Exam 1 Study Guide

This guide covers the first two chapters. You will learn how the family becomes the unit of care, what the RN keeps and what can be delegated, how the cycle sets ovulation and the due date, how to counsel on contraception, and how consent and confidentiality work. Then you will follow a new person from fertilization to the first breath: implantation, the embryonic window, the placenta, the three fetal shunts, the inheritance patterns and the prenatal tests. Work one chapter at a time. Read the "what to know" paragraphs, study the tables, then try each worked case with the steps covered. Finish each chapter with its ten self-test items. The cram sheet at the end puts the rules and numbers in one place.

WHAT THIS GUIDE COVERS

- Chapter 1 · the four pillars of family-centered care, atraumatic care and non-blaming language, consent and assent, delegation, the ovarian and endometrial cycles, Naegele's rule, menstrual disorders and PALM-COEIN, contraception by tier and its contraindications, emergency contraception, infertility, screening and preconception care, cultural humility, interpreters, the social determinants, disparities and bias, informed consent, capacity, refusal, confidentiality and mandatory reporting.
- Chapter 2 · meiosis and gametes, fertilization, cleavage and implantation, hCG, twinning and chorionicity, gestational versus fertilization age, the embryonic and fetal periods, teratogens and TORCH, folic acid dosing, the placenta and amniotic fluid, the cord, fetal circulation and its closure, cord prolapse, magnesium toxicity and early hemorrhage, inheritance patterns, chromosome changes, screening versus diagnosis and newborn screening.

CHAPTER 1

Family-Centered Care, Reproductive Health, Equity and Accountability

Read it in full: **Chapter 1 in the textbook**. Practice it in the lab: **The Assignment Board and the Words You Chart** and **The Cycle Dial, the Tract and the Due Date**.

What to know

In this specialty the patient often arrives attached to another patient, and the person who will give most of the care after discharge is in the room the whole time. So the **family is the unit of care**. Family-centered care rests on four pillars. **Dignity and respect**: build the plan around what this family values. **Information sharing**: complete, unfiltered, timely information in words the family can use; a bare lab value with no explanation informs no one. **Participation**: the family chooses how involved to be. **Collaboration**: families help shape the plan, discharge design and even unit policy.

At the bedside that means sitting down, using names, and asking the parent what they notice. A parent who says "he is not himself" has given you a clinical finding to document and act on. Family structure is whatever the family says it is. Record who the actual caregivers are and who holds legal decision-making authority, because they are not always the same person.

Atraumatic care lowers the physical and emotional distress caused by care itself. Cluster painful procedures, do them in a treatment room so the bed stays a safe place, use topical anesthetic for planned venipuncture, offer sucrose and non-nutritive sucking for newborn procedures, allow skin-to-skin holding during heel sticks, and offer real choices only about things that are truly optional. **Language is an intervention.** "Failure to progress" becomes the cervical change over a stated time with the contraction pattern. "Poor feeder" becomes what was seen at the breast. "Non-compliant" becomes the barrier, such as no transport.

A minor generally cannot give legal consent. A parent or guardian gives permission and the child gives **assent**, expected from about age 7. **Emancipated minors** (married, in the military, living independently, or declared by a court) consent for themselves. Every United States jurisdiction lets a minor consent to diagnosis and treatment of sexually transmitted infections; rules for contraception, pregnancy care and mental health vary by jurisdiction. In a true emergency, consent for life-saving care is implied.

The RN keeps **assessment, teaching, evaluation and any unstable patient**. That includes fundal and lochia assessment in the first 24 hours, reading fetal heart rate patterns, and titrating oxytocin or magnesium. The LPN or LVN may collect data and reinforce teaching the RN already gave.

Assistive personnel may take vital signs, intake and output and weights on a stable patient, and help with bathing, positioning and ambulation. Check the **five rights of delegation** every time: right task, right circumstance, right person, right direction and communication, right supervision and evaluation. The same vital sign set is safe to delegate at hour 20 on a stable postpartum patient and unsafe at hour 2 with a boggy fundus.

Pulsatile GnRH drives FSH and LH. FSH recruits follicles; the dominant follicle makes rising estradiol. Once estradiol stays high for about two days, feedback flips to positive and triggers the **LH surge**. Ovulation follows 24 to 36 hours after the surge begins. The corpus luteum then makes progesterone, which raises basal body temperature by about 0.3 to 0.6 °C and makes the lining secretory. The **luteal phase is fixed at 14 ± 2 days**; the follicular phase varies. So ovulation is 14 days before the next period. A 35-day cycle ovulates near day 21. If implantation occurs, hCG rescues the corpus luteum until the placenta takes over at about 8 to 10 weeks.

Sperm live up to 5 days in the female tract; the ovum can be fertilized for only 12 to 24 hours. The fertile window is the five days before ovulation plus ovulation day. Spermatogenesis takes about 64 to 74 days, which is why an abnormal semen analysis is repeated after about three months. **Naegele's rule**: first day of the LMP, minus 3 months, plus 7 days, plus 1 year. It assumes a 28-day cycle, so it runs early for a long cycle. A first-trimester crown-rump length (accurate to about ± 5 to 7 days) overrides it when the two disagree by more than that.

