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National Practice Patterns for Prenatal Monitoring in Gastroschisis: Gastroschisis Outcomes of Delivery (GOOD) Provider Survey

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Keywords
Gastroschisis · Surveillance · Antenatal testing · Timing of delivery

Abstract
Background: Gastroschisis is an abdominal wall defect with increasing incidence. Given the lack of surveillance guidelines among maternal-fetal medicine (MFM) specialists, this study describes current practices in gastroschisis management. ***Materials and Methods:*** An online survey was administered to MFM specialists from institutions affiliated with the North American Fetal Therapy Network (NAFTNet). Questions focused on surveillance timing, testing, findings that changed clinical management, and delivery plan. ***Results:*** Responses were obtained from 29/29 (100%) NAFTNet centers, comprising 143/371 (39%) providers. The majority had a regimen for antenatal surveillance in patients with stable gastroschisis (94%; 134/141). Antenatal testing began at 32 weeks for 68% (89/131) of MFM specialists. The nonstress test (55%; 72/129), biophysical profile (50%; 63/126), and amniotic fluid index (64%; 84/131) were used weekly. Estimated fetal weight (EFW) was performed monthly by 79% (103/131) of providers. At 28 weeks, abnormal EFW (77%; 97/126) and Doppler ultrasound (78%; 99/127) most frequently altered management. In stable gastroschisis, 43% (60/140) of providers delivered at 37 weeks, and 29% (40/140) at 39 weeks. ***Discussion:*** Gastroschisis management differs among NAFTNet centers, although the majority initiate surveillance at 32 weeks. Timing of delivery still requires consensus. Prospective studies are necessary to further optimize practice guidelines and patient care.

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Introduction

Gastroschisis is an abdominal wall defect involving prolapse of the bowel and potentially other abdominal organs into the amniotic cavity. Exposure to the amniotic fluid is thought to lead to inflammatory changes in the bowel wall. Compromise to the mesenteric blood supply can result in necrosis of the bowel, atresia, and short bowel syndrome. Additionally, there is a risk of fetal de-

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mise, which is seven times higher in gastroschisis than in uncomplicated pregnancies [1]. However, without these complications, morbidity is low and the survival rate is >95% [2]. There are currently no standardized guidelines for either fetal monitoring or timing of delivery in these patients. With rising incidence and increased prevalence worldwide [2–4], there is a need for a consensus in management.

Over 90% of gastroschisis cases are diagnosed by fetal ultrasound in the second trimester, prompting further antenatal surveillance [5]. Monitoring often begins with monthly ultrasounds until 30–32 weeks of gestation, after which time the frequency of testing increases to either weekly or even biweekly [6–9]. The main forms of testing include Doppler ultrasound of the umbilical artery, biophysical profile (BPP), and nonstress test (NST) [10]. Fetal growth, amniotic fluid index (AFI), bowel dilation, and bowel status or appearance are all closely followed by ultrasound [6–8, 11–16]. There is significant variation described in terms of the type of test used, the frequency of testing, and findings that would alter the surveillance regimen within institutions as well as providers.

In addition to antenatal surveillance, both method and timing of delivery are important aspects of prenatal management. There was a shift in practice from elective cesarean to vaginal delivery in the 1990s–2000s [3, 17]. This transition is attributable to a number of studies that failed to show any benefit in cesarean delivery in these patients [17–20]. The optimal timing of delivery, however, remains largely unknown. Two prospective trials were conducted, but both were underpowered and yielded inconclusive results [20, 21]. It remains unclear whether the risk of fetal death and bowel injury that can occur later in pregnancy is greater than the risk of iatrogenic preterm delivery.

The purpose of this study was to survey maternal-fetal medicine (MFM) specialists within the North American Fetal Therapy Network (NAFTNet) on their antenatal practices in caring for patients with gastroschisis. The survey information was used to define current provider and institutional practices that may help establish minimal safety guidelines for further prospective studies related to the care and delivery of patients with gastroschisis.

