CHAPTER 1

Routine Prenatal Care

Megan Schneiderman and Amira El-Messidi

A 27-year-old primigravida at 11^{+1} weeks' gestation by menstrual dating presents for her first visit for routine prenatal care, accompanied by her husband. While discussing the comprehensive medical history with you before you meet the couple, your obstetric trainee mentions that the patient is allergic to penicillin.

LEARNING OBJECTIVES

1. Take a comprehensive prenatal history, demonstrating the ability to appropriately assign a gestational age based on clinical and sonographic parameters
2. Appreciate defining features for a severe penicillin allergy and provide safe alternative intrapartum pharmacologic treatment where clinically indicated
3. Address common aspects of prenatal care for a low-risk patient, including, but not limited to, routine prenatal investigations and pharmacologic treatments, vaccinations, nutritional intake, chemical exposure, umbilical cord blood banking, and potential for air travel during pregnancy
4. Appreciate the importance of maintaining a low threshold for multidisciplinary collaboration where unexpected events occur among low-risk singleton pregnancies
5. Recognize important elements of the routine postpartum visit

SUGGESTED READINGS

Antenatal Care

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Chemical Exposure during Pregnancy

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https://doi.org/10.1017/9781108975780.003 Published online by Cambridge University Press

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Immunizations

6. ACOG Committee Opinion No. 718: Update on immunization and pregnancy: tetanus, diphtheria, and pertussis vaccination. *Obstet Gynecol.* 2017;130(3):e153–e157.
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Iron-Deficiency Anemia and Rh Immunoglobulin

9. ACOG Committee on Practice Bulletins – Obstetrics. Anemia in pregnancy: ACOG Practice Bulletin, No. 233. *Obstet Gynecol.* 2021;138(2):e55–e64.
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Physical Activity

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Travel during Pregnancy

16. ACOG Committee Opinion No. 746: Air travel during pregnancy. *Obstet Gynecol.* 2018;132(2):e64–e66.
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https://doi.org/10.1017/9781108975780.003 Published online by Cambridge University Press

Universal Cervical Length Screening in Low-Risk Singleton Pregnancies

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POINTS

1. Elaborate on defining features for high risk of anaphylaxis or a severe reaction to penicillin, appreciating that *one* feature is satisfactory. *(1 point each)*

Max 5

High risk for IgE-mediated reactions:

- ☐ Pruritic rash
- ☐ Urticaria (hives)
- ☐ Immediate flushing
- ☐ Hypotension
- ☐ Angioedema
- ☐ Respiratory distress (*e.g.*, wheezing, stridor, dyspnea, throat/chest tightness, repetitive dry cough)

High risk for severe non-IgE-mediated reactions:

- ☐ Eosinophilia and drug-induced hypersensitivity syndrome
- ☐ Stevens–Johnson syndrome
- ☐ Toxic epidermal necrolysis

Other:

- ☐ Positive penicillin allergy test
- ☐ Reaction to multiple beta-lactam antibiotics
- ☐ Recurrent reactions

Special note:

Refer to Prevention of Group B Streptococcal Early-Onset Disease in Newborns: ACOG Committee Opinion No. 797. *Obstet Gynecol*. 2020;135(2):e51–e72. [Correction in *Obstet Gynecol*. 2020 Apr;135(4):978–979]

https://doi.org/10.1017/9781108975780.003 Published online by Cambridge University Press

2. In the absence of drug or environmental allergies, outline aspects of the comprehensive patient history elicited by your obstetric trainee at this patient's first prenatal visit. *(1 point each)*

Max 30

Current/recent pregnancy-related features and management, *if any*:

- ☐ Nausea and/or vomiting (*i.e.*, duration, frequency, quantity); effect of symptoms on daily living
- ☐ Vaginal bleeding
- ☐ Pelvic cramping, especially that prevents or awakens from sleep
- ☐ Determine whether a dating sonography or other investigations were performed

Gynecologic history:

- ☐ First day of the last menstrual period
- ☐ Cycle regularity
- ☐ Recent contraceptive use and whether pregnancy was planned
- ☐ Determine if and when prenatal vitamins have been initiated
- ☐ History of sexually transmitted infections (STIs); specifically, inquire about history of genital herpes simplex virus (in the patient or her partner)
- ☐ Duration since last cervical cytology test (*i.e.*, Papanicolaou test) and history of abnormal results
- ☐ Inquire about spontaneous or therapeutic undisclosed early pregnancy losses *in confidence with the patient* (individualized timing and setting)

Medical and surgical history:

- ☐ Determine if the patient accepts transfusion of blood products (*e.g.*, enquire whether patient is a Jehovah's Witness) and prior receipt of blood transfusions
- ☐ Chronic active or dormant medical or psychological conditions, including treatments
- ☐ Prior surgeries (*e.g.*, cerebral, cardiothoracic, abdominal-pelvic)

Social history and routine health maintenance:

