

National and international guidelines on the management of twin pregnancies: a comparative review



Omer Weitzner, MD; Jon Barrett, MD; Kellie E. Murphy, MD; John Kingdom, MD; Amir Aviram, MD; Elad Mei-Dan, MD; Liran Hiersch, MD; Greg Ryan, MD; Tim Van Mieghem, MD; Nimrah Abbasi, MD; Nathan S. Fox, MD; Andrei Rebarber, MD; Vincenzo Berghella, MD; Nir Melamed, MD, MSc

Twin gestations are associated with increased risk of pregnancy complications. However, high-quality evidence regarding the management of twin pregnancies is limited, often resulting in inconsistencies in the recommendations of various national and international professional societies. In addition, some recommendations related to the management of twin gestations are often missing from the clinical guidelines dedicated to twin pregnancies and are instead included in the practice guidelines on specific pregnancy complications (eg, preterm birth) of the same professional society. This can make it challenging for care providers to easily identify and compare recommendations for the management of twin pregnancies. This study aimed to identify, summarize, and compare the recommendations of selected professional societies from high-income countries on the management of twin pregnancies, highlighting areas of both consensus and controversy. We reviewed clinical practice guidelines of selected major professional societies that were either specific to twin pregnancies or were focused on pregnancy complications or aspects of antenatal care that may be relevant for twin pregnancies. We decided a priori to include clinical guidelines from 7 high-income countries (United States, Canada, United Kingdom, France, Germany, and Australia and New Zealand grouped together) and from 2 international societies (International Society of Ultrasound in Obstetrics and Gynecology and the International Federation of Gynecology and Obstetrics). We identified recommendations regarding the following care areas: first-trimester care, antenatal surveillance, preterm birth and other pregnancy complications (preeclampsia, fetal growth restriction, and gestational diabetes mellitus), and timing and mode of delivery. We identified 28 guidelines published by 11 professional societies from the 7 countries and 2 international societies. Thirteen of these guidelines focus on twin pregnancies, whereas the other 16 focus on specific pregnancy complications predominantly in singletons but also include some recommendations for twin pregnancies. Most of the guidelines are recent, with 15 of the 29 guidelines published over the past 3 years. We identified considerable disagreement among guidelines, primarily in 4 key areas: screening and prevention of preterm birth, using aspirin to prevent preeclampsia, defining fetal growth restriction, and the timing of delivery. In addition, there is limited guidance on several important areas, including the implications of the “vanishing twin” phenomenon, technical aspects and risks of invasive procedures, nutrition and weight gain, physical and sexual activity, the optimal growth chart to be used in twin pregnancies, the diagnosis and management of gestational diabetes mellitus, and intrapartum care. This consolidation of key recommendations across several clinical practice guidelines can assist healthcare providers in accessing and comparing recommendations on the management of twin pregnancies and identifies high-priority areas for future research based on either continued disagreement among societies or limited current evidence to guide care.

Key words: American College of Obstetricians and Gynecologists, antenatal care, aspirin, clinical, comparison, delivery, expert, growth restriction, growth retardation, guidelines, International Federation of Gynecology and Obstetrics, International Society of Ultrasound in Obstetrics and Gynecology, management, multifetal, multiple, National Institute for Health and Care Excellence, practice, preeclampsia, prenatal care, prenatal screening, preterm, professional, recommendations, review, Royal College of Obstetricians and Gynaecologists, societies, Society of Obstetricians and Gynaecologists of Canada, summary, twin, twins

From the Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynaecology, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Canada (Drs Weitzner, Aviram, and Melamed); Department of Obstetrics and Gynecology, McMaster University, Hamilton, Canada (Dr Barrett); Ontario Fetal Centre, Department of Obstetrics and Gynaecology, Mount Sinai Hospital, University of Toronto, Toronto, Canada (Drs Murphy, Kingdom, Ryan, Van Mieghem, and Abbasi); Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynaecology, North York General Hospital, University of Toronto, Toronto, Canada (Dr Mei-Dan); Lis Maternity Hospital, Tel Aviv Sourasky Medical Center, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel (Dr Hiersch); Icahn School of Medicine at Mount Sinai, New York, NY (Drs Fox and Rebarber); Maternal Fetal Medicine Associates, PLLC, New York, NY (Drs Fox and Rebarber); and Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Sidney Kimmel Medical College, Thomas Jefferson University, Philadelphia, PA (Dr Berghella).

Received April 5, 2023; revised May 20, 2023; accepted May 22, 2023.

J.B., A.A., E.A.D., G.R., T.V.M., N.A., and N.M. are coauthors of the Society of Obstetricians and Gynaecologists of Canada guidelines on twin pregnancies. The other authors report no conflict of interest.

N.M. holds the Waugh Family Chair in Twin Fetal Medicine Research at the Sunnybrook Health Sciences Centre and the University of Toronto. None of the funding agencies had any role in the idea, design, analyses, interpretation of data, writing of the manuscript, or decision to submit the manuscript.

Corresponding author: Nir Melamed, MD, MSc. nir.melamed@sunnybrook.ca

0002-9378/\$36.00 • © 2023 Elsevier Inc. All rights reserved. • <https://doi.org/10.1016/j.ajog.2023.05.022>



Introduction

Twin gestations, accounting for >3% of pregnancies in the United States and Canada,^{1,2} are associated with increased risk of common pregnancy complications such as preterm birth, hypertensive disorders of pregnancy, gestational diabetes mellitus, cesarean delivery, and fetal growth restriction.^{3–7} Therefore, twin pregnancies are associated with considerable risk to both mothers and their developing fetuses.⁸ Indeed, twin births account for a disproportionately high rate of neonatal morbidity and healthcare resource utilization,⁹ and mothers with twins are at >4-fold risk of severe acute morbidity compared with those with a singleton pregnancy.^{10,11} Therefore, early risk stratification, proper use of preventive strategies, adequate maternal and fetal surveillance, and optimization of timing and mode of delivery are all key components of antepartum and intrapartum care of twin pregnancies, with the ultimate goal of minimizing morbidity and mortality in this high-risk group of pregnancies.

However, the underlying quality of evidence to guide the management of twin pregnancies is generally poor in comparison with singleton pregnancies, in part because twins have been under-represented in clinical trials. This deficit has been acknowledged in a recent statement by the Society for Maternal-Fetal Medicine on the state of science on multifetal gestations.¹² The limited research data have made it challenging to either provide or agree upon clear evidence-based recommendations for the management of twin pregnancies, resulting in considerable variation and inconsistencies in the recommendations of various professional societies worldwide.^{13–21} Such inconsistencies may cause unnecessary confusion for care providers and perpetuate variations in the management of twin pregnancies between centers and countries. Another important challenge that care providers are often faced with is that some key recommendations for twin gestations are often included within practice guidelines on specific topics (eg, guidelines on preterm birth or fetal growth restriction, which are predominantly

focused on singleton pregnancies, but also include some recommendations for twins) rather than being included in the clinical practice guideline on twin pregnancies issued by the same professional society. This resource gap makes it challenging for busy care providers to easily identify, compare, and access the recommendations of the various professional societies on the management of twin pregnancies. Summarizing recommendations from different guidelines into a single document would make it easier for care providers to access recommendations and identify areas of consensus and disagreement between guidelines. In addition, such a resource would direct the twin pregnancy research community to topics with insufficient guidance or evidence, and that might therefore merit additional research.

Our goal was to identify, summarize, and compare the recommendations of selected professional societies from high-income countries on the management of twin pregnancies, highlighting areas of both consensus and controversy.

Methods

Eligibility criteria and search strategy

We included clinical practice guidelines of selected major professional societies that were either specific to twin pregnancies or were focused on pregnancy complications or aspects of antenatal care that may be relevant for twin pregnancies. We decided a priori to include clinical guidelines from 7 high-income countries (United States, Canada, United Kingdom, France, Germany, and Australia and New Zealand grouped together), and from 2 international societies (International Society of Ultrasound in Obstetrics and Gynecology [ISUOG] and the International Federation of Gynecology and Obstetrics [FIGO]).

For each country or international society, we identified twin-specific clinical guidelines, and reviewed clinical guidelines on the following topics for recommendations specific to twin pregnancies: preterm birth, hypertensive complications of pregnancy, fetal growth restriction, prenatal screening for genetic and

structural anomalies, ultrasound in pregnancy, and nutrition in pregnancy. Guidelines were identified through the following approaches: (1) a detailed review of all relevant guidelines on the website of the specific society; (2) a search in PubMed and Google using the following key words: (guideline OR guidelines OR recommendations OR practice OR consensus) AND (twin OR twins OR multifetal OR “multiple gestation” OR “preterm birth” OR “preterm labor” OR “preterm labour” OR progesterone OR cerclage OR hypertension OR hypertensive OR preeclampsia OR aspirin OR growth OR restriction OR retardation OR screening OR genetic OR prenatal OR ultrasound OR sonographic OR nutrition OR weight OR obesity OR exercise OR activity); and (3) a search in the International Guideline Library website.

The last search was undertaken on February 10, 2023. When >1 version of a guideline on a specific topic was identified, only the most recent version of this guideline was included.

Areas of antenatal and intrapartum care

We decided a priori to identify recommendations regarding the following areas of antenatal and intrapartum care in twin pregnancies: (1) first-trimester care—including dating, labeling, chorionicity, prenatal genetic screening and testing, “vanishing” twins, and intrauterine fetal demise; (2) antenatal surveillance—including the frequency of ultrasound and visits, sonographic screening for structural anomalies, and nutritional and lifestyle recommendations; (3) preterm birth—including screening with cervical-length measurement, preventive interventions (cerclage, progesterone, pessary, tocolysis), and administration of antenatal corticosteroids; (4) other pregnancy complications including preeclampsia, fetal growth restriction, and gestational diabetes mellitus; and (5) timing and mode of delivery.