Normal cycle facts: menarche at 12 to 13 (normal 9 to 15), cycle 24 to 38 days, flow 8 days or less, loss 5 to 80 mL, menopause at about 51, confirmed after 12 months without menses. **Primary dysmenorrhea** is prostaglandin cramping with no pathology; NSAIDs work best started at the first sign of bleeding or 24 to 48 hours before. **Secondary dysmenorrhea** starts later and worsens: think endometriosis, adenomyosis, fibroids or pelvic inflammatory disease. Endometriosis gives dysmenorrhea, dyspareunia and infertility. PCOS uses the Rotterdam criteria (two of three) in adults, but within 8 years of menarche both irregular cycles and hyperandrogenism are required. Abnormal bleeding is sorted by **PALM-COEIN**; heavy bleeding from menarche suggests a coagulopathy such as von Willebrand disease.

Counsel contraception by **typical-use tier**. Tier 1 (under 1 in 100 per year): implant, IUDs, sterilization. Tier 2 (about 4 to 7 in 100): pill, patch, ring, progestin-only pill, depot injection. Tier

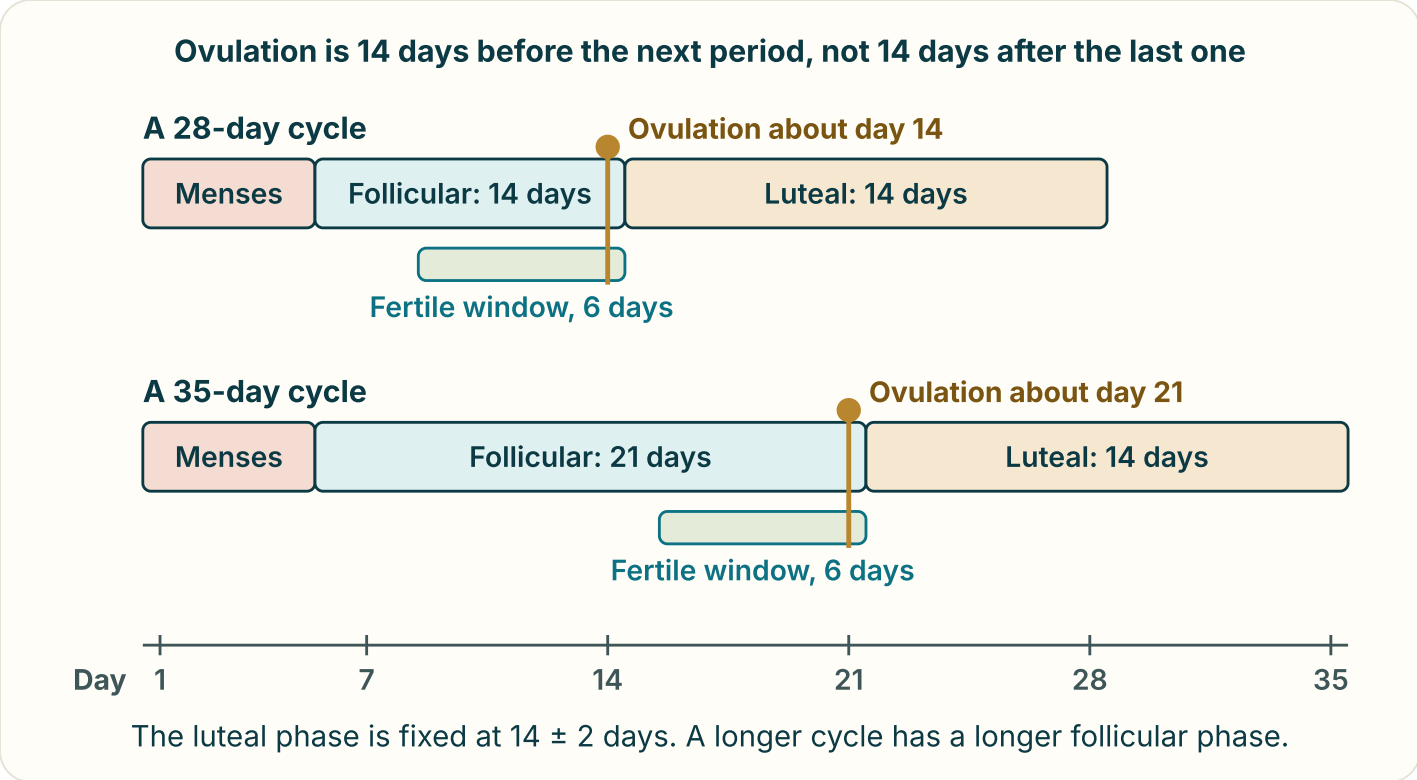
3 (about 11 to 23 in 100): condoms, withdrawal, fertility awareness. Combined (estrogen) methods are contraindicated with smoking at 35 or older (absolute at 15 or more cigarettes a day), migraine with aura, prior VTE or thrombophilia, systolic 160 or diastolic 100 or higher, the first 21 days postpartum, current breast cancer, active liver disease and several other conditions. Teach **ACHES**. For emergency contraception the IUDs rank first, then ulipristal (to 120 hours), then levonorgestrel (best within 72 hours). Oral emergency contraception never waits for a pregnancy test.

Infertility is 12 months without conception, or 6 months at 35 or older. Evaluate both partners; the first test is a **semen analysis**. Screen for chlamydia and gonorrhea yearly in sexually active women under 25, HIV at least once from 15 to 65, and HIV, syphilis, hepatitis B and C at the first prenatal visit. Cervical screening starts at 21. Preconception care: **folic acid 400 micrograms daily** starting at least a month before conception, or 4 mg after a prior neural tube defect; give live vaccines (rubella, varicella) at least 4 weeks before conception.