- ☐ Ethnicity of the patient and partner
- ☐ Occupation (*e.g.*, exposure to daycare children, toxic chemicals, radiation, prolonged standing, physical activity, or risk of injury) and socioeconomic status (including food and housing security and potential barriers to accessing medical care)
- ☐ Dietary restrictions (*i.e.*, assess adequacy of calcium and iron intake)
- ☐ Vaccination status, namely, to COVID-19, hepatitis B, and annual *H. influenza*, and history of varicella disease or prior vaccination
- ☐ Exercise patterns (*i.e.*, type, frequency, and duration per week)
- ☐ Cigarette smoking, including quantity (*i.e.*, type [cigarette, cigar, water pipe/hookah, vape], quantity, and duration of use)
- ☐ Alcohol consumption (*i.e.*, type, quantity, and duration of use)
- ☐ Illicit drug use (*i.e.*, source, type, quantity, and duration of use)

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- ☐ Nonmedical use of medications
- ☐ Recent travel, or intended trips, to areas endemic for infectious diseases (*e.g.*, Zika virus, tuberculosis, malaria, Lyme disease)
- ☐ Past, present, and future risk of abuse (*e.g.*, intimate partner violence or other forms of physical, sexual, psychological, or emotional trauma)
- ☐ Pets at home, specifically cats *(refer to Chapter 66, 'Toxoplasmosis in Pregnancy')*

Family history:

- ☐ *e.g.*, Cardiovascular, autoimmune, or pregnancy-associated complications
- ☐ Congenital anomalies or aneuploidies
- ☐ *e.g.*, Mental or developmental delays, autism spectrum disorders

Male partner:

- ☐ Consanguinity
- ☐ Personal history of neural tube defect (NTD)
- ☐ History of STIs, specifically genital herpes simplex virus (HSV)
- ☐ Smoking (with regard to the gravida's exposure to second-hand smoke)

You learn that the patient continues to practice as an attorney, as she has not experienced any obstetric complications to date. Sonographic pregnancy dating has not been performed, although the patient is confident of her menstrual dates. Medical and surgical histories are unremarkable; she confirms having remotely had varicella infection. She practices noncontact aerobic as well as strength-conditioning exercise as 30-minute sessions four times weekly and consumes a Mediterranean diet, as consistent with her ethnicity. Neither of the couple smokes cigarettes or uses illicit substances; they do not have pets. As the couple planned conception two months prior to pregnancy, she discontinued her two-year use of combined oral contraception, initiated folic acid-containing prenatal vitamins, received the COVID-19 and flu vaccines, and has abstained from twice-weekly glasses of wine with dinner. Although she has never received blood products, the patient is not against receipt for medical indications. In confidence, the patient ascertained to your obstetric trainee that there are no undisclosed pregnancies; neither she nor her husband has had STIs. A routine cervical smear performed eight months ago was normal, as per her usual. Family history is noncontributory.

She elaborates that her penicillin allergy entails onset of hives and a generalized pruritic rash shortly after exposure; the patient does not have any other drug or environmental allergies.

Having met the couple and reviewed the clinical history, you confirm that she is normotensive and that her prepregnancy body mass index is 23.5 kg/m^2, and remaining maternal findings on physical examination are unremarkable. You inform the patient that in addition to routine prenatal investigations discussed earlier by your obstetric trainee, you advise an obstetric ultrasound scan at this time.

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3. Indicate advantages of first-trimester sonography for consideration in counseling this patient. *(1 point each)*

10

- ☐ Determine pregnancy location
- ☐ Confirm viability
- ☐ Improved accuracy for determining gestational age compared to menstrual dating among spontaneously conceived pregnancies, regardless of menstrual cycle regularity
- ☐ Ascertain fetal number, and ascertain chorionicity and amnionicity in the case of multiples
- ☐ Highlight that her recent discontinuation of oral contraceptives may contribute to inaccurate menstrual dating
- ☐ Inform the patient that bleeding in early pregnancy may have been misperceived as menses
- ☐ Allow early detection of embryo-fetal malformations
- ☐ Contribute to fetal aneuploidy risk assessment, improving performance of prenatal screening
- ☐ Contribute to preeclampsia risk assessment
- ☐ Decreased maternal anxiety about pregnancy†

Special note:

† *Refer to* Crowther CA, Kornman L, O'Callaghan S, et al. Is an Ultrasound Assessment of Gestational Age at the First Antenatal Visit of Value? A Randomised Clinical Trial. *Br J Obstet Gynaecol.* 1999;106(12):1273–1279.

The patient appreciates your counseling and understands that ultrasound is a nonionizing form of radiant energy where the risk of bioeffects is minimal when performed in accordance with sonographic principles. As such, ultrasound performed during this clinical visit by your colleague with sonographic expertise reveals a viable intrauterine singleton at 12^{+2} weeks' gestation with normal early morphology and no markers of aneuploidy. To optimize aneuploidy risk assessment, the patient agrees to complement first-trimester sonographic findings with noninvasive tests available in your jurisdiction.†

Special note:

† Refer to Chapter 5.

4. Among the reported fetal crown–rump length (CRL) and mean diameters of gestational sac and yolk sac, inform your obstetric trainee how the sonographic estimated due date was established.