We chose not to include recommendations on complications unique to monochorionic twins (twin-to-twin transfusion syndrome, twin anemia-polycythemia sequence, twin reversed

arterial perfusion, selective fetal growth restriction, and single fetal demise) because these conditions involve complex diagnosis and management processes and may warrant a separate review to summarize available recommendations.

Data extraction

The clinical guidelines documents were reviewed in detail by 2 independent reviewers (O.W. and N.M.). Recommendations regarding any of the areas of care listed above were extracted and tabulated. Then, for each area of care, the recommendations of the various societies were compared, to identify areas of consensus and controversy. Areas with good agreement, considerable disagreement, or insufficient guidance were flagged in the last column by a green checkmark, red “x,” or blue question mark, respectively. Given the difficulty in quantifying agreement, these 3 categories of agreement were determined by the authors in a qualitative and subjective manner, with the main goal of facilitating for the readers the identification of areas where the variation between societies is greatest.

Results

Description of the clinical guidelines

We identified 28 guidelines published by 11 professional societies from the 7 countries and 2 international societies included in the current review (Table 1). Thirteen of these guidelines are focused on twin pregnancies, whereas the other 16 mostly focus on complications in singletons but include certain specific recommendations for twin pregnancies. Most of the guidelines are recent, with 15 and 22 of the 28 guidelines published over the past 3 and 5 years, respectively.

First-trimester care and prenatal genetic screening

Recommendations regarding first-trimester care and prenatal genetic screening are summarized in Table 2.

Dating and labeling

The dating method is addressed in 4 guidelines (Canada, Germany, ISUOG, and FIGO), all of which recommend that

pregnancy dating be based on the crown–rump length of the larger twin (Table 2). Five guidelines (Canada, United Kingdom, Germany, ISUOG, and FIGO) describe the approach for twin labeling, recommending that it be based on the lateral or vertical orientation and include as many parameters as possible. Only the Canadian guidelines recommend that in laterally oriented twins, the twin on the maternal right be labeled as A and that the naming be maintained for all subsequent scans irrespective of change in location to maintain consistency, especially for complex pregnancies that need to be referred for invasive interventions (Table 2).

Chorionicity

All guidelines highlight the importance of determining chorionicity in the first trimester (Table 2). Six guidelines describe the sonographic signs that should be used to determine chorionicity, including the number of gestational sacs, the lambda and T signs (in the cases of a single placenta), membrane thickness, and fetal sex. Whereas the US, German, and ISUOG guidelines mention the number of placentas as another sign for the determination of chorionicity (ie, 2 placentas being an indication of dichorionic placentation), the Canadian guideline states that this is not a reliable sign given that 3% of monozygotic twins have separate placental masses (Table 2).

Prenatal genetic screening

All guidelines recommend assessing the nuchal translucency between 11⁺⁰ and 13⁺⁶ weeks' gestation (Table 2). Although there seems to be an agreement that the screening accuracy of biochemical markers is less accurate for trisomy 21 twins than for singletons, some guidelines either recommend their use (Germany) or state that they may be considered (Canada, ISUOG, FIGO) or should be offered (United Kingdom), whereas the French guideline states that their use is not recommended (Table 2).

Six guidelines mention cell-free fetal DNA–based noninvasive prenatal testing (NIPT) as an option for screening for trisomy 21 in twin pregnancies (Table 2). Most guidelines highlight the

limited validation of NIPT in twins compared with singleton pregnancies. The US guidelines state that the performance of NIPT in twins is similar to that reported in singletons, whereas others comment that it is associated with lower detection rates (Germany, ISUOG) and higher failure rates (Australia and New Zealand) than in singletons.

Invasive testing

Six guidelines address the role of chorionic villus sampling. The loss rate associated with chorionic villus sampling is described as 2% to 3.8% (Germany, ISUOG, FIGO) or 1% above the background risk (Canada). Several guidelines recommend using chorionic villus sampling over amniocentesis in dichorionic twin pregnancies, given the earlier gestational age when results will be available (France, Germany, ISUOG, FIGO) (Table 2). Three guidelines state that the loss rate is similar for the transcervical and transabdominal approaches (Canada, France, ISUOG), but only the French guideline states that the transabdominal approach is preferred.

Several guidelines state that the risk associated with amniocentesis is higher in twins than in singleton pregnancies (France, ISUOG, FIGO), with a loss rate of 1.5% to 3.1% (Germany, ISUOG) (Table 2). Only 2 guidelines refer to the amniocentesis technique, stating that there is no difference in loss rate between single- and double-uterine entry techniques (Canada) and that the choice should be left to the operator (France), although it should be noted that the double-uterine entry technique may increase the risk of injury to the dividing membrane. Some controversy exists concerning the number of sacs that should be sampled when amniocentesis is performed in monozygotic twin pregnancies. Whereas the Canadian guideline recommends sampling both sacs routinely given the (small) risk of heterokaryotypic twins, others suggest that routine sampling of both sacs is not always necessary (French), especially if chorionicity was documented before 14 weeks and the fetuses are concordant for growth and have normal anatomy (United Kingdom, ISUOG).

TABLE 1
List of the clinical guidelines included in the current review

Country	Society	Title	Year	Ref
United States	ACOG	Practice Bulletin No. 231. Multifetal Gestations: Twin, Triplet, and Higher-Order Multifetal Pregnancies ^a	2021	American College of Obstetricians and Gynecologists ¹³
		Committee Opinion No. 743. Low-Dose Aspirin Use During Pregnancy	2018	ACOG ²²
		Practice Bulletin No. 234. Prediction and Prevention of Spontaneous Preterm Birth	2021	American College of Obstetricians and Gynecologists ²³
	Practice Bulletin No. 227. Fetal Growth Restriction	2021	ACOG ²⁴	
	SMFM	Consult Series #52: Diagnosis and Management of Fetal Growth Restriction	2020	SMFM ²⁵
Canada	SOGC	Guideline No. 441: Management of Monochorionic Twin Pregnancies ^a	2023	Lee et al ²¹
		Guideline No. 428: Management of Dichorionic Twin Pregnancies ^a	2022	Mei-Dan et al ¹⁴
		Guideline No. 260: Ultrasound in Twin Pregnancies ^a	2017	Morin and Lim ²⁶
		Guideline No. 262: Prenatal Screening for and Diagnosis of Aneuploidy in Twin Pregnancies ^a	2017	Audibert and Gagnon ²⁷
		Guideline No. 373: Cervical Insufficiency and Cervical Cerclage	2019	Brown ²⁸
		Guideline No. 398: Progesterone for Prevention of Spontaneous Preterm Birth	2020	Jain et al ²⁹
		Guideline No. 426: Hypertensive Disorders of Pregnancy: Diagnosis, Prediction, Prevention, and Management	2022	Magee et al ³⁰
United Kingdom	RCOG	Green-top Guideline No. 51: Management of Monochorionic Twin Pregnancy ^a	2017	Green-top Guideline ³¹
	NICE	Clinical Guideline 137: Updated guidance for the management of twin and triplet pregnancies ^a	2019	NICE ³²
		Clinical Guideline 133: Hypertension in pregnancy: diagnosis and management	2019	NICE ³³
Australia and New Zealand	RANZCOG	Management of monochorionic twin pregnancy ^a	2021	RANZCOG ¹⁶
France	CNGOF	Twin pregnancies: guidelines for clinical practice ^a	2011	Vayssière et al ¹⁷
		Prevention of spontaneous preterm birth	2017	Sentilhes et al ³⁴
Germany	AWMF	Screening, Management and Delivery in Twin Pregnancy ^a	2021	von Kaisenberg et al ¹⁸
		Prevention and Therapy of Preterm Birth	2019	Berger et al ³⁵

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

(continued)

TABLE 1
List of the clinical guidelines included in the current review (continued)

Country	Society	Title	Year	Ref
International	ISUOG	Practice Guidelines: role of ultrasound in twin pregnancy ^a	2016	Khalil et al ¹⁹
		Practice Guidelines: role of ultrasound in the prediction of spontaneous preterm birth	2022	Coutinho et al ³⁶
		Practice Guidelines: ultrasound assessment of fetal biometry and growth	2019	Salomon et al ³⁷
		Practice Guidelines: diagnosis and management of small-for-gestational-age fetus and fetal growth restriction	2020	Lees et al ³⁸
	FIGO	Good clinical practice advice: Management of twin pregnancy ^a	2019	FIGO ²⁰
		Best practice advice for screening, diagnosis, and management of fetal growth restriction	2021	Melamed et al ³⁹
		FIGO good practice recommendations on cervical cerclage for prevention of preterm birth	2021	Shennan et al ⁴⁰
		FIGO good practice recommendations on the use of pessary for reducing the frequency and improving outcomes of preterm birth	2021	Grobman et al ⁴¹

ACOG, American College of Obstetricians and Gynecologists; AIWMF, Association of the Scientific Medical Societies in Germany; CNGOF, French College of Gynaecologists and Obstetricians; FIGO, The International Federation of Gynecology and Obstetrics; ISUOG, International Society of Ultrasound in Obstetrics and Gynecology; NICE, National Institute for Health and Care Excellence; PANZCOG, Royal Australian and New Zealand College of Obstetricians and Gynaecologists; RCOG, Royal College of Obstetricians and Gynaecologists; SMFM, Society for Maternal-Fetal Medicine; SOGC, Society of Obstetricians and Gynaecologists of Canada.

^a Guidelines that are focused on twin pregnancies.

Weitzner. Summary of clinical guidelines on twin pregnancies. Am J Obstet Gynecol 2023.

