In the name of God
Multiple Gestation

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Multiple gestations have become one of the most common high-risk conditions.
Almost most common:

-the number of twins delivered in the United States has risen over 80%

- Twins now represent approximately 3% of all live births

- Triplets and higher-order births;
**B-high-risk condition:**

- Perinatal morbidity and mortality
  - Greater risk of dying before their first birthday
  - Increased risk of long-term mental and physical handicaps
  - Increased risk of growth restriction
  - Other complications: higher rates of congenital anomaly, twin-to-twin transfusion, monoamnionicity, placenta cord prolapse, placental abruption, previa, intrapartum asphyxia

* Higher health care costs
A-Monozygotic (MZ) twins:

* Both fetuses arise from single fertilized ova
* Both fetuses are genetically identical
* Random event
* Incidence: 3 to 4 per 1,000 live birth
* Use of assisted reproductive technology (ART)
**B-Dizygotic (DZ) twinning:**

*Result from multiple ovulation with fertilization by separate sperm*
*Incidence: variable*
*Factors are known to affect the incidence:*
  1. personal or family history
  2. delayed childbearing
  3. use of ART
  4. Maternal race
  5. higher BMI
  6. recent discontinuation of hormonal birth control agents
A–Dizygotic (DZ) twinning:

* Will always be diamniotic, dichorionic
* Two complete placental units
* Membrane separating: four layers
B–Monozygotic (MZ) twins:
*The placentation depends on the time at which twin division occurs:
  0–3: diamnion and dichorion
  3–8: diamnion, monochorion
  8–13: monoamnion, monochorion
  >13: monochorionic, monoamniotic placentation + physical attachment of the fetuses
<table>
<thead>
<tr>
<th>Zygote</th>
<th>Dizygotic</th>
<th>Monozygotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day of division</td>
<td>0–3</td>
<td>3–8</td>
</tr>
<tr>
<td>Placenta</td>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
<tr>
<td>Central membrane</td>
<td>2 Amnion 2 Chorion</td>
<td>2 Amnion 2 Chorion</td>
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16-36% 60-70% 1%

**Figure 14.1** Types of placentation in MZ and DZ twinning.
determining zygosity of the infants

*Examination of the placenta(s) and a detailed description of its dividing membrane

A–there is no dividing membrane: monoamniotic, monochorionic

B–there is dividing membrane microscopic appearance:
1–two layers: diamniotic, monochorionic
2–four layers: diamniotic, dichorionic

IF apposite sex: DZ
multiple-marker screening generally has been used in twin pregnancies, although with a decreased sensitivity for aneuploidy and a higher false-positive rate compared with its use in singletons.
Maternal Complications

Women who are pregnant with multiples are more likely to be hospitalized antenatally for both an increased frequency and severity of pregnancy-related complications.

*higher plurality and the more extreme maternal adaptation (majority of these complications)

*maternal characteristics:
  - older maternal age
  - nulliparity
  - increased pregravid BMI
  - conception by ART
Maternal Complications

1–Cardiovascular Risks
2–Hematologic Abnormalities
3–Metabolic Disorders
4–Pregnancy–Induced Hypertension or Preeclampsia
5–Placental Abruption
6–Hydramnios
7–Urinary Tract Infection
8–Postpartum Hemorrhage
Cardiovascular Risks

However

* the common use of tocolytic therapy:
  - pulmonary edema
  - myocardial ischemia
  - potentially lethal maternal tachyarrhythmias

* the common iatrogenic fluid overload

* the occasional infection

**all will generate significant additional cardiovascular demand**

risk of postpartum cardiomyopathy (especially among older gravidas with higher-order multiple)

multiple pregnancy was an independent and significant risk factor for admission to an intensive care unit
Increased red blood cell volume expansion is unable to keep pace with plasma volume expansion

physiologic hemodilution

Hb & Hct

*first trimester → decline beginning

*second trimester → reaching a nadir

*third trimester → gradually rising
Hematologic Abnormalities

in either the first or third trimester;

Hemoglobin levels $< 11 \text{ g/dL}$

serum ferritin $< 12 \text{ mg/dL}$

\[ \downarrow \]

IDA

%21 to 36% of multiple gestations

\[ \downarrow \]

two- to threefold higher than in singletons

*consumption of heme-rich animal protein
*60mg/d Fe
*1mg/d folic acid

The average hemoglobin concentration for women pregnant with twins is 10 g/dL at 20 weeks gestation.
Metabolic Disorders

Women who are pregnant with multiples have lower fasting and postprandial glucose levels, exaggerated insulin responses to eating, and higher levels of B2-hydroxybutyrate than women pregnant with singletons.