2

- ☐ Direct measurement of the CRL is the most accurate indicator of dating spontaneous conceptions when the embryo is clearly seen, where the narrowest confidence interval appears to be between 7 and 60 mm for CRL *(SOGC[3])*.

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5. Based on clinical and sonographic estimated due dates, rationalize your chosen assigned gestational age for this patient. *(1 point each)*

Max 2

Superiority of ultrasound redating:

- ☐ There is a greater than seven-day discrepancy between clinical and ultrasound dating at gestational age between 9^{+0} and 13^{+6} weeks *(ACOG[4])*;† accepted practice also favors selecting first-trimester CRL dating, when appropriate, irrespective of discrepancy from clinical dating *(SOGC[3,5])*.
- ☐ Improved performance of prenatal screening programs (*i.e.*, increase the sensitivity for Down syndrome and/or decrease false-positive rates).
- ☐ Reduced rates of postdate pregnancy, related labor inductions, or iatrogenic prematurity.

Special note:

† At $\leq 8^{+6}$ weeks' gestation, the CRL-based dating is accurate within five days of the birthdate.

You explain that guidance for an optimal frequency of prenatal visits is limited: among nulliparous women with uncomplicated pregnancies, this may involve 10 visits per pregnancy *(NICE[1])*,† or scheduled to accommodate a minimum of 8 visits, which would entail 1 visit in the first trimester, 2 in the second trimester, and 5 thereafter, regardless of parity *(WHO)*,§ or prenatal visits arranged at monthly intervals until ~28 weeks' gestation, followed by bimonthly visits until 36 weeks and weekly visits thereafter until delivery.†‡

Special notes:

† Parous women with uncomplicated pregnancies may have less frequent prenatal visits.

‡ For postdate pregnancies, increased fetal surveillance is recommended according to local protocols.

§ WHO Recommendations on Antenatal Care for a Positive Pregnancy Experience. November 2016. Available at www.who.int/publications/i/item/9789241549912, accessed October 12, 2021.

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6. Outline your recommended routine prenatal investigations for *this* patient and provide her with an overview of subsequent routine investigations until the estimated due date. *(1 point each)*

Max 15

Initial prenatal visit:§

- ☐ Full/complete blood count (FBC/CBC)
- ☐ Ferritin
- ☐ Blood type and antibody screen
- ☐ Hepatitis B surface antigen (HBsAg) and antibody (HBsAb)
- ☐ Hepatitis C antibody
- ☐ Human immunodeficiency virus (HIV) conventional third-generation enzyme-linked immunoassay (ELISA) or fourth-generation antigen/antibody assay *(using the 'opt-out' approach)*
- ☐ Rubella IgG antibodies
- ☐ Syphilis nontreponemal or treponemal test†
- ☐ Hemoglobin protein electrophoresis (HPEP) [*i.e., Mediterranean ethnicity*]
- ☐ Fetal aneuploidy screening by either the first component of integrated prenatal screening (IPS) test or cell-free DNA (cfDNA) [*the second component of the IPS test is performed in the second trimester, if indicated*]
- ☐ Urinalysis and culture
- ☐ Urine chlamydia nucleic acid amplification test (NAAT); a vaginal or endocervical swab demonstrates similar sensitivity to urine testing

Second trimester:

- ☐ Sonographic fetal morphology survey at 18–22 weeks' gestation
- ☐ Screening for gestational diabetes at 24–28 weeks' gestation
- ☐ Repeat a CBC between 24^{+0} and 28^{+6} weeks' gestation to screen for anemia

Third trimester:

- ☐ Vaginal-rectal group B *Streptococcus* swab (GBS) at 36–37 weeks' gestation, unless known positive GBS bacteriuria at any time during pregnancy or a positive vaginal-rectal swab resulted during investigations for preterm labor# [*screening all women for GBS colonization is not routinely offered in the United Kingdom; refer to the clinical description after Question 19*]‡

Special notes:

† Refer to Chapter 65, 'Syphilis in Pregnancy'

§ Given self-reported history of infection, varicella serology is unnecessary for this patient; *refer to* Question 2 in Chapter 67, 'Varicella in Pregnancy.' There are no specified high-risk features in this case scenario to suggest routine toxoplasmosis, cytomegalovirus (CMV), or parvovirus serologies, although international practice variations exist.

A positive vaginal-rectal GBS swab may also be repeated if more than five weeks have elapsed since the at-risk episode for preterm labor; *refer to* Question 1 in Chapter 15, 'Labor at Term.'

‡ *Refer to* **(a)** UK National Screening Committee. UK NSC Group B Streptococcus (GBS) Recommendation. London: UK NSC; 2017; **(b)** Hughes RG, Brocklehurst P, Steer PJ, et al. Prevention of early-onset neonatal group B streptococcal disease. Green-Top Guideline No. 36. *BJOG.* 2017;124:e280–e305.