Materials and Methods

An online survey was created by the lead investigators of the MFM committee for the Gastroschisis Outcomes of Delivery (GOOD) study. The questions focused on the gestational age at which surveillance begins, tests used for monitoring, tests with abnormal findings that would change clinical management, tests with abnormal findings that would lead to delivery, and the recommendations for the timing and route of delivery. The survey consisted of nine questions, and there was no requirement to answer each question. Participants were identified by the number of years practiced beyond MFM fellowship, and the type of location in which they practiced (academic, private, or military). The survey was distributed via Survey Monkey to all 373 MFM specialists of the 29 NAFTNet centers. Responses were collected over a 4-week period. Results were reviewed and analyzed using descriptive and exploratory statistics.

Results

Responses were obtained from 29/29 (100%) of NAFTNet centers, comprising 143/371 (39%) individual MFM providers. Eighty-seven percent of providers were affiliated with an academic medical practice, while 10% were in private practice. Twenty-two percent of the MFM specialists had 0–5 years of experience, 15% had 6–10 years, 17% had 11–15 years, 14% had 16–20 years, and 31% of providers had >20 years of experience beyond completion of their MFM fellowship. The majority of MFM specialists (94%; 134/141) acknowledged having a regimen for antenatal surveillance in patients with stable gastroschisis.

Antenatal testing began at 32 weeks for 68% (89/131) of MFM specialists (Fig. 1). Another 12% (16/131) began at 28 weeks, and 8% (10/131) began at 34 weeks. Three tests were used on a weekly basis – the NST (55%; 72/129), BPP (50%; 63/126), and ultrasound measuring AFI (64%; 84/131). Ultrasound for estimated fetal weight (EFW) was performed monthly by 79% (103/131) of providers (Fig. 2). Ultrasound of the bowel diameter was used weekly by 22% (28/129) of providers, every other week by 10% (13/129) of providers, and monthly by 29% (37/129) of providers. Bowel wall thickness was not measured by 48% (63/131) of MFM specialists. Doppler ultrasounds of the mesenteric and umbilical artery were rarely used in patients with stable gastroschisis. However, for patients with fetal growth lag (FGL), weekly Doppler ultrasound of the umbilical artery was commonly performed (79%; 104/131), whereas Doppler ultrasound of the mesenteric artery was not (20%; 25/125). Per open comments, some MFM specialists increased surveillance measures to twice weekly if FGL or abnormal Doppler ultrasound of the umbilical artery was identified.

At 28 weeks of gestational age, abnormalities in EFW (77%; 97/126) and Doppler ultrasound of the umbilical artery (78%; 99/127) most frequently altered clinical

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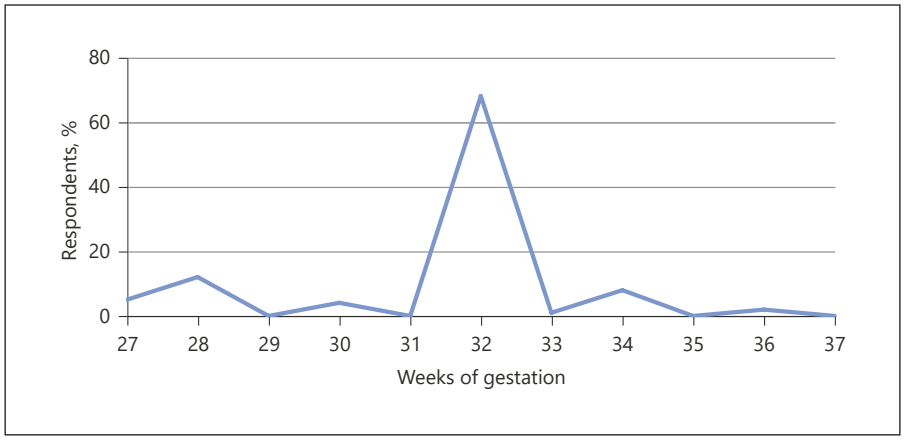

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Fig. 1. Gestational age at testing or gastroschisis surveillance initiation.

management. A change in clinical management was defined as a change in either testing method or frequency that was outside of normal practice for the respective provider. Abnormal NST (80%; 102/126) and BPP (82%; 105/128) at 28 or 32 weeks or later also led to changes in clinical management with increasing surveillance.