Cultural humility asks rather than assumes; competence implies you could finish learning a culture. Use a **trained interpreter** for the whole encounter, never a family member and never a child, and speak to the patient in the second person. Trauma-informed care assumes trauma may be present: explain before touching, ask each time, offer choices and stop when asked. The **social determinants of health** explain most of what gets charted as non-adherence. Never ask about a need you have no route to address. Black birthing people die of pregnancy-related causes at about three times the rate of white birthing people, and the gap does not close with income or education; it is produced by structural racism and unequal access, not by race. More than four in five pregnancy-related deaths are judged preventable, and most happen after the birth.

Consent is a conversation; the form is its receipt. Informed consent covers the problem, the proposal, risks and benefits, alternatives, and what happens with no treatment. **The clinician doing the procedure obtains consent.** A nurse who witnesses attests only to identity, voluntariness and apparent capacity. If the patient cannot say what is planned, stop and call the clinician back. **Capacity** means she can understand, appreciate, reason and communicate a consistent choice; it is decision-specific and is not lost by disagreeing. A pregnant patient with capacity may refuse; document her words and request ethics support, never coercion. Interview

adolescents alone for part of every visit. Nurses are **mandated reporters** of suspected child abuse on reasonable suspicion, and the duty is personal.



The luteal phase is the fixed part. Only the follicular phase changes length, so ovulation sits 14 days before the next period. A 35-day cycle ovulates near day 21, which is why Naegele's rule runs early for that patient.

LOCK THESE IN

- Four pillars: dignity and respect, information sharing, participation, collaboration.
- The RN keeps assessment, teaching, evaluation and the unstable patient. Delegation is checked against the five rights every time.
- Assent from about age 7; emancipated minors consent for themselves; emergencies imply consent.
- Ovulation is 14 days before the next period; the luteal phase is fixed at 14 ± 2 days.
- Naegele's rule: LMP minus 3 months plus 7 days plus 1 year. Early ultrasound wins when they disagree.
- No estrogen with smoking at 35 or older, migraine with aura, prior VTE, BP 160/100 or higher, or the first 21 days postpartum.
- Folic acid 400 micrograms before conception; 4 mg after a prior neural tube defect.
- The provider obtains consent; the nurse witnesses identity, voluntariness and apparent capacity. A patient with capacity may refuse.

Who may do what, and who decides

Item	Rule	Note
Assessment, teaching, evaluation	RN only	Includes the unstable patient and first 24 hours fundal checks
Titrating oxytocin or magnesium	RN only	Also reading fetal heart rate patterns
Vital signs, I and O, weights	UAP or LPN on a stable patient	Not on a patient whose status is changing
Reinforcing teaching	LPN/LVN	Only teaching the RN already gave; RN evaluates
Child below age of consent	Parent or guardian decides	Seek the child's assent from about age 7
Adolescent STI care	The adolescent	Allowed in every US jurisdiction; warn about billing statements
Pregnant adult refusing care	The patient	Document informed refusal; ethics, never coercion
Emergency, no decision maker	Consent implied	Document the emergency and the attempts made

Cycle, contraception and screening numbers

Item	Value	Why it matters
Cycle length	24 to 38 days	Outside this is abnormal uterine bleeding
Luteal phase	14 ± 2 days	Anchors ovulation timing and dating
Sperm and ovum life	Sperm up to 5 days; ovum 12 to 24 hours	Fertile window is 6 days
Tier 1 methods	Under 1 in 100 per year	Implant, IUDs, sterilization
Pill, patch, ring	About 7 in 100 per year	Screen estrogen contraindications
Emergency contraception	IUD within 5 days; ulipristal to 120 h; levonorgestrel best by 72 h	Never delay for a pregnancy test
Infertility	12 months, or 6 months at 35 or older	First test is a semen analysis
Folic acid	400 micrograms; 4 mg after a prior NTD	Start at least a month before conception

Worked cases

WORKED CASE 1 · DATE THE PREGNANCY AND SPOT THE LIMIT

A patient's last menstrual period began on 25 January 2026. Her cycles are a regular 35 days. Find the estimated date of birth by Naegele's rule and say how her cycle changes the estimate.

STEP 1 · SUBTRACT THREE MONTHS

25 January 2026 minus three months is 25 October 2025.

STEP 2 · ADD SEVEN DAYS

25 October plus 7 days is 1 November 2025. Watch the month change: October has 31 days.

STEP 3 · ADD ONE YEAR

1 November 2025 becomes **1 November 2026**.

STEP 4 · CHECK THE ASSUMPTION

The rule assumes a 28-day cycle with ovulation on day 14. Her luteal phase is still about 14 days, so she ovulates near day 35 minus 14, which is day 21.

STEP 5 · APPLY IT

She ovulated about 7 days later than the rule assumes, so the estimate is about a week early. A first-trimester crown-rump length overrides the date if the two disagree by more than about 5 to 7 days.

WORKED CASE 2 · HAND OUT THE TASKS SAFELY

You have one assistive person and four tasks: vital signs on a stable postpartum patient at hour 20, a fundal check at hour 2 on a patient whose uterus is boggy, teaching a first-time parent to bottle-feed, and walking a stable patient to the bathroom.

STEP 1 · FIND THE UNSTABLE PATIENT

The boggy fundus at hour 2 is a changing status that needs real-time interpretation. That stays with you.

STEP 2 · FIND THE TEACHING

Teaching a new parent is education, and the RN must also evaluate understanding. That stays with you.

STEP 3 · MATCH THE REST

Vital signs on a stable patient at hour 20 and ambulating a stable patient are routine tasks with predictable results. Delegate both.