Vanishing twin and fetal demise

Only the Canadian guideline refers to the “vanishing” twin phenomenon, stating that it is associated with increased risk for fetal structural anomalies, growth restriction, and preterm birth in the surviving co-twin. A few guidelines state that fetal death of 1 twin in a dichorionic twin pregnancy is associated with a 3% to 4% risk of death and a 1% to 3% risk of neurologic injury to the surviving twin (United States, France, ISUOG), and an increased risk of preterm birth (Canada, ISUOG).

Antenatal surveillance and management

Recommendations regarding antenatal surveillance and management are summarized in Table 3.

Frequency of visits and ultrasound examinations

For dichorionic twins, most guidelines recommend routine sonographic assessment of growth and fetal well-being every 4 weeks starting at 20 weeks (United States, United Kingdom, Germany, ISUOG, FIGO); others recommend sonographic assessment every 3 to 4 weeks starting at 24 to 25 weeks (Canada) or every 2 weeks (France). For monochorionic twins, there was a consensus among guidelines that sonographic assessment should be performed every 2 weeks starting at 16 weeks, given the higher risk of discordant growth and the need for surveillance for twin–twin transfusion syndrome.

Assessment for structural anomalies

Six guidelines recommend routine anatomic assessment at 18 to 22 weeks of gestation, whereas 4 guidelines recommend that fetal anatomy also be assessed during the first-trimester scan at 11 to 14 weeks (Table 3), and the Canadian guidelines state that this can be done if the expertise is available. Four guidelines recommend routine fetal echocardiography for monochorionic twins in the second trimester.

Weight gain and lifestyle advice

We found very little guidance concerning nutrition, weight gain, physical exercise, and restrictions (or lack thereof) regarding physical and sexual activity (Table 3).

TABLE 2
First-trimester care and prenatal genetic screening

Topic	Unites States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Dating and chorionicity									
Dating: timing		11 ^{0/7} to 13 ^{6/7} wk	First trimester			At CRL 45–84 mm (11 ^{0/7} to 13 ^{6/7} wk)	At CRL 45–84 mm (11 ^{0/7} to 13 ^{6/7} wk)	11 ^{0/7} to 13 ^{6/7} wk	✓
Dating: method		CRL of larger twin				CRL of larger twin (unless in vitro fertilization)	CRL of larger twin (unless in vitro fertilization) Use head circumference of larger twin after 14 wk	CRL of larger twin Use head circumference of larger twin after 14 wk	✓
Labeling: which parameters should be used		Lateral or vertical orientation, rather than their proximity to the cervix As many parameters as possible: location, biometry, structural anomalies or variants, sex, placental location, and cord insertion	According to their lateral or vertical orientation			As many parameters as possible—location, position, placental location, umbilical cord insertion site, fetal sex	According to their lateral or vertical orientation As many parameters as possible	As many parameters as possible	✓
Labeling: naming		In laterally oriented twins, the twin on the maternal right should be labeled as A. ^b Naming should be maintained for all subsequent scans irrespective of change in location.							?
Chorionicity: timing	First and early second trimester	11 ^{0/7} to 13 ^{6/7} weeks	11 to 13 ^{6/7} weeks	<14 weeks	11 to 14 weeks	<14 weeks	11–13 ^{6/7} weeks	First trimester	✓

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

(continued)

TABLE 2
First-trimester care and prenatal genetic screening (continued)

Topic	Unites States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Chorionicity: signs	Two placentas or differing fetal sex \diamond dichorionic. If only 1 placenta is visualized, use twin peak sign vs T-sign.	Fetal sex, twin peak or lambda sign, the T sign, and membrane thickness. The number of placentas is unreliable because 3% of monozygotic twins have separate placental masses. ^b			Number of gestational sacs at 7–10 wk; lambda sign at 11–14 wk	Membrane thickness at the site of placental insertion; T-sign or lambda sign; number of placentas	Membrane thickness at the site of placental insertion; T sign or lambda sign; number of placentas	Membrane thickness at the site of placental insertion; T sign or lambda sign	✔
Prenatal genetic screening									
Nuchal translucency	Recommended	Recommended	Recommended at 11–13 ^{6/7} wk	Recommended at 11–13 ^{6/7} wk	Recommended	Recommended	Recommended in the first trimester	Recommended at 11–13 ^{6/7} wk	✔
Biochemical markers	Not as accurate as in singletons	May be considered; provides some improvement over nuchal translucency alone	Should be offered	Lower detection rate than in singletons	Not recommended but is currently being assessed ^b	Recommended	May be considered	May be considered	✘
NIPT	Performance seems similar to singletons, but number of reported affected cases is small. Difficult to determine the accuracy for trisomy 18 and 13.	NIPT is recommended and funded for twins in some provinces, such as Ontario and British Columbia.		May be offered. Increased test failure rate, fewer data on performance than in singletons.		Can be considered. Detection rates are lower than for singletons.	Detection rate may be lower than in singletons, but data are still limited.	May be offered.	✘

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

(continued)

TABLE 2

First-trimester care and prenatal genetic screening (continued)

Topic	Unites States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Chorionic villus sampling: risk	Procedure-associated loss rate is slightly increased compared with singletons Risk of sampling error ~ 1%	Loss rate has an excess risk of ~ 1% above the background risk			Chorionic villus sampling is recommended over amniocentesis, given earlier results	Loss rate 2%–3.8% Chorionic villus sampling is recommended over amniocentesis in dichorionic twins, given earlier results	Loss rate 2%–3.8% Chorionic villus sampling is recommended over amniocentesis in dichorionic twins, given earlier results	Risk of loss seems to be greater than in singletons (2%) Chorionic villus sampling is recommended over amniocentesis in dichorionic twins, given earlier results	✓
Chorionic villus sampling: approach		No difference in the loss rate between transabdominal and transcervical chorionic villus sampling. In dichorionic twins, the combination of transabdominal and transcervical approaches or a transabdominal-only approach seems to minimize the risk of sampling errors.			Transabdominal route is preferred over transcervical ^b			Risk similar for transabdominal and transcervical approaches	?
Amniocentesis: risk					Risk may be slightly higher than in singletons	1.5%–3.1%	Risk may be slightly higher than in singletons, 1.5%–3.1%	Risk may be slightly higher than in singletons	?
Amniocentesis: technique		No difference in loss rate between single- and double-uterine entry			The choice of inserting 1 or 2 needles is left to the operator				?

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

(continued)

TABLE 2
First-trimester care and prenatal genetic screening (continued)

Topic	United States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Amniocentesis: number of sacs to be sampled in monochorionic twins		Sampling of both amniotic sacs should be considered ^b	Both amniotic sacs should be sampled unless monochorionic confirmed <14 wk and the fetuses are concordant for growth and anatomy		Routine sampling of both sacs is not always necessary		It is acceptable to sample only 1 sac if monochorionic confirmed <14 wk and the fetuses are concordant for growth and anatomy		?
Vanishing twin and fetal demise									
"Vanishing" fetus		Vanishing twin pregnancies may be at increased risk for fetal structural anomalies, growth restriction, and preterm birth							?
Intrauterine fetal demise > 14 wk: dichorionic twins: risk to co-twin	Demise > 14 wk: Death: 3% Neurologic injury: 3%	Higher risk of preterm birth, the latency being inversely proportionate to gestational age at the time of fetal death					Death: 3% Neurologic injury: 2% Preterm birth: 54%		?

CRL, crown-rump length; NIPT, noninvasive prenatal testing.

^a Areas with good agreement, considerable disagreement, or insufficient guidance are flagged by a green checkmark, red x, or blue question mark, respectively; ^b Noticeable differences between guidelines.

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

Prediction and prevention of preterm birth

Recommendations regarding the prediction and prevention of preterm birth are summarized in [Table 4](#).

Cervical-length screening

We identified some disagreement among guidelines regarding the use of sonographic cervical length measurement to screen for spontaneous preterm birth. Whereas 5 guidelines recommend such screening, the French guidelines recommend against it, and the UK guidelines chose not to provide any recommendation. The recommended timing for screening is at the time of the routine second-trimester anatomy scan (United States, Germany) or at 18 to 24 weeks (ISUOG, FIGO), whereas the Canadian guideline was the only one recommending measuring cervical length twice (at the anatomy scan and once again before 24 weeks) ([Table 4](#)). Only the FIGO guidelines specify explicitly that screening should be performed using the transvaginal approach. The Canadian guidelines state that either the transabdominal or transvaginal approaches can be used, whereas the US guidelines recommend the transabdominal approach. Only 3 guidelines describe cutoff values that should define a short cervix (25 mm according to the German and ISUOG guidelines and 20 mm according to FIGO).

Prevention of preterm birth

All the guidelines (except the Royal Australian and New Zealand College of Obstetricians and Gynaecologists [RANZCOG]) advise against the routine use of progesterone, cervical cerclage, cervical pessary, or tocolysis in unselected twin pregnancies ([Table 4](#)).

Two guidelines recommend vaginal progesterone for short cervical length (≤ 25 mm) found before 24 weeks (Canada, Germany), whereas the ISUOG guidelines state that it may be considered in this scenario.