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You inform her that she will complete a short, validated screening tool for depression and anxiety at least once during the antenatal and/or postpartum period, which she is pleased to complete today. You explain that the *routine* physical examination components of each prenatal visit will entail measurement of her blood pressure (BP), weight, and auscultation of the fetal heart rate, while fundal height assessments will commence at ~24 weeks' gestation.

7. Address a patient inquiry regarding routine antenatal pharmacologic treatments, apart from vitamin and mineral supplementation. *(1 point per main bullet)*

3

- ☐ Flu vaccine in any trimester if the patient is pregnant in the fall or winter
- ☐ Pertussis vaccine, ideally at 27–32 weeks' gestation; administration outside this gestational window, including while breastfeeding, is also possible
- ☐ Single-dose Rh immunoglobulin at 28–30 weeks' gestation or two-dose regimen given at around 28 and 34 weeks, respectively, if D-negative and nonsensitized; repeat antibody screen is necessary prior to drug administration†
  - ○ Where cell-free DNA (cfDNA) is available for fetal blood group genotyping, maternal prophylactic anti-D immunoglobulin may be obviated, particularly among male fetuses

Special note:

† Selection of single- or two-dose regimen may depend on cost and local practice.

8. Highlight the contraindicated vaccinations during pregnancy, which you intend to teach your obstetric trainee after this consultation. *(1 point each)*

Max 5

Live-attenuated bacterial vaccines	Live-attenuated viral vaccines	Inactivated viral vaccines
☐ Oral typhoid	☐ Measles, mumps, rubella (MMR)	☐ Human papilloma virus (HPV)
☐ Bacillus Calmette–Guérin	☐ Varicella	
	☐ Zoster	
	☐ Rotavirus	
	☐ Yellow fever†	
	☐ Japanese encephalitis	
	☐ Live-attenuated influenza	
	☐ Smallpox (vaccinia)	

Special note:

† Pregnancy is a *precaution* for receipt of the yellow fever vaccine by the Advisory Committee on Immunization Practices (ACIP) as risk of exposure to yellow fever virus may outweigh risks of vaccination; *refer to* www.cdc.gov/vaccines/pregnancy/hcp/guidelines.html, accessed August 26, 2022.

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Keen to maintain a healthy lifestyle, the patient inquires about optimal gestational weight gain and foods to avoid in pregnancy. You take the opportunity to offer her your local 'nutrition in pregnancy' resource manuals as well as consultation with a perinatal dietitian, if preferred.

9. With reference to the patient's BMI, inform her of the advised overall gestational weight gain, and summarize nutritional intake to be avoided during pregnancy. *(1 point each)* — 6

☐ Based on a BMI of 23.5 kg/m^2, the ideal gestational weight gain is 11.5–16 kg (25–35 lb)

Food and beverages to avoid in pregnancy: ***(max 5)***

☐ Alcohol
☐ Caffeine >250–300 mg/d
☐ Soy protein or isoflavone supplements
☐ Raw or undercooked fish, meat, eggs, poultry
☐ Cold deli meat
☐ Cold smoked salmon
☐ Fish with high levels of methylmercury (*e.g.*, fresh/frozen tuna, shark, swordfish, escolar, martin, orange roughly)
☐ Fish considered to have had high exposure to pollutants
☐ Unpasteurized dairy products
☐ Unpasteurized juices
☐ Unwashed fruits and vegetables

In response to a concern, you advise that she remain in well-ventilated areas or minimize use of scent-producing hair and nail chemicals. You explain that despite the lack of high-quality evidence, avoidance of ammonia- or formaldehyde-containing hair products and nail polishes containing toluene, formaldehyde, and dibutyl phthalate is prudent, as inhaled products may trigger asthma or allergic reactions during pregnancy or pose theoretical risks due to absorption through the scalp or nail bed.

You later receive results of prenatal genetic screening, showing low risks of trisomies 13, 18, and 21 and of sex chromosome aneuploidies. Her blood group is B-negative without atypical antibodies. First-trimester maternal investigations are only significant for the following:

Hemoglobin concentration	99 g/L (9.9 g/dL)
Mean corpuscular volume	78 fL
Hematocrit	30% (*i.e.*, <33%)
Ferritin	10 ng/ml (10 ug/L)†
HPEP	HbA, 96.5%
	HbA2, 2.5%
	HbF, 1%
	HbS, HbC, absent

Special note:
† Serum ferritin <30 ug/L confirms iron-deficiency anemia.

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10. What is the most specific diagnosis? 2

☐ Iron-deficiency anemia† with a normal hemoglobin pattern

Special note:

† Anemia is defined as hemoglobin concentration <110 g/L (11.0 g/dL) in the first and <105 g/L (10.5 g/dL) in the second trimester, respectively *(Suggested Readings 9 and 11)*; hemoglobin concentration <110 g/L (11.0 g/dL) or <105 g/L (10.5 g/dL) defines abnormal values in the third trimester (*Suggested Readings 9 and 11, respectively)*.