STEP 4 · RUN THE FIVE RIGHTS

Right task, right circumstance, right person, clear direction (what to report and when), and supervision. You stay accountable for the outcome.

WORKED CASE 3 · THE WITNESS SIGNATURE THAT SHOULD NOT HAPPEN

You are asked to witness a consent for a cesarean. The patient had an opioid 20 minutes ago and says only, "They said something about the baby being the wrong way round."

STEP 1 · NAME WHAT YOUR SIGNATURE MEANS

It attests to identity, voluntariness and apparent capacity. It does not attest that she understood the procedure.

STEP 2 · TEST UNDERSTANDING

Ask her to explain in her own words what is planned, why, and the alternatives, including doing nothing. Her answer shows the disclosure is incomplete.

STEP 3 · WEIGH THE TIMING

Consent after an opioid is fragile. Unless this is a true emergency, it should be revisited.

STEP 4 · ACT

Do not have her sign. Call the clinician back to complete the disclosure, with a trained interpreter if needed, and document what you found and whom you called.

WORKED CASE 4 · SCREEN A CONTRACEPTION REQUEST

A 36-year-old who smokes a pack a day asks for the combined pill. She has migraines that start with flashing lights.

STEP 1 · CHECK AGE AND SMOKING

Age 35 or older with 15 or more cigarettes a day is an absolute contraindication to estrogen.

STEP 2 · CHECK THE HEADACHE

Migraine with aura is a contraindication at any age. Both risks are arterial: stroke and heart attack.

STEP 3 · OFFER WHAT FITS

Offer methods without estrogen that are as or more effective: the implant, a levonorgestrel or copper IUD, the depot injection or the progestin-only pill.

STEP 4 · ADD SUPPORT

Offer smoking cessation help as a separate, non-judging conversation.

TRAPS PEOPLE FALL INTO

- **Ovulation on day 14 for everyone.** Ovulation is 14 days before the next period. A 35-day cycle ovulates near day 21.
- **Using a family member to interpret.** Relatives edit and children are harmed by the task. Use a trained interpreter for the whole encounter.
- **Thinking the witness confirms understanding.** The clinician obtains consent. The nurse witnesses identity, voluntariness and apparent capacity, and stops the signing if the patient cannot explain the plan.
- **Calling a refusal a loss of capacity.** Capacity is not agreement. A patient with capacity, pregnant or not, may refuse.
- **Charting "non-compliant."** Chart the barrier, such as transport or food insecurity, so someone can act on it.
- **Explaining disparities by race itself.** Race is a social category. Structural racism and unequal access produce the gaps, which persist at every income level.

Chapter 1 self-test · ten items

1. A nurse tells a parent the child's sodium value and nothing more. Which pillar of family-centered care was missed?

A. Family participation
B. Collaboration with family
C. Information sharing
D. Dignity and respect

C. Information sharing Information sharing means complete, timely information in words the family can use. A bare number does not inform.

2. Which task may the RN delegate to assistive personnel?

A. Evaluating a parent's return demonstration
B. Vital signs on a stable patient at hour 20
C. First teaching about safe sleep
D. Fundal check on a boggy uterus at hour 2

B. Vital signs on a stable patient at hour 20 Routine vital signs on a stable patient are delegable. Assessment of an unstable patient, teaching and evaluation stay with the RN.

3. A patient has regular 32-day cycles. On about which day does she ovulate?

A. Day 18
B. Day 14
C. Day 16
D. Day 22

A. Day 18 The luteal phase is fixed at about 14 days, so ovulation is 32 minus 14, which is day 18.

4. The LMP began 2 March 2026. What is the estimated date of birth by Naegele's rule?

A. 9 June 2026
B. 23 December 2026
C. 2 December 2026
D. 9 December 2026

D. 9 December 2026 2 March minus 3 months is 2 December 2025; plus 7 days is 9 December; plus a year is 9 December 2026.

5. Which finding is an absolute reason to avoid a combined estrogen pill?

A. A prior cesarean birth two years ago
B. Age 25 and nonsmoking
C. Migraine with visual aura
D. Heavy, painful periods

C. Migraine with visual aura Migraine with aura raises the risk of ischemic stroke at any age, so estrogen methods are contraindicated.

6. A patient asks for the most effective emergency contraception on day 4 after unprotected sex. What ranks first?

A. A copper or levonorgestrel 52 mg IUD
B. Levonorgestrel 1.5 mg by mouth
C. Ulipristal acetate 30 mg by mouth
D. Waiting for a pregnancy test first

A. A copper or levonorgestrel 52 mg IUD The IUDs lead in effectiveness within 5 days, once pregnancy is reasonably excluded. Oral options are never delayed for a test.

7. A couple has tried to conceive for 12 months. What is the first test?

A. A laparoscopy
B. A semen analysis
C. Day 3 FSH and AMH
D. A hysterosalpingogram

B. A semen analysis The semen analysis is cheap, fast and noninvasive, and both partners are evaluated together.

8. A 14-year-old's mother offers to interpret for her. What should the nurse do?

A. Speak slowly in English and use gestures
B. Accept, since she knows the history
C. Use the patient's 12-year-old sister
D. Use a trained interpreter instead

D. Use a trained interpreter instead Family members edit and children are harmed by interpreting. A trained interpreter is used for the whole encounter.

9. A patient with capacity declines a recommended cesarean after full explanation. What is the correct response?

A. Document her informed refusal and keep offering care
B. Seek a court order so the surgery can proceed
C. Order a capacity assessment because she refused
D. Notify child protective services about the fetus

A. Document her informed refusal and keep offering care A pregnant patient with capacity may refuse. Coercion is not justified; ethics support is the escalation route.