Cervical cerclage for a short cervix is not recommended by most guidelines, whereas the Canadian and FIGO guidelines suggest that it may be considered in cases of a very short cervix (≤ 15 mm). Where the cervix is found to be dilated, some guidelines either recommend

TABLE 3

Antenatal surveillance and management

Topic	United States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Frequency of visits and ultrasound examinations									
Dichorionic twins	Every 4 wk, starting at 20 wk	Every 3–4 wk, starting at 24–25 wk	Every 4 wk, starting at 20 wk		Ultrasound every 2 wk ^b ; consultations every 4 wk	Every 4 wk, starting at 20 wk	Every 4 wk, starting at 20 wk	Every 4 wk, starting at 20 wk	✓
Monochorionic-diamniotic twins	Every 2 wk, starting at 16 wk	Every 2 wk, starting at 16 wk	Every 2 wk, starting at 16 wk	Every 2 wk, starting at 16 wk		Every 2 wk, starting at 16 wk	Every 2 wk, starting at 16 wk	Every 2 wk, starting at 16 wk	✓
Assessment for structural anomalies									
Early anatomy scan		Where the expertise is available, an early anatomy ultrasound can be performed at 12–14 wk of gestation		First-trimester scan (11–14 wk) should include early anatomy		Should be assessed in the first-trimester scan	Should be assessed in the first-trimester scan	First-trimester scan (11–13+6 wk) should include anatomy scan	✓
Late anatomy scan	At 18–22 wk	At 18–22 wk	At 21–22 wk			At 18–22 wk	At 20–22 wk	At 20 wk	✓
Fetal echo for monochorionic twins	At 18–22 wk	Not recommended	Recommended			At 18–22 wk		Recommended	✓
Weight gain and lifestyle advice									
Gestational weight gain									?

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

(continued)

TABLE 3
Antenatal surveillance and management (continued)

Topic	United States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Restrictions regarding physical activity		At least 150 min of moderate-intensity physical activity each wk, over at least 3 d per wk Pelvic floor muscle training may be performed daily							?
Restrictions regarding sexual activity									?

^a Areas with good agreement, considerable disagreement, or insufficient guidance are flagged by a green checkmark, red x, or blue question mark, respectively; ^b Noticeable differences between guidelines. Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

cerclage (Canada) or state that it may be considered (United States, Germany, ISUOG).

Most guidelines do not recommend vaginal insertion of a cervical pessary for a short cervix, except for the German guideline that states that one can be placed when the cervical length is ≤ 25 mm before 24 weeks.

With respect to antenatal corticosteroids, most guidelines recommend following the same recommendations used in singleton pregnancies and therefore advise against routine administration in twin pregnancies.

Other pregnancy complications—preeclampsia, growth restriction, and gestational diabetes mellitus

Recommendations regarding other pregnancy complications are summarized in Table 5.

Preeclampsia

Four guidelines refer to the use of aspirin for the prevention of preeclampsia, and recommendations vary with regard to the indications, dose, and timing. Whereas the US guidelines recommend aspirin prophylaxis in *all* twin pregnancies, others recommend that it be used *only* in the presence of additional risk factors (Canada, United Kingdom, FIGO). Whereas some recommend low-dose aspirin of 75 to 81 mg (United States, FIGO), others recommend either a low dose or double dose of 150 or 162 mg (Canada, United Kingdom). The recommended timing of initiation of aspirin varies from 12 weeks (United Kingdom, FIGO), before 16 weeks (Canada), and between 12 and 28 weeks. It is recommended that aspirin be discontinued either at birth (United States, United Kingdom, FIGO) or at 36 weeks (Canada).

Fetal growth restriction

The definition of fetal growth restriction varies between guidelines. Whereas the Canadian and German guidelines adopt the consensus definitions for fetal growth restriction in twins that are based on fetal size and Doppler evaluation,⁴² others use the traditional definition based on the combination of estimated fetal weight < 10 th and > 25 % weight discordance (United Kingdom, Australia

TABLE 4
Prediction and prevention of preterm birth

Topic	Unites States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Sonographic cervical-length screening									
Routine cervical-length screening	Recommended	Recommended	No recommendation is made		Not recommended ^b	Recommended	Recommended	Recommended	X
Timing	18–22 wk	Anatomy scan If possible, once again before 24 wk ^b				20 wk	18–24 wk	18–24 wk	X
Approach	Transabdominal ^b ; if suspected to be short, then use transvaginal.	Transabdominally or transvaginally						Transvaginal	?
Threshold to define short cervix						25 mm	25 mm	20 mm ^b	X
Prevention: unselected twins									
Routine cerclage	Not recommended	Not recommended	Not recommended		Not recommended	Not recommended		Not recommended	✓
Routine progesterone	Not recommended	Not recommended	Not recommended		Not recommended	Not recommended	Not recommended	Not recommended	✓
Routine vaginal pessary	Not recommended	Not recommended			Not recommended	Not recommended	Not recommended	Not recommended	✓
Tocolysis	Not recommended	Not recommended	Not recommended		Not recommended		Not recommended	Not recommended	✓
Prevention: cases of short cervix									
Vaginal progesterone	Insufficient data	Recommend vaginal progesterone 400 mg/d if cervical length ≤ 25 mm at 16–24 wk ^b	No recommendation is made		Not recommended	Recommend vaginal progesterone 200–400 mg/d if cervical length ≤ 25 mm before 24 wk ^b	Vaginal progesterone may be considered for cervical length ≤ 25 mm		X

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

(continued)

TABLE 4
Prediction and prevention of preterm birth (continued)

Topic	United States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Cerclage	Short cervix: insufficient data. Dilated cervix: may be considered.	Short cervix: consider if cervical length ≤ 15 mm. Dilated cervix: recommended if ≥ 1 cm before 24 wk. ^b			Short cervix: not recommended.	Short cervix: not recommended. Dilated cervix: consider if >1 cm before 24 wk.	Short cervix: not recommended. Dilated cervix: consider if asymptomatic and <24 wk (along with antibiotics and tocolysis).	Short cervix: insufficient data, but observational data suggest a possible advantage for cervical length <15 mm. ^b	X
Vaginal pessary	Not recommended	Insufficient data			Not recommended	Can be placed if cervical length ≤ 25 mm at <24 wk. ^b	Not recommended	Not recommended	X
Antenatal corticosteroids									
Routine	Not recommended	Not recommended	Not recommended				Not recommended	Not recommended	✓
Immediate risk of preterm birth	Same as in singleton pregnancies	Same as in singleton pregnancies	Same as in singleton pregnancies				Same as in singleton pregnancies	Same as in singleton pregnancies	✓

^a Areas with good agreement, considerable disagreement, or insufficient guidance are flagged by a green checkmark, red X, or blue question mark, respectively; ^b Noticeable differences between guidelines. Weitzner. *Summary of clinical guidelines on twin pregnancies. Am J Obstet Gynecol* 2023.

and New Zealand, ISUOG, and FIGO). The US guidelines do not provide specific recommendations for the definition of fetal growth restriction in twin pregnancies. Only 2 guidelines refer to the choice of the growth chart to be used in twin gestations, stating that it is reasonable to use a twin-specific growth chart (Canada, ISUOG). The definition of discordant growth ranges from 20% to 25%.

Recommendations regarding the surveillance and timing of delivery in dichorionic twins with fetal growth restriction are limited. Either weekly (Canada, United Kingdom) or biweekly (ISUOG) monitoring is recommended depending on the severity of fetal growth restriction. With respect to the timing of delivery, most guidelines provide a general recommendation that the timing of delivery be based on the same factors used in singleton pregnancies (primarily Doppler studies). However, in contrast to singleton pregnancies,^{38,39} none of the guidelines provide specific recommendations regarding the timing of delivery based on the estimated fetal weight centile, level of discordance, or Doppler findings (Table 5).

Gestational diabetes mellitus

None of the guidelines provides specific recommendations regarding the screening, diagnosis, or management of diabetes mellitus in twin pregnancies.

Timing and mode of delivery

Recommendations regarding timing and mode of delivery are summarized in Table 6.

Timing of delivery

There is considerable inconsistency and lack of clarity (due to the use of only whole gestational weeks) among guidelines regarding the timing of delivery, with the French guidelines being the most permissive (Table 6; Figure). In the case of dichorionic twin pregnancies, most guidelines recommend delivery at 37 to 38 weeks, whereas others recommend delivery only at 38^{0/7} to 38^{6/7} weeks (United States) or between 38 and <40 weeks (France). Similarly, for monochorionic-diamniotic twin pregnancies, most guidelines recommend delivery at 36 to 37 weeks, whereas

TABLE 5
Preeclampsia, growth restriction, and gestational diabetes mellitus

Topic	Unites States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Aspirin for the prevention of preeclampsia									
Indications	All twins ^b	If there are additional risk factors	If they have ≥ 2 risk factors					If there are additional risk factors (refer to the NICE UK guidelines)	X
Dose	81 mg ^b	81 or 162 mg	75–150 mg					75 mg ^b	X
Timing	Start between 12 and 28 wk ^b (optimally before 16 wk) until birth	Start before 16 wk until 36 wk	From 12 wk until birth					From 12 wk until birth	X
Diagnosis of fetal growth restriction and discordance									
Definition of fetal growth restriction in dichorionic twins		Estimated fetal weight <3 rd centile OR $\geq 2/3$ of: (1) estimated fetal weight <10 th centile; (2) discordance $\geq 25\%$; (3) umbilical artery pulsatility index >95 th centile	Estimated fetal weight <10 th centile AND discordance >25%			Estimated fetal weight <3 rd centile OR $\geq 2/3$ of: (1) estimated fetal weight <10 th centile; (2) discordance $\geq 25\%$; (3) umbilical artery pulsatility index >95 th centile	Estimated fetal weight <10 th centile AND discordance >25%	Estimated fetal weight <10 th centile Many clinicians also require discordance >25%	X
Choice of growth chart		Consider using twin-specific charts						Twin growth charts should be used. However, the use of such charts is controversial.	?
Discordance cutoff	$\geq 20\%$	$\geq 20\%$ –25%	$\geq 20\%$		$\geq 20\%$ –25%	$\geq 25\%$	$\geq 20\%$	$\geq 25\%$	✓

Weitzner. Summary of clinical guidelines on twin pregnancies. Am J Obstet Gynecol 2023.