Elective premature delivery was not common practice given any abnormal findings. An abnormal BPP led to early delivery by 28% of providers between 28 and 31^{+6} weeks, and by 36% of providers between 32 and 36^{+6} weeks. If there was evidence of abnormal EFW, 71% (89/125) of providers delivered at ≥37 weeks with continuation of expectant management and monitoring. In stable gastroschisis, 43% (60/140) of providers delivered at 37 weeks, and 29% (40/140) delivered at 39 weeks. Only 6% (9/140) recommended delivery prior to 37 weeks in a stable gastroschisis patient. Lastly, only 2/135 MFM specialists recommended cesarean section solely based on the presence of fetal gastroschisis.

There were also several differences in management practices between providers within a single institution. At one center, an MFM provider recommended delivery in a stable gastroschisis patient at 37 weeks, while another from the same center recommended delivery at 39 weeks. Nine MFM providers from six centers denied having an antenatal regimen for following stable gastroschisis, citing insufficient evidence to support that surveillance improves outcomes. However, at least one other respondent from the same center reported having a regimen for antenatal testing. Finally, two MFM providers recommended delivery by cesarean section in stable gastroschisis, which was not in accordance with the other members of their respective centers.

	NST	BPP	AFI	EFW
Weekly	72 (60%)	63 (60%)	84 (69%)	0
Bi-weekly	28 (23%)	9 (8%)	14 (11%)	17 (15%)
Monthly	0	2 (2%)	13 (11%)	103 (85%)
Test not done	21 (17%)	32 (30%)	11 (9%)	0

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Fig. 2. Frequency of testing to determine stability of the fetus with gastroschisis. AFI, amniotic fluid index; BPP, biophysical profile; EFW, estimated fetal weight; NST, nonstress test.

Discussion

There is significant variation in gastroschisis surveillance and delivery management among MFM providers as well as within individual NAFTNet centers. Despite these differences, there is consensus in some aspects of surveillance, including the gestational age to begin testing, forms of testing, and tests that change clinical management. Aspects of monitoring that still require consensus include the method of antenatal surveillance testing and the recommended gestational age of delivery.

The literature demonstrates a variety of practices that guide antenatal surveillance and timing of delivery. In addition to improving the prenatal diagnosis rate of gastroschisis [22], a standardized practice of surveillance and delivery can allow for unified guidelines to be used in large-scale studies to improve long-term outcomes. A recent study examining the impact of an antenatal surveillance protocol on intrauterine death rates in gastroschisis patients found that a surveillance strategy helped reduce intrauterine demise rates from 5.5 to 2.2%, leading to a 58% overall reduction [23]. In our study, 94% of providers

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stated that they followed an antenatal monitoring regimen in these patients.

The majority of MFM specialists in our study began testing at 32 weeks (68%; 89/131), which is consistent with retrospective reviews in the literature [6–9]. This timing may be secondary to minimal change noted in the bowel until 30–32 weeks, after which time more rapid changes can be seen [20]. The types of testing performed were also consistent with the recommendations in the literature, although the significance of each test remains controversial. The NST (55%; 72/129) and BPP (50%; 63/126) were two of the more consistently utilized surveillance tests in our study, similar to a number of studies reported in the literature [7, 24–26]. While ultrasound for EFW was performed weekly by the majority of providers (79%; 104/131), at least two other studies disagreed on its ability to accurately predict adverse outcomes [27, 28]. There is also debate in the literature regarding the value of measuring bowel wall diameter and its relationship to outcomes, which may further explain the wide range of practices seen in our survey [6, 13, 15, 16, 29, 30].

Many of the MFM specialists in our study followed EFW (77%; 97/126) and used evidence of FGL as a marker to change surveillance patterns. However, there is literature that both supports and refutes the association of FGL with adverse outcomes [26, 27]. Interestingly, many of our providers also used FGL as an indicator for increased surveillance for uteroplacental insufficiency via Doppler ultrasound of the umbilical artery (78%; 99/127), despite a report that ultrasound findings are usually normal, and therefore of little use in these patients [12].

Over the last few decades there has been a shift from cesarean to vaginal delivery, which was also the method of delivery preferred by the majority of our providers (99%, 133/135). A recent meta-analysis evaluating mode of delivery and outcomes in neonates with gastroschisis suggested that the mode of delivery was not significantly associated with overall mortality, neonatal mortality, primary or secondary repair, necrotizing enterocolitis, sepsis, short gut syndrome, duration until enteral feeding, or length of hospital stay [31]. Furthermore, due to the variability of both delivery and postdelivery care within the literature, there remains insufficient evidence to advocate the use of cesarean section over vaginal delivery in these patients [31].