10. A nurse suspects child abuse and tells the charge nurse. Is the reporting duty met?

A. No, a report is made only once there is proof
B. Yes, telling the charge nurse discharges the duty
C. Yes, if the charge nurse agrees the concern is real
D. No, the nurse who suspects it must see a report made

D. No, the nurse who suspects it must see a report made Mandated reporting is a personal duty on reasonable suspicion. Telling the charge nurse does not discharge it unless a report is made.

CHAPTER 2

Conception, Fetal Development and Genetics

Read it in full: **Chapter 2 in the textbook**. Practice it in the lab: **What, and Exactly When: The Teratogen Window Bench** and **One in Four, Every Time: Recurrence Risk and the Pedigree**.

What to know

Body cells carry 46 chromosomes in 23 pairs. Gametes must carry 23, so germ cells go through **meiosis**, two divisions that halve the number and shuffle the parental chromosomes. If a pair fails to separate (**nondisjunction**), the gamete carries 24 or 22 and the conceptus is trisomic or monosomic. Oocytes sit arrested in the first meiotic division for decades, which explains the rise in trisomy 21 with maternal age: about 1 in 1250 at 25, 1 in 350 at 35, 1 in 100 at 40 and 1 in 30 at 45. Frame it kindly: no one did anything wrong.

The secondary oocyte can be fertilized for about 12 to 24 hours; sperm survive up to 5 days. Fertilization almost always happens in the **ampulla**. Sperm undergo capacitation, the acrosome digests a path, and the zona reaction blocks a second sperm. Cleavage makes a 16-cell morula that enters the uterus on day 3 to 4. By day 5 it is a **blastocyst**: the inner cell mass becomes the embryo and the trophoblast becomes the placenta. It implants on **days 6 to 10**. The trophoblast makes hCG, which rescues the corpus luteum. hCG is detectable in serum about 8 to 11 days after conception, roughly doubles every 48 to 72 hours early on, and peaks at 8 to 10 weeks.

Dizygotic twins come from two ova and always have two chorions and two amnions. Monozygotic twins come from one zygote, and the **day of division decides the risk**: days 1 to 3 give two placentas and two sacs; days 4 to 8 give one placenta and two sacs (the most common, with risk of twin-to-twin transfusion); days 8 to 13 give one placenta and one sac (cord entanglement); after day 13, conjoined twins.

Gestational age counts from the first day of the LMP. Fertilization happens about two weeks later, so 10 weeks gestational age is 8 weeks after conception. Charts use gestational age; embryology texts often count from conception. A first-trimester crown-rump length is the most accurate dating, and every later decision rests on that date.

The **pre-embryonic period** (first two weeks) is all or none: the conceptus is lost or recovers fully. The **embryonic period**, weeks 3 to 8 after conception, is organogenesis and the window of greatest teratogen sensitivity. The neural tube closes by day 26 to 28 after conception (about 6 weeks gestational age), often before a first prenatal visit. The heart beats from about day 21 to 22; the palate fuses between days 42 and 55. The same drug at two different times gives two different results: ACE inhibitors harm the working fetal kidney in the second and third trimesters.

In the fetal period organs grow and mature. Fetal urine is the main source of amniotic fluid after about 16 weeks, so renal agenesis causes severe oligohydramnios. Quickening is felt at 16 to 18 weeks by someone who has been pregnant before and 18 to 20 weeks in a first pregnancy. Surfactant starts at about 24 weeks and is mature near 35 weeks (L/S ratio 2:1). Periviability begins around 22 to 25 weeks. Antenatal corticosteroids speed lung maturity.

A **teratogen** causes permanent structural or functional harm; the effect depends on agent, dose, timing and susceptibility. Alcohol has no safe amount, trimester or type. Isotretinoin, warfarin, valproate, lithium (Ebstein anomaly), tetracyclines and methotrexate are named teratogens; uncontrolled diabetes is too. The **TORCH** infections share microcephaly, calcifications, hearing loss, chorioretinitis and growth restriction. Cytomegalovirus is the most common congenital infection; teach hand hygiene after contact with toddler saliva and urine. Rubella vaccine is live: vaccinate postpartum and avoid pregnancy for 4 weeks.

The placenta weighs about 500 g at term. Exchange is by diffusion (oxygen, most drugs), facilitated diffusion (glucose), active transport (amino acids, calcium, iron) and pinocytosis (IgG). **Maternal IgG crosses; IgM does not**, so IgM in a newborn means fetal infection. Placental hormones: hCG keeps the corpus luteum, progesterone quiets the uterus, estrogen grows it, and **human placental lactogen** antagonizes insulin, the basis of gestational diabetes and of screening at 24 to 28 weeks. Amniotic fluid peaks at 800 to 1000 mL near 36 to 38 weeks. Normal AFI is 5 to 24 cm; normal deepest pocket is 2 to 8 cm.