11. In preparation for patient counseling, teach your trainee the recommended initial management and identify perinatal risks that have been associated with iron-deficiency anemia. *(1 point each; max points specified per section)* 10

Initial management: ***(3)***

☐ Explain the diagnosis and advise a trial of oral iron supplementation
☐ Plan reassessment of hemoglobin to monitor response to oral therapy (*e.g.*, in two to three weeks [*Suggested Reading 11*] after commencing treatment)
☐ Inform the patient of associated perinatal complications with iron-deficiency anemia

Maternal risks: ***(max 6)***

☐ Fatigue
☐ Thyroid dysfunction or altered metabolism
☐ Preterm birth
☐ Preeclampsia
☐ Need for parenteral iron or blood transfusion
☐ Postpartum hemorrhage (PPH)†
☐ Peripartum hysterectomy‡
☐ Postpartum depression
☐ Mortality, in low- and middle-income countries

Fetal-infant risks: ***(max 1)***

☐ Low birthweight or small-for-gestational-age newborn
☐ Low Apgar score, <5 at one minute
☐ Perinatal and neonatal mortality
☐ Mental and psychomotor delays

Special notes:

† Possibly due to suboptimal uterine contractility with decreased availability of oxygen; consideration for active management of the third stage of labor for women with iron-deficiency anemia at time of delivery
‡ After adjustment for confounding factors, such as PPH

You communicate with the patient in advance of the subsequent prenatal visit; she appreciates your counseling and agrees to initiate oral supplemental iron while continuing routine prenatal vitamins. In response to her query, you inform her that neither extended release nor enteric coated

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formulations are recommended, as absorption of iron from these preparations is limited.[§] As she is concerned about not tolerating or responding to oral iron supplements, you reassure her of the availability of intravenous iron therapy.[#] Further to your discussion, she has confirmed that brands of prenatal vitamins she uses contain vitamin D 400[†]–600[‡] IU (10–15 mcg) per day, consistent with recommendations for pregnancy and lactation.

Special notes:

§ Refer to *Suggested Readings 9, 11* and Tapiero H, Gaté L, Tew KD. Iron: Deficiencies and Requirements. *Biomed Pharmacother*. 2001;55(6):324–332.

Intravenous iron therapy is also indicated for noncompliance to oral treatment or women presenting at >34 weeks' gestation with confirmed iron-deficiency anemia and hemoglobin concentration <100 g/L *(Suggested Reading 11)*.

† *Refer to* National Institute for Health and Care Excellence. Vitamin D: Supplement Use in Specific Population Groups. Public Health Guideline [PH56]. Last updated August 2017. Available at www.nice.org.uk/guidance/ph56, accessed October 14, 2021.

‡ *Refer to* **(a)** Institute of Medicine. Dietary Reference Intakes for Calcium and Vitamin D. Washington, DC: National Academy Press; 2010; **(b)** Health Canada website, available at www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/vitamins-minerals/vitamin-calcium-updated-dietary-reference-intakes-nutrition.html, accessed October 14, 2021.

12. Instruct the patient how to ingest oral iron supplements. *(1 point each)* — 3

- ☐ Take iron supplements on an empty stomach, with water or a source of vitamin C to maximize absorption
- ☐ Avoid simultaneous ingestion of other medications, such as multivitamins and antacids
- ☐ Consideration for alternate-day dosing to optimize absorption relative to consecutive daily dosing[†]

Special note:

† *Refer to* Stoffel NU, Cercamondi CI, Brittenham G, et al. Iron Absorption from Oral Iron Supplements Given on Consecutive versus Alternate Days and as Single Morning Doses versus Twice-Daily Split Dosing in Iron-Depleted Women: Two Open-Label, Randomised Controlled Trials. *Lancet Haematol*. 2017;4(11):e524–e533.

13. Facilitate your trainee's learning of contraindications for intravenous iron therapy, as requested after your telecommunication with the patient. *(1 point each)* — Max 3

- ☐ First trimester of pregnancy
- ☐ Active acute or chronic bacteremia
- ☐ Decompensated liver disease
- ☐ Anaphylactic reactions

The patient tolerates oral ferrous iron well, and serial laboratory assessments demonstrate a positive response to supplementation. Second-trimester ultrasound shows appropriate fetal biometry and amniotic fluid volume and normal fetal–placental morphology; assessment of maternal cervical length was feasible and is normal.[†]

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Glucose screening test and anti-D immunoglobulin are planned simultaneously at 28 weeks' gestation. Routine repeat antibody screen at 28 weeks remains negative.

Special note:

† Practice variations exist with regard to routine cervical length screening at second-trimester morphology ultrasound; as examples:

1. AIUM[22] recommends transvaginal or transperineal sonographic imaging if the cervix appears shortened or funneled or is not adequately visualized during transabdominal ultrasound examination.
2. SOGC[23] does not fully recommend stand-alone universal cervical length screening across Canada at this time.
3. ACOG[24] recommends assessment of the maternal cervix when clinically appropriate and when technically feasible.
4. FIGO[25] recommends transvaginal sonographic cervical length in all women at 19^{+0}–23^{+6} weeks' gestation.
5. Although SMFM[26] does not mandate universal cervical length screening in singleton gestations without history of preterm birth, it may be reasonable for individual practitioners' consideration.
6. NICE, RCOG, and ISUOG do not address routine cervical length screening at the second-trimester morphology ultrasound.