While vaginal delivery was the preferred method of delivery for the majority of our providers, the timing of delivery was more controversial. In stable gastroschisis, 43% (60/140) of providers delivered at 37 weeks, and 29% (40/140) delivered at 39 weeks. Two studies found that preterm delivery results in increased complications, increased incidence of sepsis, longer time on total parenteral nutrition, and increased length of hospital stay [17, 32]. Al-Kaff et al. [33] showed that planned induction at 36–37 weeks did not lead to better outcomes compared to 38 weeks or later, and Cain et al. [34] found that delivery after 37 weeks was related to improved perinatal outcomes. Two reviews also agreed that post-term delivery is related to lower medical costs [34, 35]. In contrast, another study showed that induction at 37 weeks of gestation had reduced risk of sepsis, bowel damage, and neonatal death with pregnancies managed expectantly beyond 37 weeks [25].

Despite this, only 6% of current MFM providers (9/140) will deliver prior to 37 weeks. In support, two studies showed that preterm delivery at 35 or 36 weeks did not increase morbidity and mortality in the mother or child and may lead to improved surgical outcomes [20, 36]. A randomized controlled trial from 2005 demonstrated a trend to better outcomes with shorter times to full enteral feeds and shorter hospital stays, with elective delivery at 36 weeks compared to spontaneous onset of labor [21]. A recent study by Sparks et al. [37] observed an increased stillbirth rate in babies with gastroschisis as gestational age increased, peaking at 39 weeks of gestational age. This study suggests that mortality risks for fetuses with gastroschisis may be minimized with delivery as early as 37 weeks gestation. There is no level I evidence based on prospective studies that provides adequate guidance as to the optimal timing of delivery of a fetus with gastroschisis.

As a survey, our results are limited and subjective. Our response rate of 39% may have limited the ability to identify all practice differences that exist within the NAFTNet centers. Furthermore, due to limitations in obtaining program data for all recipients of the survey, we were unable to describe and compare individuals that responded and those that did not respond. Some individuals chose not to answer all questions, which made some of our results incomplete. We did allow for open-ended comments, and many respondents stated that their answers might vary if more detailed parameters were provided within the question. Furthermore, recommendations and practice management patterns may differ both on an individual and institutional basis, and thus our results may only be applicable to the respondents of this survey. Also, given the survey format of our study, we were unable to capture combinations of testing within each center. The strengths of this study are that we were able to capture 100% of the NAFTNet centers. Also, while the majority

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of providers (87%) were affiliated with an academic institution, we did have a varying range of years of experience within the providers that were queried.

The variability in provider practices for antenatal monitoring and delivery regimens in gastroschisis is likely due to the lack of high-level evidence in the literature. For every study reporting improved neonatal outcomes with a given method of surveillance, method, or timing of delivery, there are also conflicting data to suggest otherwise. Additionally, most published data are retrospective in nature. Despite these differences, there is consensus in some aspects of surveillance among the surveyed providers. Our results suggest that minimal monitoring requirements should include initiation of testing at 32 weeks with weekly BPP or NST with AFI as well as and monthly EFW. This survey information outlines provider and institutional practices within the NAFTNet-affiliated centers and the lack of evidence-based data to develop clinical management algorithms and guidelines. Furthermore, this study highlights the need for collaborative clinical prospective studies related to the care and delivery of patients with gastroschisis.

Statement of Ethics

This study was approved by the Children's Hospital of Wisconsin Institutional Review Board.

Disclosure Statement

The authors declare no conflict of interest.