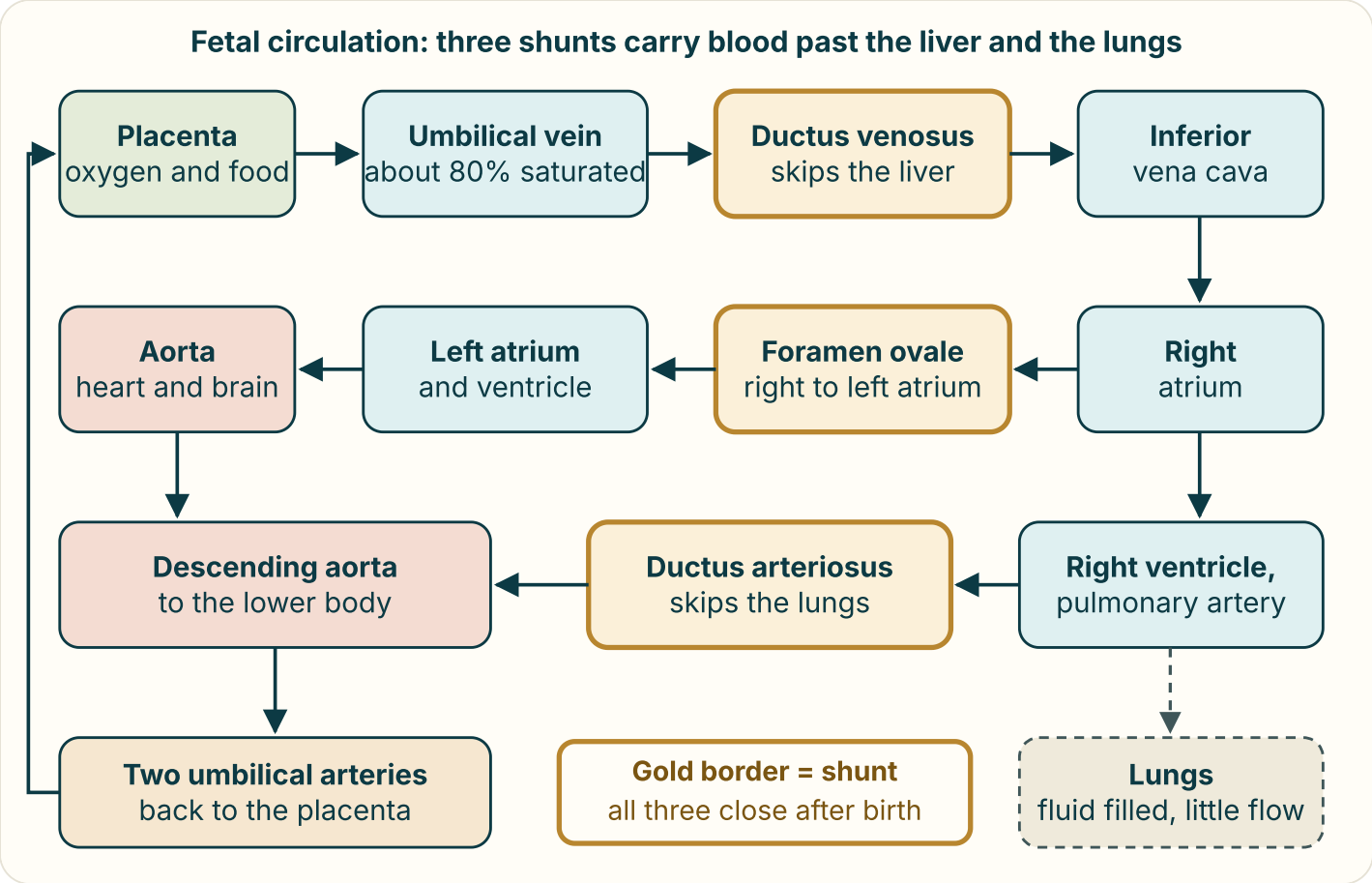
The cord has **two arteries and one vein**. The vein carries oxygenated blood to the fetus. A single umbilical artery (about 1 percent) calls for a careful newborn check and often a renal ultrasound. Three shunts route blood: the **ductus venosus** skips the liver, the **foramen ovale** and the **ductus arteriosus** skip the lungs. At the first breath lung resistance falls and cord clamping raises systemic resistance. The foramen ovale closes first, the ductus arteriosus closes functionally in 12 to 24 hours and almost always by 72 hours, and the ductus venosus closes over days.

Three emergencies teach that **the first action changes the outcome**. Cord prolapse: lift the presenting part off the cord with two gloved fingers and keep your hand there until birth; never push the cord back. Magnesium toxicity: reflexes disappear first, then breathing slows; if reflexes are absent or respirations fall below 12, stop the infusion first, then give calcium gluconate. Early postpartum hemorrhage (1000 mL or more, or any loss with signs of hypovolemia, within 24 hours): massage the fundus first, since atony causes 70 to 80 percent.

Autosomal dominant: 50 percent per pregnancy, every generation. Autosomal recessive with two carrier parents: 25 percent affected, 50 percent carriers, 25 percent unaffected, **every pregnancy**, because each conception is independent. X-linked recessive from a carrier mother: half of sons affected, half of daughters carriers, and **no father-to-son transmission**. Mitochondrial conditions pass only from the mother. Multifactorial defects recur at about 2 to 5 percent. Trisomy 21 is usually nondisjunction, but a Robertsonian translocation in a parent raises recurrence risk sharply, which is why every infant with Down syndrome gets a full karyotype.

A **screen returns a probability; a diagnostic test returns an answer**. Cell-free DNA (from 10 weeks) detects over 99 percent of trisomy 21 but is still a screen, and its predictive value falls when the condition is rare. It does not screen for neural tube defects. A high AFP is first checked

against dates and fetal number by ultrasound. CVS (10 to 13 6/7 weeks) and amniocentesis (15 to 20 weeks) are diagnostic. Newborn blood spots are drawn after 24 hours of feeding, ideally at 24 to 48 hours. Pulse oximetry for critical heart disease passes at 95 percent or more in hand or foot with a difference of 3 percent or less. Counseling stays non-directive, and the RN keeps assessment, teaching and evaluation.