14. Based on your proposed treatment, outline aspects to discuss in the informed consent process for routine administration of anti-D immunoglobulin in this D-negative, nonsensitized patient. *(1 point each)*

Max 4

Benefit/efficacy:

☐ The risk of RhD alloimmunization after two deliveries of D-positive ABO-compatible infants would decrease from ~16% to 0.17%–0.28% through routine third-trimester prophylaxis

Risks:

☐ Provide reassurance that only negative plasma for antibodies to hepatitis B and C viruses, human immunodeficiency viruses (HIV), and parvovirus B19 is used to make anti-D immunoglobulin; viral inactivation steps (viral clearance ultrafiltration) further reduce risks of infection

☐ Allergic reactions are very rare; the risk of severe hypersensitivity and anaphylaxis is increased if the patient has IgA antibodies due to trace amounts of IgA in the drug preparation

☐ *Theoretical* risk of transmitting variant Creutzfeldt–Jakob disease

Alternatives:

☐ The only alternative is not to administer prophylactic anti-D immunoglobulin

The glucose screening test is negative, and the patient tolerated anti-D immunoglobulin† well. She has also received routine pertussis vaccination, as recommended in each pregnancy. All aspects of routine prenatal care are unremarkable.

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At 28^{+6} weeks' gestation, the patient calls your office requesting a timely visit, as she needs to travel for an urgent family matter to a destination five hours away by air for one week. Accommodating the patient, you ensure absence of medical contraindications to air travel and document normal maternal-fetal assessment. As she may be exposed to a forested area, you inform her on ways to prevent insect bites.‡ She will obtain travel insurance. You will provide a copy of her medical records and a letter confirming the due date and fitness to travel.

Special notes:
† Dosing varies by international jurisdiction and brand name.
‡ Refer to Question 23 in Chapter 68.

15. Prior to her travels, review with the patient clinical features requiring immediate medical care; she recalls this discussion earlier in pregnancy as well. *(1 point each)* — 7

- ☐ Pelvic or abdominal pain
- ☐ Vaginal bleeding
- ☐ Potential rupture of chorioamniotic membranes
- ☐ Uterine contractions or other features of preterm labor
- ☐ Signs or symptoms of preeclampsia (*e.g.*, headache unrelieved by acetaminophen or paracetamol, nausea and/or vomiting, visual changes, epigastric or right upper quadrant pain)
- ☐ Severe vomiting, diarrhea, or signs of dehydration
- ☐ Signs or symptoms of possible deep vein thrombosis (DVT) or pulmonary embolism (PE) (*e.g.*, unusual swelling of leg with pain in calf or thigh, unusual shortness of breath)

Special note:
Refer to Centers for Disease Control and Prevention. Yellow Book; Chapter 7. Available at wwwnc.cdc.gov/travel/yellowbook/2020/family-travel/pregnant-travelers, accessed October 15, 2021.

16. Address an inquiry about maternal-fetal risks of radiation exposure from airport body scanners and cosmic radiation with air travel. *(1 point each)* — 2

Body scanners:
- ☐ Reassure the patient that the total radiation dose from airport body scanners (*e.g.*, two to three scans) is less than that from two minutes flying at cruising altitude or from one hour at ground level; negligible radiation doses are absorbed into the body, therefore fetal dose is much lower than maternal dose

Cosmic radiation:
- ☐ Based on the recommended maximum of 1 millisievert (mSv) radiation exposure over the course of a 40-week pregnancy,† fetal risks from cosmic radiation are negligible; the longest available intercontinental flights would expose passengers to no more than 15% of this limit for *occasional* flyers *(restrictions are entailed for aircrew or frequent flyers who may exceed these limits)*

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Special note:

† *Refer to* **(a)** ACOG[16] and **(b)** Barish RJ. In-Flight Radiation Exposure during Pregnancy. *Obstet Gynecol.* 2004;103(6):1326–1330.

17. Provide the patient with practical considerations and advice in preparation for and during air travel, particularly a medium- to long-haul flight of more than four hours' duration. *(1 point each)*

Max 8

Pretravel:

☐ Avoid gas-producing foods and beverages before the flight due to expansion of entrapped gases at altitudes
☐ Consider having prophylactic antiemetic medication for travel-associated maternal discomfort
☐ Avoid restrictive clothing
☐ Wear properly fitted graduated elastic compression stockings (DVT prevention)

General in-flight safety:

☐ Encourage wearing the seatbelt continuously while seated, belted below the abdomen and onto the thighs

In-flight measures for DVT prevention:†

☐ Have an aisle seat to facilitate ease of movement
☐ Walk regularly in the cabin
☐ Perform in-seat exercises approximately every 30 minutes
☐ Maintain adequate hydration, and avoid caffeinated drinks due to risk of dehydration

Special note:

† For patients at increased risk of thrombosis, pharmacologic prophylaxis with low molecular weight heparin (LMWH) should be considered; low-dose aspirin alone is not recommended for thromboprophylaxis associated with air travel.

