ. No adjustments are needed for multiple comparisons. *Epidemiology* 1990;1:43-46.
15. Beauchamp, TL and Childress, JF, *Principles of biomedical ethics*. 2001, New York: Oxford University Press.

Supplemental Digital Content S1. 22-Week Practice Pattern Items. Questionnaire items used to determine providers' willingness to offer induction, order steroids, and perform cesarean at 22 weeks.

Table 1. Study Population (N=325)

	N (%)
Age	
30-39	19 (6)
40-49	87 (27)
50-59	133 (41)
60-69	72 (22)
70 or over	14 (4)
No. of years post-residency	22 (mean); 2-49 (range)
No. of periviable deliveries (last 6 months)	13 (mean); 2-49 (range)
Region	
Northeast	83 (26)
South	92 (28)
Midwest	69 (21)
West	76 (23)
Missing	5 (2)
Practice Setting	
Private Practice	82 (25)
HMO	6 (2)
Hospital-owned	74 (23)
University-based	141 (43)

Other	21 (7)
Missing	1 (0)
Race/Ethnicity	
White	241 (74)
Black	19 (6)
Hispanic	10 (3)
Asian	41 (13)
Other	4 (1)
Missing	10 (3)
Sex	
Male	191 (59)
Female	134 (41)
Marital Status	
Single	19 (6)
Married or partnered	270 (83)
Divorced or separated	28 (9)
Other	4 (1)
Missing	4 (1)
Parent	
Yes	284 (87)
No	39 (12)
Missing	2 (1)

Parent of Child with Special Needs	
Yes	32 (10)
No	291 (90)
Missing	2 (1)
Political Views	
Liberal	124 (38)
Moderate	109 (34)
Conservative	74 (23)
Other	13 (4)
Missing	5 (2)
Religion	
Protestant or Catholic	162 (50)
Jewish	46 (14)
Muslim, Buddhist, Hindu	20 (6)
Other	30 (9)
None	64 (20)
Missing	3 (1)
Attendance at Religious Services	
High Attenders	128 (39)
Low Attenders	193 (59)
Missing	4 (1)
Importance of Religion	

High Importance	102 (31)
Low Importance	177 (55)
N/A. No religion.	402 (12)
Missing	6 (2)
Malpractice Lawsuit	
Yes	129 (40)
No	193 (59)
Missing	3 (1)
Supervise Residents	
Yes	240 (74)
No	80 (24)
Missing	5 (2)

Table 2. 22 Week Policies and Practices (N=325)

	N	%
Induction Allowed at Hospital		
Yes	244	75.1
No	76	23.4
Missing	5	1.5
Induction Allowed in State		
Yes	276	84.9
No	33	10.2
Missing	16	4.9
Offer Induction		
Yes	284	87.4
No	37	11.4
Missing	4	1.2
Offer Steroids		
Yes	92	28.3
No	228	70.2
Missing	5	1.5
Offer Cesarean		
Yes	39	12.0
No	281	86.5
Missing	5	1.5

Table 3. Bivariate Associations between Physician Characteristics and Provider Practices, Stratified by Intervention

	Induction		Steroids		Cesarean for Labor	
	Yes	p	Yes	p	Yes	p
Age		.861		.592		.190
30-39	17 (6)		3 (3)		0 (0)	
40-49	71 (27)		23 (25)		14 (36)	
50-59	117 (41)		38 (41)		12 (31)	
60-69	62 (22)		24 (26)		11 (28)	
70 or over	11 (4)		4 (4)		2 (5)	
Region		.007		.517		.430
Northeast	77 (28)		27 (29)		6 (15)	
South	77 (28)		22 (24)		14 (36)	
Midwest	56 (20)		22 (24)		9 (23)	
West	70 (25)		21 (23)		10 (26)	
Practice Setting		.001		.066		.633

Private Practice	69 (24)		23 (25)		11 (28)	
HMO	6 (2)		1 (1)		0 (0)	
Hospital-owned	67 (24)		15 (17)		6 (15)	
University-based	128 (45)		41 (45)		19 (49)	
Other	13 (5)		11 (12)		3 (8)	
Race/Ethnicity		.821		.268		.375
White	208 (76)		67 (74)		27 (71)	
Black	17 (6)		3 (3)		2 (5)	
Hispanic	9 (3)		2 (2)		0 (0)	
Asian	36 (13)		17 (19)		8 (21)	
Other	4 (2)		1 (1)		1 (3)	
Sex		.292		.532		1.00
Male	165 (58)		57 (62)		23 (59)	
Female	119 (42)		35 (38)		16 (41)	
Marital Status		.702		.790		.863
Single	18 (6)		6 (7)		2 (5)	

Married or partnered	234 (84)		75 (82)		33 (85)	
Divorced or separated	24 (9)		10 (11)		4 (10)	
Other	4 (1)		1 (1)		0 (0)	
Parent		.281		.572		1.00
Yes	246 (87)		79 (86)		35 (90)	
No	36 (13)		13 (14)		4 (10)	
Parent of Child with Special Needs		.557		.538		.568
Yes	30 (11)		11 (12)		5 (13)	
No	253 (89)		81 (88)		34 (87)	
Political Views		.004		.986		.385
Liberal	116 (42)		35 (38)		11 (28)	
Moderate	93 (33)		32 (35)		14 (36)	
Conservative	58 (21)		21 (23)		11 (28)	
Other	12 (4)		4 (4)		3 (8)	
Religion		.058		.037		.104
Protestant or Catholic	133 (47)		41 (45)		18 (46)	

Jewish	43 (15)		9 (10)		2 (5)	
Muslim, Buddhist, Hindu	18 (6)		11 (12)		5 (13)	
Other	29 (10)		9 (10)		3 (8)	
None	58 (21)		22 (24)		11 (28)	
Attendance at Religious Services		.012		.076		.863
High Attenders	105 (37)		29 (32)		15 (39)	
Low Attenders	176 (63)		62 (68)		24 (62)	
Importance of Religion		.051		.545		.187
High Importance	83 (30)		27 (29)		9 (23)	
Low Importance	158 (57)		51 (55)		22 (56)	
N/A. No religion.	37 (13)		14 (15)		8 (21)	
Malpractice Lawsuit		.212		.311		1.00
Yes	117 (42)		32 (36)		15 (40)	
No	164 (58)		58 (64)		23 (61)	
Supervise Residents		1.00		.774		.690
Yes	209 (75)		66 (74)		30 (79)	

No	71 (25)		23 (26)		8 (21)	
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