Three shunts, three bypasses. The ductus venosus skips the liver; the foramen ovale and the ductus arteriosus skip the lungs. At the first breath lung resistance falls, the cord is clamped, and all three begin to close.

LOCK THESE IN

- Fertilization in the ampulla; blastocyst by day 5; implantation days 6 to 10; hCG rescues the corpus luteum.
- Gestational age is about two weeks more than fertilization age.
- Weeks 3 to 8 after conception build the organs and are the peak teratogen window. The neural tube closes by day 28.
- Maternal IgG crosses the placenta; IgM does not.
- Cord: two arteries, one vein. The vein carries oxygenated blood to the fetus.
- First actions: lift the presenting part, stop the magnesium, massage the fundus.
- Dominant 50 percent; recessive 25 percent every pregnancy; X-linked recessive has no father-to-son transmission.
- A screen gives a probability and must be confirmed by CVS or amniocentesis.

Fetal shunts and what they become

Structure	Before birth	Closure and remnant
Ductus venosus	Umbilical vein blood bypasses the liver	Days after clamping; ligamentum venosum
Foramen ovale	Right atrium to left atrium	Functional at first breaths; fossa ovalis
Ductus arteriosus	Pulmonary artery to aorta	Functional 12 to 24 h, usually by 72 h; ligamentum arteriosum
Umbilical vein	Oxygenated blood to the fetus	Ligamentum teres
Umbilical arteries	Deoxygenated blood to the placenta	Medial umbilical ligaments

Inheritance and prenatal tests

Item	Risk or timing	Key point
Autosomal dominant	50 percent per child	Every generation; both sexes
Autosomal recessive	25 percent affected, 50 percent carriers	Same risk every pregnancy
X-linked recessive	Carrier mother: half of sons affected	No father-to-son transmission
Multifactorial	2 to 5 percent after one affected child	Neural tube defects, cleft lip and palate
Cell-free DNA	From 10 weeks; screen	No neural tube information; confirm a positive
CVS	10 0/7 to 13 6/7 weeks; diagnostic	Never before 10 weeks; no NTD information
Amniocentesis	15 to 20 weeks; diagnostic	Empty the bladder first; Rh immune globulin if Rh negative
Newborn blood spot	24 to 48 hours of age	Repeat if drawn before 24 hours

Worked cases

WORKED CASE 1 · TEN TIMES THE DOSE, ONE SAFE TABLET

A patient took valproate in a prior pregnancy that was affected by a neural tube defect. She plans another pregnancy and asks how much folic acid to take and whether she can just take more prenatal vitamins.

STEP 1 · PICK THE DOSE

A prior neural tube defect (or valproate or carbamazepine use) calls for 4 mg daily. The standard dose is 400 micrograms, which is 0.4 mg.

STEP 2 · SHOW THE MATH

4 mg divided by 0.4 mg equals **10**. Her dose is ten times the standard dose.

STEP 3 · SPOT THE HAZARD

Ten prenatal vitamins would also give ten times the vitamin A. Preformed vitamin A above roughly 10,000 IU a day is itself teratogenic.

STEP 4 · TEACH

She takes a single-ingredient folic acid tablet, starting at least one month before conception and through the first trimester.

WORKED CASE 2 · TWO CARRIER PARENTS AND THE COIN WITH NO MEMORY

Two parents who both carry the cystic fibrosis allele have one affected child. They believe the next three children will be fine because "the one in four has happened."

STEP 1 · DRAW THE SQUARE

Each parent passes the typical allele or the altered allele. The four equal outcomes are one affected, two carriers and one with two typical copies.

STEP 2 · STATE THE RISK

Each pregnancy carries a 25 percent chance of an affected child, 50 percent carrier and 25 percent unaffected noncarrier.

STEP 3 · CORRECT THE BELIEF

Each conception is independent. The chance resets every time.

STEP 4 · SAY IT KINDLY

"The chance is one in four each time, and it starts fresh with each pregnancy." Then offer genetic counseling and respect what the family decides.

WORKED CASE 3 · KEEP THE DUCT OPEN IN A 3 KG NEWBORN

A 3 kg newborn with a ductal-dependent heart lesion is starting prostaglandin E1 at 0.05 micrograms per kilogram per minute. Work the rate and the nursing watch point.

STEP 1 · SET UP

Dose per minute = weight times rate per kilogram.

STEP 2 · CALCULATE

3 kg times 0.05 micrograms/kg/min = **0.15 micrograms per minute**.

STEP 3 · NAME THE REASON

The duct closes as oxygen rises and prostaglandin falls after birth. In a ductal-dependent lesion that closure causes collapse, so the drug keeps it open.

STEP 4 · WATCH

Apnea is a common expected effect, so airway equipment stays at the bedside.

WORKED CASE 4 · THE CORD IN THE VAGINA

Membranes rupture and the fetal heart rate drops to 70 for three minutes. You feel a pulsing cord in the vagina.

STEP 1 · FIRST ACTION

With two gloved fingers, lift the presenting part off the cord and keep your hand there until the birth.

STEP 2 · CALL

Call for help and press the emergency bell at the same time.

STEP 3 · POSITION

Knee-chest or steep Trendelenburg so gravity helps.

STEP 4 · SUPPORT

Oxygen, stop any oxytocin, start IV fluids, continuous monitoring and prepare for immediate cesarean. If the cord is outside, cover it with warm, saline-moist sterile gauze. Never push it back.