During a weeknight† hospital call duty, your patient calls the obstetric emergency assessment unit as she panicked after her husband just removed a tick with tweezers from the back of her knee. She was in a forested area yesterday morning,† and although she used insect repellants, she forgot to wear long pants or shower within two hours of being outside, as you had advised. The couple kept the insect for laboratory analysis. Having seen the insect by a photograph she sent you, there is a high suspicion for a blacklegged tick bite. The patient has no systemic or obstetric complaints; fetal activity is normal. You consult with a maternal-fetal medicine/infectious disease expert(s) to assist in counseling and management of your patient.

Special note:

† Clinical scenario implies at least 24 hours have passed since attachment of the blacklegged tick.

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18. In collaboration with the maternal-fetal medicine/infectious disease expert, indicate aspects to discuss with the patient after removal of the tick attached for over 24 hours. *(1 point per main and subbullet)*

10

- ☐ Reassure the patient that the risk of vertical transmission appears to be very low; transplacental transmission is *theoretical*, without a defined congenital syndrome
- ☐ Pregnancy does not affect the manifestations or severity of Lyme disease, if it develops
- ☐ Encourage preserving the tick as the laboratory can determine the length of time it was embedded based on its engorgement
- ☐ Offer single-dose prophylactic **doxycycline 200 mg** to be taken within 72 hours of tick removal to decrease the risk of developing Lyme disease by 10-fold (*i.e.*, 2.2%–0.2%), based on reassuring drug-related literature and clinical experience:[§]
  - ○ No doxycycline-associated teratogenicity in pregnancy
  - ○ No permanent tooth staining from in utero exposure or use by children under eight years old
  - ○ No hepatotoxicity
  - ○ No permanent inhibitory effects on bone growth
- ☐ Advise the patient to report signs and/or symptoms of Lyme disease that may manifest within the next 30 days (*e.g.,* single, localized, painless, nonpruritic skin lesion that slowly increases in size from >5 to ~60 cm [erythema migrans], fever, arthralgia, myalgia, headache), regardless of doxycycline prophylaxis
- ☐ Breastfeeding will not be contraindicated, even if she does develop Lyme disease

Special note:

Refer to **(a)** National Institute for Health and Care Excellence (NICE). Lyme disease (NG95). London, United Kingdom: NICE; 2018 Available at www.nice.org.uk/guidance/ng95, accessed October 15, 2021.

(b) Smith GN, Moore KM, Hatchette TF, et al. Committee Opinion Number 399: Management of Tick Bites and Lyme Disease During Pregnancy. *J Obstet Gynaecol Can.* 2020;42(5):644–653.

§ *Refer to* Cross R, Ling C, Day NP, McGready R, Paris DH. Revisiting doxycycline in pregnancy and early childhood–time to rebuild its reputation? *Expert Opin Drug Saf.* 2016;15(3):367–382.

The patient returns from her trip and remains asymptomatic after the tick bite, as the insect was confirmed in the local infectious disease laboratory. She was reassured by your evidence-based counseling on doxycycline prophylaxis.

At a 32-week routine prenatal visit, you address patient inquiries on umbilical cord blood banking, after having provided her with patient-focused references earlier in gestation. She recalls that the chance for a future sibling to be a full human leukocyte antigen (HLA) match is 25%.

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19. Review with the patient the advantages and disadvantages of hematopoietic stem cell collection from umbilical cord blood. *(1 point each; max points specified per section)* 4

Advantages: ***(max 2)***

- ☐ Potential use in numerous conditions (*e.g.,* correction of inborn errors of metabolism, treatment of certain hematopoietic malignancies or genetic disorders of the hematologic and immune systems)
- ☐ Relative to bone marrow or peripheral stem cell collection, umbilical cord blood collection is easier, with negligible collection-related risks to the donor
- ☐ Relative to receipt of bone marrow or peripheral stem cells, umbilical cord blood hematopoietic stem cells have a low risk of acute graft-vs-host reaction
- ☐ The recipient of hematopoietic stem cells from umbilical cord blood should tolerate greater mismatch or disparity in human leukocyte antigen (HLA) relative to receipt of bone marrow or peripheral stem cells

Disadvantages: ***(max 2)***

- ☐ Limited amounts of hematopoietic stem cells are available in umbilical cord blood units
- ☐ Slow engraftment rates
- ☐ Potential genetic transfer of abnormal or premalignant cells to the recipient

(Continuation of scenario for countries where universal bacteriological screening for GBS is practiced):

At the 36-week visit, you collect the vaginal-rectal GBS swab, recalling that if positive, routine first-line intrapartum penicillin therapy would have to be substituted by a safe alternative.