(continued)

TABLE 5
Preeclampsia, growth restriction, and gestational diabetes mellitus (continued)

Topic	United States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Surveillance in dichorionic twins with fetal growth restriction		Weekly, depending on severity of fetal growth restriction, Dopplers, fluid, and gestational age	Weekly if discordance >20% or estimated fetal weight <10 th centile				Every 2 wk, depending on severity		?
Timing of delivery in dichorionic twins with fetal growth restriction	Should be individualized	Same as in singletons—based on growth velocity, Dopplers				Same as singletons	Same as singletons—based on Dopplers	Same as singletons	✓
Gestational diabetes mellitus									
Screening, diagnosis, and management									?

NICE, National Institute for Health and Care Excellence.

^a Areas with good agreement, considerable disagreement, or insufficient guidance are flagged by a green checkmark, red x, or blue question mark, respectively. ^b Noticeable differences between guidelines.

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

others recommend delivery either earlier at 34^{0/7} to 37^{6/7} weeks (United States) or later at 36^{0/7} to 38^{6/7} weeks (France). Finally, for monochorionic-monoamniotic twins, most guidelines recommend delivery at 32 to 34 weeks, whereas the recommended gestational age range by other guidelines is either more strict (32^{0/7}–32^{6/7} weeks, Germany) or more permissive (32 and <36 weeks, France) (Table 6; Figure).

Mode of delivery

Most guidelines restrict a trial of vaginal birth to pregnancies with a first twin in cephalic presentation, whereas the French guideline extended this recommendation to cases with a first twin in breech presentation (Table 6). Only 1 guideline limits a trial of vaginal birth to pregnancies without marked size discordance (United Kingdom), whereas the Canadian guideline states that there is insufficient information to provide recommendations in such cases and in cases of a noncephalic second twin before 32 weeks or <1500 g.

Only 2 guidelines (Canada, France) refer to the management of the non-cephalic second twin and recommend that total breech extraction with or without internal podalic version be preferred over external cephalic version in such cases. The French guideline is the only one recommending using internal podalic version for a second cephalic twin with an unengaged head.

For monochorionic-monoamniotic twins, all guidelines recommend cesarean delivery.

Intrapartum considerations

Recommendations regarding intrapartum management of twin pregnancies are limited (Table 6). Four guidelines explicitly recommend epidural analgesia (United States, Canada, United Kingdom, France) and continuous intrapartum fetal heart rate monitoring of both twins (Canada, United Kingdom, Australia and New Zealand, FIGO). Only 2 guidelines refer to the use of a scalp electrode to monitor the heart rate of the first twin and recommend using it either routinely (FIGO) or when abdominal monitoring is unsuccessful (United Kingdom).

TABLE 6
Timing and mode of delivery

Topic	Unites States	Canada	United Kingdom	Australia and New Zealand	France	Germany	ISUOG	FIGO	Agreement ^a
Timing of delivery									
Uncomplicated dichorionic twins	38 ^{0/7} –38 ^{6/7} wk	37–38 wk	37 wk		From 38 to <40 wk ^b	37 ^{0/7} –38 ^{0/7} wk		From 37 ^{0/7} wk	X
Uncomplicated monochorionic-diamniotic twins	34 ^{0/7} –37 ^{6/7} wk ^b	36–37 wk	36 wk	By 37 wk	36 ^{0/7} –38 ^{6/7} wk ^b	36 ^{0/7} –37 ^{0/7} wk		From 36 ^{0/7} wk	X
Uncomplicated monochorionic-monoamniotic twins	32 ^{0/7} –34 ^{0/7} wk	By 32–34 wk	32 ^{0/7} –33 ^{6/7} wk		From 32 to <36 wk ^b	32 ^{0/7} –32 ^{6/7} wk	At 32–34 wk	At 32–34 wk	X
Mode of delivery									
Criteria for vaginal delivery	Twin A: cephalic	Twin A: cephalic Care provider skilled in managing a second twin with a noncephalic presentation ^b Insufficient evidence to guide mode of delivery for noncephalic second twin at <32 wk or estimated fetal weight <1500 g ^b or when the second twin is larger by >25% than the first twin. ^b	Twin A: cephalic No marked size discordance between the twins ^b		Twin A: cephalic or breech presentation ^b	Twin A: cephalic		Twin A: cephalic	X
Management of noncephalic second twin		Total breech extraction should be preferred over external cephalic version			Total breech extraction should be preferred over external cephalic version				?
Role of internal podalic version		Second twin in transverse lie			Second twin in transverse lie. May be considered for second twin in cephalic presentation with an unengaged head. ^b				?

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

(continued)

TABLE 6
Timing and mode of delivery (continued)

Topic	Australia and New Zealand					Agreement ^a
	United States	Canada	United Kingdom	France	Germany	
Monochorionic-monoamniotic twins	Cesarean delivery	Cesarean delivery	Cesarean delivery	Cesarean delivery	Cesarean delivery	✓
Intrapartum considerations						
Epidural	Recommended	Recommended. Alternative is pudendal block.	Recommended	Recommended		✓
Continuous fetal heart rate monitoring		Recommended	Recommended		Recommended	✓
Use of scalp electrode on the first twin			If abdominal monitoring is unsuccessful or there are concerns about synchronicity of the fetal hearts		Recommended	?

^a Areas with good agreement, considerable disagreement, or insufficient guidance are flagged by a green checkmark, red x, or blue question mark, respectively. ^b Noticeable differences between guidelines. Weitzner. *Summary of clinical guidelines on twin pregnancies. Am J Obstet Gynecol* 2023.

Comment

Principal findings

Our goal was to summarize and compare the recommendations of selected professional societies on the management of twin pregnancies. Our main findings are as follows: (1) over half of the guidelines containing recommendations on twin pregnancies were not focused on twin pregnancies (but on specific pregnancy complications, primarily in singleton pregnancies); this finding highlights the challenge faced by healthcare providers in easily identifying recommendations on twin pregnancies and the benefit of consolidating recommendations into a single accessible publication; (2) we identified considerable disagreement between guidelines, primarily concerning the screening and prevention of preterm birth, the use of aspirin to prevent preeclampsia, the definition of fetal growth restriction, and delivery timing; and (3) there was limited guidance about certain topics, including the implications of the “vanishing” twin, technical aspects of invasive procedures, nutrition and weight gain, physical and sexual activity, type of growth chart, gestational diabetes mellitus, and intrapartum management.

Areas of consensus

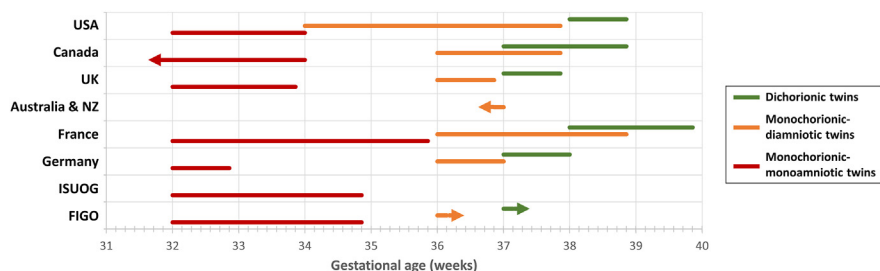
Most guidelines had similar recommendations regarding pregnancy dating (using the crown–rump length of the larger twin), determination of chorionicity, and the use of nuchal translucency assessment in twins. In addition, most guidelines recommended a similar visit and ultrasound schedule in dichorionic and monochorionic twin pregnancies (every 4 and 2 weeks, respectively). Finally, all guidelines recommended against the use of interventions for the prevention of preterm birth (such as cervical cerclage, progesterone, and pessary) in unselected twin pregnancies and the routine administration of antenatal corticosteroids.

Areas of disagreement

There was inconsistency among guidelines regarding the accuracy of biochemical serum markers and whether they should be used to screen for trisomy 21 in twin pregnancies. In a recent

FIGURE

Summary of recommendations on timing of delivery in twin pregnancies



Recommendations of the various professional societies on the timing of delivery are shown for dichorionic (green lines), monochorionic-diamniotic (orange lines), and monochorionic monoamniotic (red lines) twin pregnancies. (Right-pointing arrows) and (left-pointing arrows) represent recommendations to deliver from or until a given gestational age, respectively.

FIGO, The International Federation of Gynecology and Obstetrics; ISUOG, International Society of Ultrasound in Obstetrics and Gynecology; NZ, New Zealand; UK, United Kingdom; USA, United States of America.

Weitzner. Summary of clinical guidelines on twin pregnancies. *Am J Obstet Gynecol* 2023.

position statement of the International Society for Prenatal Diagnosis, the detection rate of trisomy 21 using conventional first-trimester screening in twin pregnancies was reported to be 80% (for a false-positive rate of 5%),⁴³ which is lower than the corresponding detection rate in singleton pregnancies (82%–87%).⁴⁴ This is attributed to the fact that serum marker levels in twin pregnancies are averaged together, thereby potentially masking abnormal levels in 1 of the twins. By contrast, the detection rate of trisomy 21 using NIPT in twin pregnancies is far superior (98.8%, for a false-positive rate of 0.1%)⁴³ and is relatively similar to that reported in singleton pregnancies (99.5%, for a false-positive rate of 0.05%).^{45,46} Therefore, although most guidelines question whether the accuracy of NIPT is as high in twins as in singletons, it is clear that NIPT in twin pregnancies is a more accurate screening approach than the traditional first-trimester screen based on nuchal translucency and biochemical markers.⁴⁷ In addition, single-nucleotide polymorphism–based NIPT assays can provide information on zygosity (which may be valuable in certain scenarios) and individual fetal fractions.