References

1 South AP, Stutey KM, Meinzen-Derr J: Meta-analysis of the prevalence of intrauterine fetal death in gastroschisis. Am J Obstet Gynecol 2013;209:114.e1–e13.
2 Gamba P, Midrio P: Abdominal wall defects: prenatal diagnosis, newborn management, and long-term outcomes. Semin Pediatr Surg 2014;23:283–290.
3 Friedman AM, Ananth CV, Siddiq Z, D'Alton ME, Wright JD: Gastroschisis: epidemiology and mode of delivery, 2005–2013. Am J Obstet Gynecol 2016;215:348.e1–e9.
4 Jones AM, Isenburg J, Salemi JL, Arnold KE, Mai CT, Aggarwal D, Arias W, Carrino GE, Ferrell E, Folorunso O, Ibe B, Kirby RS, Krapfl HR, Marengo LK, Mosley BS, Nance AE, Romitti PA, Spadafino J, Stock J, Honein MA: Increasing prevalence of gastroschisis – 14 states, 1995–2012. MMWR Morb Mortal Wkly Rep 2016;65:23–26.
5 Nelson DB, Martin R, Twickler DM, Santiago-Munoz PC, McIntire DD, Dashe JS: Sonographic detection and clinical importance of growth restriction in pregnancies with gastroschisis. J Ultrasound Med 2015;34:2217–2223.
6 Bauseler A, Funke K, Möllers M, Hammer K, Steinhard J, Borowski M, Muller V, Klockenbusch W, Schmitz R: Outcome of fetuses with gastroschisis after modification of prenatal management strategies: prenatal management and outcome of gastroschisis. Arch Gynecol Obstet 2015;294:239–243.
7 Barseghyan K, Aghajanian P, Miller DA: The prevalence of preterm births in pregnancies complicated with fetal gastroschisis. Arch Gynecol Obstet 2012;286:889–892.
8 Kuleva M, Khen-Dunlop N, Dumez Y, Ville Y, Salomon LJ: Is complex gastroschisis predictable by prenatal ultrasound? BJOG 2012;119:102–109.
9 Mousty E, Chalouhi GE, El Sabbagh A, Khen-Dunlop N, Kuleva M, Salomon LJ, Ville Y: Secondary bladder herniation in isolated gastroschisis justifies increased surveillance. Prenat Diagn 2012;32:888–892.
10 Overton TG, Pierce MR, Gao H, Kurinczuk JJ, Spark P, Draper ES, Marven S, Brocklehurst P, Knight M: Antenatal management and outcomes of gastroschisis in the UK. Prenat Diagn 2012;32:1256–1262.
11 Kuleva M, Salomon LJ, Benoist G, Ville Y, Dumez Y: The value of daily fetal heart rate home monitoring in addition to serial ultrasound examinations in pregnancies complicated by fetal gastroschisis. Prenat Diagn 2012;32:789–796.
12 David AL, Tan A, Curry J: Gastroschisis: sonographic diagnosis, associations, management and outcome. Prenat Diagn 2008;28:633–644.
13 Heinig J, Müller V, Schmitz R, Lohse K, Klockenbusch W, Steinhard J: Sonographic assessment of the extra-abdominal fetal small bowel in gastroschisis: a retrospective longitudinal study in relation to prenatal complications. Prenat Diagn 2008;28:109–114.
14 Holland AJ, Walker K, Badawi N: Gastroschisis: an update. Pediatr Surg Int 2010;26:871–878.
15 Vegunta RK, Wallace LJ, Leonardi MR, Gross TL, Renfroe Y, Marshall JS, Cohen HS, Hocker JR, Macwan KS, Clark SE, Ramiro S, Pearl RH: Perinatal management of gastroschisis: analysis of a newly established clinical pathway. J Pediatr Surg 2005;40:528–534.
16 Nick AM, Bruner JP, Moses R, Yang EY, Scott TA: Second-trimester intra-abdominal bowel dilation in fetuses with gastroschisis predicts neonatal bowel atresia. Ultrasound Obstet Gynecol 2006;28:821–825.
17 Yang EY, Davies LM, Buchanan P, Kling C, Banyard DA, Ramones T: Spontaneous onset of labor, not route of delivery, is associated with prolonged length of stay in babies with gastroschisis. J Pediatr Surg 2014;49:1776–1781.
18 Salihu HM, Emusu D, Aliyu ZY, Pierre-Louis BJ, Druschel CM, Kirby RS: Mode of delivery and neonatal survival of infants with isolated gastroschisis. Obstet Gynecol 2004;104:678–683.
19 Puligandla PS, Janvier A, Flageole H, Bouchard S, Laberge JM: Routine cesarean delivery does not improve the outcome of infants with gastroschisis. J Pediatr Surg 2004;39:742–745.
20 Moir CR, Ramsey PS, Ogburn PL, Johnson RV, Ramin KD: A prospective trial of elective preterm delivery for fetal gastroschisis. Am J Perinatol 2004;21:289–294.
21 Logghe HL, Mason GC, Thornton JG, Stringer MD: A randomized controlled trial of elective preterm delivery of fetuses with gastroschisis. J Pediatr Surg 2005;40:1726–1731.
22 Fleurke-Rozema H, van de Kamp K, Bakker M, Pajkrt E, Bilardo C, Snijders R: Prevalence, timing of diagnosis and pregnancy outcome of abdominal wall defects after the introduction of a national prenatal screening program. Prenat Diagn 2017;37:383–388.
23 Perry H, Healy C, Wellesley D, Hall NJ, Drewett M, Burge DM, Howe DT: Intrauterine death rate in gastroschisis following the introduction of an antenatal surveillance program: retrospective observational study. J Obstet Gynaecol Res 2017;43:492–497.