(Continuation of scenario for countries where risk factor-based screening for early-onset GBS disease is practiced):

You learn that an international visiting obstetric trainee incidentally performs vaginal-rectal GBS screening, unknowing of risk factor-based screening in your local jurisdiction; the swab has already been sent to the laboratory. You take this opportunity to inform your trainee of numerous reasons for risk factor-based screening, among which are that offspring of many women who carry the bacteria do not develop an infection and universal screening in late pregnancy cannot accurately predict which neonates will develop GBS infection; in addition, between 17% and 25% of women who have a positive swab will be GBS-negative at delivery, while 5%–7% of women who are GBS-negative in late pregnancy will be GBS-positive at delivery.‡

‡ *Refer to* UK National Screening Committee. UK NSC Group B Streptococcus (GBS) Recommendation. London: UK NSC; 2017 and Hughes RG, Brocklehurst P, Steer PJ, Heath P, Stenson BM on behalf of the Royal College of Obstetricians and Gynaecologists. Prevention of early-onset neonatal group B streptococcal disease. Green-Top Guideline No. 36. *BJOG* 2017;124:e280–e305

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20. Review with your trainee the particularities related to completion of *this* patient's laboratory requisition for vaginal-rectal GBS swab. ☐ Highlight the importance of documenting the high-risk penicillin allergy on the laboratory requisition to ensure that GBS isolates are tested for clindamycin sensitivity	2
21. Where the GBS bacteria are resistant to clindamycin, state the intrapartum prophylactic regimen. ☐ Intravenous vancomycin 20 mg/kg every eight hours, with a maximum of 2 g per single dose and minimum infusion time of one hour	4

The patient presents in spontaneous labor at 38^{+4} weeks' gestation with rupture of chorioamniotic membranes; intravenous clindamycin is commenced, based on susceptibility of GBS isolates.

22. State the regimen for prophylactic intrapartum clindamycin ☐ Intravenous clindamycin 900 mg every eight hours until delivery	4

A healthy neonate delivers spontaneously after an uncomplicated labor and delivery. The patient receives guidance with breastfeeding and is discharged from hospital with planned postpartum follow-up with you in approximately six weeks, as routine.

23. Identify important elements of maternal care to discuss at the routine postpartum visit for this healthy patient after a generally uncomplicated pregnancy and spontaneous vaginal delivery. *(1 point each)* ☐ Breastfeeding status ☐ Continued use of prenatal vitamins, preferably at least until end of breastfeeding ☐ Resumption of exercise and a healthy diet for healthy living and to facilitate gestational weight loss ☐ Screen for postpartum depression using a validated questionnaire ☐ Availability of social support systems (*e.g.,* family, community resources) ☐ Quantity and quality of lochia, or possible resumption of menses ☐ Symptoms of urinary incontinence or anal incontinence to flatus or stool ☐ Sexual function and resumption of sexual activity ☐ Contraception and subsequent resumption of fertility and ovulation **Special note:** As this patient had a normal cervical smear within the past two years, repeat testing is not presently required.	Max 7

You learn from comprehensive discussion that the postpartum period has been well; she continues to exclusively breastfeed, resumed exercise and sexual function, and scored 3/30 on the Edinburgh

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Postnatal Depression Scale (EPDS).† She has not yet resumed menses. The patient is interested in learning of her options for postpartum contraception.

Special note:
† Refer to Question 1 in Chapter 29.

24. Summarize the available options for postpartum contraception§ for this healthy patient who continues to breastfeed. *(1 point each)* — 4

- ☐ Systemic progestin-only contraceptives, namely progestin-only pill, intramuscular Depo-Provera, or progestin implants can be safely used without restrictions (Category 1), reassuring the patient of no impact on quantity or quality of breast milk
- ☐ Intrauterine contraceptives, namely copper intrauterine device (IUD) or levonorgesterel intrauterine system (LNG-IUS) can be safely used without restrictions as of four weeks postpartum (Category 1)
  - ○ *Beware of the higher risk of perforation within the first year postpartum among breastfeeding women*
- ☐ Systemic combined hormonal contraceptives, namely pill, patch, or vaginal ring can be used when the patient is primarily breastfeeding and is at least six weeks to six months postpartum as the advantages outweigh theoretical or proven risks (Category 2)†; reassuringly, estrogen-containing agents should not have an impact once breastfeeding is well established *(combined hormonal contraceptives are safe while breastfeeding once the patient is greater than or equal to six weeks postpartum)*
- ☐ Barrier methods can be used without restriction (Category 1)

Special notes:
§ *Refer to* UK and US Medical Eligibility Criteria (MEC) for Contraceptive Use, 2016; UK-MEC revised September 2019, US-MEC amended 2020
† If not breastfeeding, the patient may use combined hormonal contraceptives as of ≥6 weeks postpartum without restriction (Category 1)

While exclusively breastfeeding, she inquires about its reliability as a contraceptive method until she decides upon a long-term reliable method.

25. Refer to the required criteria that must be met for lactational amenorrhea to be considered an effective contraceptive method. *(1 point each)* — 3

- ☐ The patient must be within six months of delivery

and

- ☐ Exclusively, or near-exclusively (*i.e.,* at least ¾ of feeds) breastfeeding

and

- ☐ Amenorrheic

TOTAL: **155**

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