We identified a variation among guidelines concerning the use of sonographic cervical-length measurement to

screen for preterm birth in twin pregnancies. The French guideline is the only one presently recommending against cervical-length measurement. Although their recommendation was based on the lack of clear evidence of effective interventions in patients with a short cervix, it should be noted that this guideline was published more than a decade ago (2011) when fewer relevant data were available.¹⁷ The UK National Institute for Health and Care Excellence (NICE) guidelines chose not to make any recommendations regarding cervical-length measurement, although the committee members supported this screening approach. This decision was made because the committee became aware that new evidence might emerge about the benefit of vaginal progesterone in patients with twins and a short cervix that could change their conclusions about its effectiveness.³² The Canadian guideline is the only one suggesting screening of cervical length more than once before 24 weeks.¹⁴ This recommendation is based on observational data indicating that the discriminatory ability of cervical length is limited when measured before 20 weeks and that serial cervical-length measurements can improve the detection of twin pregnancies at risk of preterm birth.^{48,49}

Data regarding the benefit of progesterone in twin pregnancies with a short

cervix remain unclear, as reflected by the disagreement between guidelines. An individual patient data meta-analysis from 2017 found that administering vaginal progesterone to patients with twins and cervical length ≤ 25 mm ($n=303$) was associated with reduced risk of preterm birth and neonatal mortality and morbidity.⁵⁰ However, 1 study that contributed 74% of the sample size to the meta-analysis was recently retracted.^{51,52} Nevertheless, an updated individual patient data meta-analysis found similar benefits for vaginal progesterone.⁵³ Findings from the ongoing PROSPECT trial (NCT02518594) may provide additional data regarding the benefit of progesterone in this population.

Similarly, recommendations regarding the use of cerclage in patients with twins and a short cervix are conflicting. Despite the lack of data from randomized controlled trials, the Canadian and FIGO guidelines recommend that clinicians consider cervical cerclage in patients with a very short cervix of ≤ 15 mm; this recommendation is based on a multicenter retrospective study and a recently published meta-analysis of observational studies that reported a considerable reduction in the risk of preterm birth.^{54,55} The recommendations regarding cervical cerclage in patients with twins and a dilated cervix are based predominantly on a recently published trial of 30 patients with twins and cervical dilatation of 1 to 5 cm before 24 weeks, where cerclage was associated with a reduction in the risk of preterm birth and perinatal mortality.⁵⁶ However, only the ISUOG guideline emphasizes that the intervention in that trial consisted of a combination of indomethacin (for 48 hours) and antibiotics (primarily cephalosporins) in addition to cervical cerclage. Therefore, recommendations for physical examination–indicated cerclage that are based on this latter trial should ideally include antibiotics and indomethacin in addition to cerclage.

Recommendations on the use of aspirin for the prevention of preeclampsia in twin pregnancies are inconsistent. Although it is clear that

twin pregnancy is a risk factor for preeclampsia (especially early-onset disease),^{57,58} the benefit of prophylactic aspirin in twin pregnancies without additional risk factors for preeclampsia remains unclear. In a recent meta-analysis of randomized controlled trials and observational studies, the prophylactic administration of aspirin in twin pregnancies was associated with a reduction in the risk of preeclampsia, but there was no reduction in the risk of preterm birth, and the overall quality of evidence was low.⁵⁹ There are ongoing efforts to develop accurate multimodal prediction models for preeclampsia in twin pregnancies.⁶⁰ Such prediction models are a prerequisite for a large trial on the use of aspirin to prevent preeclampsia in twin pregnancies, similar to that performed in singletons.⁶¹

Variations in the definition of fetal growth restriction in twin pregnancies may be attributed, at least in part, to the fact that only the more recent guidelines have adopted the consensus definition for fetal growth restriction in twin pregnancies that was published in 2019.⁴² This consensus definition, which considers the degree of fetal smallness (estimated fetal weight <3rd vs at 3rd–9th centile) and umbilical artery Doppler, is more consistent with the consensus definition of fetal growth restriction in singleton pregnancies,⁶² and may be more specific for placenta-mediated growth restriction than the traditional definition (which is based on estimated fetal weight <10th centile along with size discordance >25%). Another key aspect of the definition of fetal growth restriction in twins relates to the type of growth chart that should be used to determine estimated fetal weight centiles. There is growing evidence that using twin-specific charts (as opposed to singleton growth charts) can reduce the proportion of twin fetuses identified with suspected growth restriction by up to 8-fold without compromising the detection of twin fetuses at risk for adverse outcomes caused by uteroplacental insufficiency.⁶³ Currently, only 2 guidelines (Canada and ISUOG) address the choice of growth charts, suggesting that it may be reasonable to use twin-

specific fetal growth charts in twin pregnancies.

Finally, we identified considerable variation among guidelines concerning the timing of delivery (Figure). In the absence of large randomized trials on the timing of delivery in twin pregnancies, current guideline recommendations are largely based on gestational week-specific estimates of the risk of stillbirth and neonatal death derived from observational data, with the largest meta-analysis on these estimates published in 2016.⁶⁴ Some of the differences may be explained by the guidelines' publication year. For example, the French guidelines, which had the most permissive recommendations regarding the timing of delivery, were published in 2011, before the meta-analysis described above became available. Nevertheless, the rationale for some of the recommendations (eg, the American College of Obstetricians and Gynecologists recommendation to deliver uncomplicated monochorionic-diamniotic twins as early as at 34^{0/7} weeks and the French guideline recommendation to defer delivery of monochorionic-diamniotic and monochorionic-monoamniotic twins up to 38⁺⁶ and 36 weeks, respectively) is not strongly evidence-based. In addition, these recommendations may benefit from following a standard and clear description of the gestational age range (ie, describing gestational age as both weeks and days and specifying both the lower and upper limits of the recommended gestational age range) to minimize confusion and incorrect interpretation by care providers.

Areas where there is limited guidance

Most guidelines did not refer to the management of cases with a vanishing twin, including its implications for prenatal screening for trisomy 21 (where both first-trimester screening and most NIPT assays cannot be performed because of elevated levels of biochemical markers and the cell-free fetal DNA of the demised twin, respectively, for many weeks after the fetal demise)⁶⁵ and its association with adverse pregnancy outcomes.⁶⁶

Other important topics missing from most guidelines include nutrition, weight gain, and other lifestyle issues in

twin pregnancies, such as physical and sexual activity.^{67,68} Although data on these topics might be limited, these are common and practical aspects of antenatal care that patients often ask about; therefore, guidance on these topics would be valuable for healthcare providers.

Inadequate maternal weight gain in twin pregnancies is associated with increased risk of preterm birth and other pregnancy complications.^{69,70} Although most of these data are observational, they are likely to remain the best source of evidence given that it is not feasible to randomize patients to a certain amount of weight gain during pregnancy. Therefore, guidance regarding the target weight gain would be an important component of future clinical guidelines on twin pregnancies.⁷¹

None of the guidelines provide recommendations on specific approaches to gestational diabetes mellitus in twin pregnancies. The diagnosis and management of gestational diabetes mellitus in twin pregnancies are, therefore, currently extrapolated from singleton pregnancies because twins have been largely excluded from most trials on gestational diabetes mellitus.¹² However, recent studies highlight the lack of information on the performance of the screening tests for gestational diabetes mellitus in twin pregnancies,⁷² and that the optimal screening and diagnostic thresholds for gestational diabetes mellitus may be higher in twins than in singletons.^{73–75} In addition, it has been questioned whether tight glycemic control in twin pregnancies with gestational diabetes mellitus improves or worsens outcomes.⁷⁶ Therefore, there is a need for additional research on the optimal diagnosis and management of gestational diabetes mellitus in twin pregnancies.

We identified very little guidance regarding the mode of delivery and the conduct of vaginal birth in twin pregnancies, especially with regard to the delivery of the second twin. The Twin Birth Study provided evidence that in twin pregnancies between 32^{0/7} and 38^{6/7} weeks, planned cesarean delivery does not decrease or increase the risk of

adverse neonatal outcomes compared with planned vaginal delivery.⁷⁷ However, data on the optimal mode of delivery before 32 weeks (and especially before 28 weeks) are limited.⁷⁷ A recent large observational study found that among twins born at <28 weeks with the second noncephalic twin, there was no difference in the risk of adverse neonatal outcome between a trial of vaginal delivery and primary cesarean delivery. However, a trial of vaginal delivery was associated with a high rate (30%) of urgent cesarean delivery for the second twin.⁷⁸ In addition, recent data suggest that cesarean delivery may be associated with lower risk of perinatal complications in the subgroup of twins born at term.^{79,80} Finally, care providers often struggle with the safety of a trial of vaginal delivery in cases where the second twin is considerably larger than the first twin, a scenario mentioned by only 2 of the guidelines (Canada and United Kingdom).

Strengths and limitations

The current review has several strengths. First, it is timely given that several new or revised guidelines on twin pregnancies have recently been published. Indeed, over half of the guidelines included in the current review were published within the past 3 years. Second, we reviewed a large number of guidelines, including many that are not focused specifically on twin pregnancies. Finally, we provided a detailed summary of recommendations across most aspects of antenatal and intrapartum care of twin pregnancies.

The current review has several limitations. First, it is limited to guidelines from selected high-income countries. The rationale underlying this decision was that the recommendations in these countries might vary considerably from those included in guidelines from low- and middle-income countries where available resources (such as ultrasound and neonatal care) may be limited.^{81,82} Second, it does not include a summary of recommendations on the diagnosis and management of complications unique to monochorionic twins. However, the diagnosis and management of these conditions are complex, and we

believe that a detailed review and discussion of these recommendations would best be achieved through a separate review dedicated to monochorionic twin pregnancies.