TRAPS PEOPLE FALL INTO

- **Counting weeks from conception on the chart.** Charts use gestational age from the LMP, about two weeks more than fertilization age.
- **Thinking the umbilical arteries carry oxygen to the fetus.** The single vein carries oxygenated blood to the fetus; the two arteries return it to the placenta.
- **Expecting the risk to "use up."** A 25 percent recessive risk applies to every pregnancy.
- **Treating a positive cell-free DNA result as a diagnosis.** It is a screen. Confirm with CVS or amniocentesis before any decision.
- **Pushing a prolapsed cord back.** Handling the cord causes vasospasm. Lift the presenting part off it instead.
- **Giving calcium gluconate before stopping magnesium.** Stop the infusion first, then give the antidote.

Chapter 2 self-test · ten items

1. Where does fertilization normally occur?

A. The canal of the cervix
B. The upper uterine fundus
C. The ampulla of the uterine tube
D. The isthmus of the uterine tube

C. The ampulla of the uterine tube Fertilization almost always occurs in the ampulla, the wide outer third of the tube.

2. A fetus is 12 weeks by gestational age. About how old is it since conception?

A. 8 weeks
B. 10 weeks
C. 12 weeks
D. 14 weeks

B. 10 weeks Gestational age counts from the LMP, about two weeks before fertilization.

3. A monozygotic pair divided on day 6. What membranes are expected?

A. One placenta and one sac
B. Conjoined twins
C. Two placentas and two sacs
D. One placenta and two sacs

D. One placenta and two sacs Division at days 4 to 8 gives monochorionic diamniotic twins, at risk of twin-to-twin transfusion.

4. When is the embryo most sensitive to structural teratogens?

A. Weeks 3 to 8 after conception
B. Weeks 20 to 28 of gestation
C. The first two weeks after conception
D. Only in the third trimester

A. Weeks 3 to 8 after conception Organs form in weeks 3 to 8, so that is when structural malformation is most likely.

5. A newborn has a high IgM level at birth. What does this suggest?

A. It is normal passive immunity at birth
B. It was absorbed from early colostrum
C. The newborn made it in response to infection
D. It crossed the placenta from the mother

C. The newborn made it in response to infection Maternal IgM does not cross the placenta, so newborn IgM points to intrauterine infection.

6. Which placental hormone is the basis of gestational diabetes?

A. Relaxin
B. Progesterone
C. Human chorionic gonadotropin
D. Human placental lactogen

D. Human placental lactogen hPL antagonizes insulin to divert glucose to the fetus.

7. A patient on magnesium sulfate has absent knee reflexes and a respiratory rate of 10. What is the first action?

A. Stop the magnesium infusion
B. Recheck reflexes in one hour
C. Increase the IV fluid rate
D. Give calcium gluconate IV

A. Stop the magnesium infusion Stop the source first, then give the antidote and support breathing.

8. A man has hemophilia A and his partner is not a carrier. What is the risk to their sons?

A. All sons will be carriers
B. No sons will be affected
C. Half of sons will be affected
D. All sons will be affected

B. No sons will be affected He passes his Y to every son, so there is no father-to-son transmission. All daughters are carriers.

9. A 24-year-old has a positive cell-free DNA screen for trisomy 13. What is the best next step?

A. Tell her the fetus has trisomy 13
B. Repeat the same screen in one week
C. Schedule only the anatomy ultrasound
D. Offer a diagnostic test (amniocentesis)

D. Offer a diagnostic test (amniocentesis) Cell-free DNA is a screen; in a young patient a positive for a rare trisomy may be a false positive.

10. A blood spot card was collected at 18 hours of age. What should the nurse do?

A. Send it with a note asking the lab to adjust
B. Collect a second card now by layering drops
C. Arrange a repeat specimen after 24 hours of feeding
D. Accept it, since an early result is better

C. Arrange a repeat specimen after 24 hours of feeding Several analytes need protein intake to become abnormal; specimens before 24 hours must be repeated.

ONE PAGE

Cram sheet

Everything from chapters 1 and 2 in one place. Cover the right column and see if you can rebuild each row.

Rules to know

Item	Rule	Note
Family-centered care	Dignity, information, participation, collaboration	Parents' concerns are findings
RN only	Assessment, teaching, evaluation, unstable patient	Five rights every time
Assent	From about age 7	Parent or guardian gives permission
Interpreter	Trained, whole encounter	Never family, never a child
Consent	Provider obtains it	Nurse witnesses identity, voluntariness, capacity
Capacity	Understand, appreciate, reason, communicate	Not lost by refusing
Mandated reporting	Reasonable suspicion	Personal, non-delegable
First actions	Lift presenting part; stop magnesium; massage fundus	Before anything else

Numbers to know

Item	Value	Note
Ovulation	14 days before next menses	LH surge 24 to 36 h before
Naegele's rule	LMP minus 3 months plus 7 days plus 1 year	Assumes 28-day cycle
Folic acid	0.4 mg; 4 mg after prior NTD	Single-ingredient tablet for 4 mg
Implantation	Days 6 to 10	hCG peaks at 8 to 10 weeks
Neural tube	Closed by day 26 to 28 after conception	About 6 weeks gestational age
AFI	5 to 24 cm	Deepest pocket 2 to 8 cm
Magnesium watch	RR at least 12, urine at least 30 mL/h	Reflexes lost first
CCHD screen pass	95 percent or more, difference 3 or less	Below 90 is an immediate fail

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