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24 Wilson MS, Carroll MA, Braun SA, Walsh WF, Pietsch JB, Bennett KA: Is preterm delivery indicated in fetuses with gastroschisis and antenatally detected bowel dilation? Fetal Diagn Ther 2012;32:262–266.
25 Baud D, Lausman A, Alfaraj MA, Seaward G, Kingdom J, Windrim R, Langer JC, Kelly EN, Ryan G: Expectant management compared with elective delivery at 37 weeks for gastroschisis. Obstet Gynecol 2013;121:990–998.
26 Adair CD, Rosnes J, Frye AH, Burrus DR, Nelson LH, Veille JC: The role of antepartum surveillance in the management of gastroschisis. Int J Gynaecol Obstet 1996;52:141–144.
27 Overcash RT, DeUgarte DA, Stephenson ML, Gutkin RM, Norton ME, Parmar S, Porto M, Poulain FR: Factors associated with gastroschisis outcomes. Obstet Gynecol 2014;124:551–557.
28 Page R, Ferraro ZM, Moretti F, Fung KF: Gastroschisis: antenatal sonographic predictors of adverse neonatal outcome. J Pregnancy 2014;2014:239406.
29 Long AM, Court J, Morabito A, Gillham JC: Antenatal diagnosis of bowel dilatation in gastroschisis is predictive of poor postnatal outcome. J Pediatr Surg 2011;46:1070–1075.
30 Lato K, Poellmann M, Knippel AJ, Bizjak G, Stressig R, Hammer R, Janni W, Kozlowski P: Fetal gastroschisis: a comparison of second vs. third-trimester bowel dilatation for predicting bowel atresia and neonatal outcomes. Ultraschall Med 2013;34:157–161.
31 Kirollos DW, Abdel-Latif ME: Mode of delivery and outcomes of infants with gastroschisis: a meta-analysis of observational studies. Arch Dis Child Fetal Neonatal Ed 2017, Epub ahead of print.
32 Nasr A, Wayne C, Bass J, Ryan G, Langer JC: Effect of delivery approach on outcomes in fetuses with gastroschisis. J Pediatr Surg 2013;48:2251–2255.
33 Al-Kaff A, MacDonald SC, Kent N, Burrows J, Skarsgard ED, Hutcheon JA; Canadian Pediatric Surgery Network: Delivery planning for pregnancies with gastroschisis: findings from a prospective national registry. Am J Obstet Gynecol 2015;213:557.e1–e8.
34 Cain MA, Salemi JL, Tanner JP, Mogos MF, Kirby RS, Whiteman VE, Salihu HM: Perinatal outcomes and hospital costs in gastroschisis based on gestational age at delivery. Obstet Gynecol 2014;124:543–550.
35 Harper LM, Goetzinger KR, Biggio JR, Macones GA: Timing of elective delivery in gastroschisis: a decision and cost-effectiveness analysis. Ultrasound Obstet Gynecol 2015;46:227–232.
36 Mesas Burgos C, Svenningsson A, Vejde JH, Granholm T, Conner P: Outcomes in infants with prenatally diagnosed gastroschisis and planned preterm delivery. Pediatr Surg Int 2015;31:1047–1053.
37 Sparks TN, Shaffer BL, Page J, Caughey AB: Gastroschisis: mortality risks with each additional week of expectant management. Am J Obstet Gynecol 2017;216:66.e1–e7.

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