Conclusion

In the current review, we summarize and compare the recommendations of selected professional societies on the management of twin pregnancies. Most recommendations are based on observational data or expert opinion, which explains the variation among guidelines and the relative arbitrariness of some of the recommendations, especially when the evidence is limited. In addition, some of the variation in the recommendations may be attributed to differences in the guidelines' publication year. Nevertheless, such guidance is important to optimize and standardize the care of these high-risk pregnancies, and we believe that the current summary can make it easier for care providers to access and compare these recommendations. In the future, we believe that twin guidelines should attempt to be as comprehensive as possible and cover all aspects of antenatal and intrapartum care, or alternatively, refer the reader to other guidelines of the same society that include recommendations for twin pregnancies with respect to specific pregnancy complications.

We identified areas of disagreement among guidelines, and areas where there is relatively limited guidance. More research is needed into these areas of care in an effort to standardize care and fill these knowledge gaps. Until then, standardization of these recommendations would best be achieved through an international consensus, with the overall goal of improving the care of individuals with twin pregnancies and their infants. ■

REFERENCES

1. Chauhan SP, Scardo JA, Hayes E, Abuhamad AZ, Berghella V. Twins: prevalence, problems, and preterm births. *Am J Obstet Gynecol* 2010;203:305–15.
2. Martin JA, Hamilton BE, Osterman MJ, Driscoll AK, Mathews TJ. Births: final data for 2015. *Natl Vital Stat Rep* 2017;66:1.
3. Hirsch L, Berger H, Okby R, et al. Incidence and risk factors for gestational diabetes mellitus

in twin versus singleton pregnancies. *Arch Gynecol Obstet* 2018;298:579–87.

4. Salem SY, Kibel M, Asztalos E, Zaltz A, Barrett J, Melamed N. Neonatal outcomes of low-risk, late-preterm twins compared with late-preterm singletons. *Obstet Gynecol* 2017;130:582–90.
5. Laine K, Murzakanova G, Sole KB, Pay AD, Heradstveit S, Räisänen S. Prevalence and risk of pre-eclampsia and gestational hypertension in twin pregnancies: a population-based register study. *BMJ Open* 2019;9:e029908.
6. Fuchs F, Senat MV. Multiple gestations and preterm birth. *Semin Fetal Neonatal Med* 2016;21:113–20.
7. Simchen MJ, Okrent Smolar AL, Dulitzky M, Sivan E, Morag I. Neonatal morbidities and need for intervention in twins and singletons born at 34–35 weeks of gestation. *J Perinat Med* 2016;44:887–92.
8. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. *Lancet* 2008;371:75–84.
9. Ness RB, Sibai BM. Shared and disparate components of the pathophysiologies of fetal growth restriction and preeclampsia. *Am J Obstet Gynecol* 2006;195:40–9.
10. Madar H, Goffinet F, Seco A, et al. Severe acute maternal morbidity in twin compared with singleton pregnancies. *Obstet Gynecol* 2019;133:1141–50.
11. Santana DS, Cecatti JG, Surita FG, et al. Twin pregnancy and severe maternal outcomes: the World Health Organization multicountry survey on maternal and newborn health. *Obstet Gynecol* 2016;127:631–41.
12. SMFM Research Committee, Grantz KL, Kawakita T, et al. SMFM Special Statement: state of the science on multifetal gestations: unique considerations and importance. *Am J Obstet Gynecol* 2019;221:B2–12.
13. American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—Obstetrics, Society for Maternal-Fetal Medicine. Multifetal gestations: twin, triplet, and higher-order multifetal pregnancies: ACOG Practice Bulletin, Number 231. *Obstet Gynecol* 2021;137:e145–62.
14. Mei-Dan E, Jain V, Melamed N, et al. Guideline No. 428: management of dichorionic twin pregnancies. *J Obstet Gynaecol Can* 2022;44:819–34.e1.
15. NICE Guideline. Twin and triplet pregnancy. 2019. Available at: <https://www.nice.org.uk/guidance/ng137>. Accessed May 1, 2023.
16. Royal Australian and New Zealand College of Obstetricians and Gynaecologists. Management of monochorionic twin pregnancy. 2021. Available at: <https://ranzcoog.edu.au/wp-content/uploads/2022/05/Management-of-Monochorionic-Twin-Pregnancy.pdf>. Accessed January 23, 2023.
17. Vayssière C, Benoist G, Blondel B, et al. Twin pregnancies: guidelines for clinical practice from the French College of Gynaecologists and Obstetricians (CNGOF). *Eur J Obstet Gynecol Reprod Biol* 2011;156:12–7.

18. von Kaisenberg C, Klaritsch P, Ochsenbein-Köible N, Hodel ME, Nothacker M, Hecher K. Screening, management and delivery in twin pregnancy. *Ultraschall Med* 2021;42:367–78.
19. Khalil A, Rodgers M, Baschat A, et al. ISUOG Practice Guidelines: role of ultrasound in twin pregnancy. *Ultrasound Obstet Gynecol* 2016;47:247–63.
20. FIGO Working Group on Good Clinical Practice in Maternal-Fetal Medicine. Good clinical practice advice: management of twin pregnancy. *Int J Gynaecol Obstet* 2019;144:330–7.
21. Lee HS, Abbasi N, Van Mieghem T, et al. Guideline No. 441: management of monochorionic twin pregnancies [in press]. *J Obstet Gynaecol Can* 2023.
22. ACOG Committee Opinion No. 743: low-dose aspirin use during pregnancy. *Obstet Gynecol* 2018;132:e44–52.
23. American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—Obstetrics. Prediction and prevention of spontaneous preterm birth: ACOG Practice Bulletin, Number 234. *Obstet Gynecol* 2021;138:e65–90.
24. Fetal growth restriction: ACOG Practice Bulletin, Number 227. *Obstet Gynecol* 2021;137:e16–28.
25. Society for Maternal-Fetal Medicine (SMFM). Electronic address: pubs@smfm.org, Martins JG, Biggio JR, Abuhamad A. Society for Maternal-Fetal Medicine Consult Series #52: diagnosis and management of fetal growth restriction: (Replaces Clinical Guideline Number 3, April 2012). *Am J Obstet Gynecol* 2020;223:B2–17.
26. Morin L, Lim K, No. 260-ultrasound in twin pregnancies. *J Obstet Gynaecol Can* 2017;39:e398–411.
27. Audibert F, Gagnon A, No. 262-prenatal screening for and diagnosis of aneuploidy in twin pregnancies. *J Obstet Gynaecol Can* 2017;39:e347–61.
28. Brown R, Gagnon R, Delisle MF. No. 373-cervical insufficiency and cervical cerclage. *J Obstet Gynaecol Can* 2019;41:233–47.
29. Jain V, McDonald SD, Mundle WR, Farine D. Guideline No. 398: progesterone for prevention of spontaneous preterm birth. *J Obstet Gynaecol Can* 2020;42:806–12.
30. Magee LA, Smith GN, Bloch C, et al. Guideline No. 426: hypertensive disorders of pregnancy: diagnosis, prediction, prevention, and management. *J Obstet Gynaecol Can* 2022;44:547–71.e1.
31. Management of monochorionic twin pregnancy: Green-top Guideline No. 51. *BJOG* 2017;124:e1–45.
32. National Institute for Health and Care Excellence. Twin and triplet pregnancy. 2019. Available at: <https://www.nice.org.uk/guidance/NG137>. Accessed January 25, 2023.
33. NICE guideline. Hypertension in pregnancy: diagnosis and management. 2019. Available at: <https://www.nice.org.uk/guidance/ng133>. Accessed May 1, 2023.
34. Sentilhes L, Sénat MV, Ancel PY, et al. Prevention of spontaneous preterm birth: guidelines for clinical practice from the French College of Gynaecologists and Obstetricians (CNGOF). *Eur J Obstet Gynecol Reprod Biol* 2017;210:217–24.
35. Berger R, Abele H, Bahlmann F, et al. Prevention and therapy of preterm birth. Guideline of the DGGG, OEGGG and SGGG (S2k Level, AWMF Registry Number 015/025, February 2019) - Part 2 with Recommendations on the Tertiary Prevention of Preterm Birth and the Management of Preterm Premature Rupture of Membranes. *Geburtshilfe Frauenheilkd* 2019;79:813–33.
36. Coutinho CM, Sotiriadis A, Odibo A, et al. ISUOG Practice Guidelines: role of ultrasound in the prediction of spontaneous preterm birth. *Ultrasound Obstet Gynecol* 2022;60:435–56.
37. Salomon LJ, Alfrevic Z, Da Silva Costa F, et al. ISUOG Practice Guidelines: ultrasound assessment of fetal biometry and growth. *Ultrasound Obstet Gynecol* 2019;53:715–23.
38. Lees CC, Stampalija T, Baschat A, et al. ISUOG Practice Guidelines: diagnosis and management of small-for-gestational-age fetus and fetal growth restriction. *Ultrasound Obstet Gynecol* 2020;56:298–312.
39. Melamed N, Baschat A, Yinon Y, et al. FIGO (international Federation of Gynecology and Obstetrics) initiative on fetal growth: best practice advice for screening, diagnosis, and management of fetal growth restriction. *Int J Gynaecol Obstet* 2021;152(Suppl1):3–57.
40. Shennan A, Story L, Jacobsson B, Grobman WA; FIGO Working Group for Preterm Birth. FIGO good practice recommendations on cervical cerclage for prevention of preterm birth. *Int J Gynaecol Obstet* 2021;155:19–22.
41. Grobman WA, Norman J, Jacobsson B; FIGO Working Group for Preterm Birth. FIGO good practice recommendations on the use of pessary for reducing the frequency and improving outcomes of preterm birth. *Int J Gynaecol Obstet* 2021;155:23–5.
42. Khalil A, Beune I, Hecher K, et al. Consensus definition and essential reporting parameters of selective fetal growth restriction in twin pregnancy: a Delphi procedure. *Ultrasound Obstet Gynecol* 2019;53:47–54.
43. Palomaki GE, Chiu RWK, Pertile MD, et al. International Society for prenatal Diagnosis Position Statement: cell free (cf)DNA screening for Down syndrome in multiple pregnancies. *Prenat Diagn* 2021;41:1222–32.
44. Malone FD, Canick JA, Ball RH, et al. First-trimester or second-trimester screening, or both, for Down's syndrome. *N Engl J Med* 2005;353:2001–11.
45. Gil MM, Quezada MS, Revello R, Akolekar R, Nicolaidis KH. Analysis of cell-free DNA in maternal blood in screening for fetal aneuploidies: updated meta-analysis. *Ultrasound Obstet Gynecol* 2015;45:249–66.
46. Mackie FL, Hemming K, Allen S, Morris RK, Kilby MD. The accuracy of cell-free fetal DNA-based non-invasive prenatal testing in singleton pregnancies: a systematic review and bivariate meta-analysis. *BJOG* 2017;124:32–46.
47. Prenatal Screening Ontario. NIPT funding criteria. 2022. Available at: [https://www.prenatalscreeningontario.ca/en/ps/prenatal-screening-options/nipt-funding-criteria.aspx#:~:text=Announcement%20\(December%2017%2C%202021\)%3A,age%20and%20other%20risk%20factors](https://www.prenatalscreeningontario.ca/en/ps/prenatal-screening-options/nipt-funding-criteria.aspx#:~:text=Announcement%20(December%2017%2C%202021)%3A,age%20and%20other%20risk%20factors). Accessed March 4, 2023.
48. Melamed N, Pittini A, Hirsch L, et al. Do serial measurements of cervical length improve the prediction of preterm birth in asymptomatic women with twin gestations? *Am J Obstet Gynecol* 2016;215:616.e1. 14.
49. Melamed N, Pittini A, Hirsch L, et al. Serial cervical length determination in twin pregnancies reveals 4 distinct patterns with prognostic significance for preterm birth. *Am J Obstet Gynecol* 2016;215:476.e1. 11.
50. Romero R, Conde-Agudelo A, El-Refaie W, et al. Vaginal progesterone decreases preterm birth and neonatal morbidity and mortality in women with a twin gestation and a short cervix: an updated meta-analysis of individual patient data. *Ultrasound Obstet Gynecol* 2017;49:303–14.
51. El-Refaie W, Abdelhafez MS, Badawy A. Vaginal progesterone for prevention of preterm labor in asymptomatic twin pregnancies with sonographic short cervix: a randomized clinical trial of efficacy and safety. *Arch Gynecol Obstet* 2016;293:61–7.
52. El-Refaie W, Abdelhafez MS, Badawy A. Retraction note: vaginal progesterone for prevention of preterm labor in asymptomatic twin pregnancies with sonographic short cervix: a randomized clinical trial of efficacy and safety. *Arch Gynecol Obstet* 2021;304:1113.
53. Romero R, Conde-Agudelo A, Rehal A, et al. Vaginal progesterone for the prevention of preterm birth and adverse perinatal outcomes in twin gestations with a short cervix: an updated individual patient data meta-analysis. *Ultrasound Obstet Gynecol* 2022;59:263–6.
54. Roman A, Rochelson B, Fox NS, et al. Efficacy of ultrasound-indicated cerclage in twin pregnancies. *Am J Obstet Gynecol* 2015;212:788.e1–6.
55. Li C, Shen J, Hua K. Cerclage for women with twin pregnancies: a systematic review and metaanalysis. *Am J Obstet Gynecol* 2019;220:543–57.e1.
56. Roman A, Zork N, Haeri S, et al. Physical examination-indicated cerclage in twin pregnancy: a randomized controlled trial. *Am J Obstet Gynecol* 2020;223:902.e1. 11.
57. Aviram A, Berger H, Abdulaziz KE, et al. Outcomes associated with hypertensive disorders of pregnancy in twin compared with singleton gestations. *Obstet Gynecol* 2021;138:449–58.
58. Francisco C, Wright D, Benkő Z, Syngelaki A, Nicolaidis KH. Hidden high rate of pre-eclampsia in twin compared with singleton pregnancy. *Ultrasound Obstet Gynecol* 2017;50:88–92.
59. D'Antonio F, Khalil A, Rizzo G, et al. Aspirin for prevention of preeclampsia and adverse perinatal outcome in twin pregnancies: a

systematic review and meta-analysis. *Am J Obstet Gynecol MFM* 2023;5:100803.

60. Benkó Z, Wright A, Rehal A, et al. Prediction of pre-eclampsia in twin pregnancy by maternal factors and biomarkers at 11-13 weeks' gestation: data from EVENTS trial. *Ultrasound Obstet Gynecol* 2021;57:257-65.

61. Rolnik DL, Wright D, Poon LC, et al. Aspirin versus placebo in pregnancies at high risk for preterm preeclampsia. *N Engl J Med* 2017;377:613-22.

62. Gordijn SJ, Beune IM, Thilaganathan B, et al. Consensus definition of fetal growth restriction: a Delphi procedure. *Ultrasound Obstet Gynecol* 2016;48:333-9.

63. Hirsch L, Barrett J, Fox NS, Rebarber A, Kingdom J, Melamed N. Should twin-specific growth charts be used to assess fetal growth in twin pregnancies? *Am J Obstet Gynecol* 2022;227:10-28.

64. Cheong-See F, Schuit E, Arroyo-Manzano D, et al. Prospective risk of stillbirth and neonatal complications in twin pregnancies: systematic review and meta-analysis. *BMJ* 2016;354:i4353.

65. Chaveeva P, Wright A, Syngelaki A, Konstantinidou L, Wright D, Nicolaides KH. First-trimester screening for trisomies in pregnancies with vanishing twin. *Ultrasound Obstet Gynecol* 2020;55:326-31.

66. Batsry L, Yinon Y. The vanishing twin: diagnosis and implications. *Best Pract Res Clin Obstet Gynaecol* 2022;84:66-75.

67. Lipworth H, Barrett J, Melamed N. Multiple pregnancies and sex. In: Farine D, González PT, eds. Sex and pregnancy: from evidence-based

medicine to dr Google. Cambridge, England: Cambridge University Press; 2022.

68. Hirsch L, Attali E, Melamed N. Special considerations regarding antenatal care and pregnancy complications in dichorionic twin pregnancies. *Am J Obstet Gynecol MFM* 2022;4:100500.

69. Lipworth H, Barrett J, Murphy KE, Redelmeier D, Melamed N. Gestational weight gain in twin gestations and pregnancy outcomes: a systematic review and meta-analysis. *BJOG* 2022;129:868-79.

70. Lipworth H, Melamed N, Berger H, et al. Maternal weight gain and pregnancy outcomes in twin gestations. *Am J Obstet Gynecol* 2021;225:532.e1. 12.

71. Institute of Medicine (US) and National Research Council (US). Committee to Reexamine IOM Pregnancy Weight Guidelines. Weight gain during pregnancy: reexamining the guidelines. 2009. Available at: <http://www.ncbi.nlm.nih.gov/books/NBK32813/>. Accessed August 30, 2022.

72. Zhao G, Murphy KE, Berger H, et al. The screening performance of glucose challenge test for gestational diabetes in twin pregnancies: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med* 2022;35:7590-600.

73. Hirsch L, Shah BR, Berger H, et al. Screening accuracy of the 50-g-glucose challenge test in twin compared with singleton pregnancies. *J Clin Endocrinol Metab* 2022;107:2854-64.

74. Hirsch L, Shah BR, Berger H, et al. DEVELOPING twin-specific 75-g oral glucose tolerance test diagnostic thresholds for gestational diabetes based on the risk of future

maternal diabetes: a population-based cohort study. *BJOG* 2021;128:1975-85.

75. Rebarber A, Dolin C, Fields JC, et al. Screening approach for gestational diabetes in twin pregnancies. *Am J Obstet Gynecol* 2014;211:639.e1. -5.

76. Fox NS, Gerber RS, Saltzman DH, et al. Glycemic control in twin pregnancies with gestational diabetes: are we improving or worsening outcomes? *J Matern Fetal Neonatal Med* 2016;29:1041-5.

77. Barrett JF, Hannah ME, Hutton EK, et al. A randomized trial of planned cesarean or vaginal delivery for twin pregnancy. *N Engl J Med* 2013;369:1295-305.

78. Hirsch L, Shah PS, Khurshid F, et al. Mode of delivery and neonatal outcomes in extremely preterm Vertex/nonvertex twins. *Am J Obstet Gynecol* 2021;224:613.e1. -10.

79. Zafarmand MH, Goossens SMTA, Tajik P, et al. Planned cesarean or planned vaginal delivery for twins: secondary analysis of randomized controlled trial. *Ultrasound Obstet Gynecol* 2021;57:582-91.

80. Smith GCS. Mode of delivery of twins at term. *Best Pract Res Clin Obstet Gynaecol* 2022;84:194-204.

81. Ganchimeg T, Morisaki N, Vogel JP, et al. Mode and timing of twin delivery and perinatal outcomes in low- and middle-income countries: a secondary analysis of the WHO Multicountry Survey on Maternal and newborn Health. *BJOG* 2014;121(Suppl1):89-100.

82. Vogel JP, Torloni MR, Seuc A, et al. Maternal and perinatal outcomes of twin pregnancy in 23 low- and middle-income countries. *PLoS One* 2013;8:e70549.