These differences suggest:
- More rapid depletion of glycogen stores
- Metabolism of fat between meals and during an overnight period
several placental hormones (human placental lactogen)

Multiples pregnancy -> placental mass

- B2 adrenergic agents
- corticosteroids

insulin resistance and hyperglycemia

Increased two- to three-fold among multiples
Pregnancy–Induced Hypertension or Preeclampsia

*It is frequently encountered in multiple gestations:
  – singletons ........ 7%
  – twins ........... 14%
  – triplets .......... 21%
  – quadruplets ...... 40%

*Twins to have a 4–fold higher risk of preeclampsia and a 14–fold higher risk if the woman is primigravid
Pregnancy-Induced Hypertension or Preeclampsia

*preeclampsia frequently occurs (in multifetal gestations):
- earlier
- more severe
- more atypical: Hypertension is not always the presenting sign, nor is proteinuria universally present

☆ The most common presentation among these higher-order multiples was laboratory abnormalities consistent with HELLP
Placental Abruption

*Twin pregnancies have an approximately threefold increased risk of abruption

*Abruption occurs most frequently in the third trimester and also is a significant risk immediately after vaginal delivery of the first infant

*Conformational changes in the uterine shape that occur between deliveries can predispose to a sheering off of the attached placenta
*Hydramnios occurs in 2% to 5% of twin gestations, and twins account for approximately 8% to 10% of all cases of hydramnios.

*Hydramnios may develop as a consequence of TTTS with the cotwin experiencing both growth restriction and oligohydramnios.

*The development of idiopathic acute hydramnios with maternal respiratory embarrassment also has been reported in multiples.
Women with multiples have a 1.4-fold increased risk of developing urinary tract infection during pregnancy.

This complication is thought to be a consequence of increased urinary stasis due to the gravid uterus.

These infections usually involve only the lower urinary tract because the incidence of pyelonephritis is not significantly increased.
*In the British study, the risk of postpartum hemorrhage among:
- singletons ..........1.2%
- twins..................6%
- triplicets.......... 12%
- quadruplets........21%

*In a British population-based study of postpartum hemorrhage, multiple pregnancy was associated with more than fourfold increased risk
Postpartum Hemorrhage

*predisposing factors:

- Overdistention of the uterus → uterine atony

  - risk for retention of placental tissue

- Surgical or mechanical trauma to the genital tract

- Pharmacologic effects of medications such as magnesium sulfate (which is frequently used to manage both preeclampsia and
Other complications

- cholestatic jaundice
- PUPP
- Hyperemesis
- deep venous thrombosis

Women with multiple gestations also experience an increased number of somatic complaints such as:

  - shortness of breath, loss of balance, varicose veins, significant dependent edema, constipation, and hemorrhoids
Complications Unique to Multiples

* Vanishing Twin Syndrome
* Fetal Death in Utero (Acute Intertwin Transfusion Syndrome)
* Monoamniotic Twins
* Discordant Twin Growth
* Twin-to-Twin Transfusion Syndrome (Chronic Intertwin Transfusion Syndrome)
Vanishing Twin Syndrome

Between 20% and 50% of multiple gestations identified by ultrasound in early pregnancy are lost either as a spontaneous abortion of all fetuses or by the spontaneous loss and reabsorption of at least one of the multiples.
In the experience of one in vitro fertilization program:

- first-trimester pregnancy loss rate was 50 of 165 twins (30.3%), 11 of 26 triplets (42.3%), and 1 of 5 quadruplets (20%)
symptoms

*there usually are no symptoms

*vaginal bleeding

5% of all patients with first-trimester bleeding
While vanishing twin syndrome occurs with a greater frequency than appreciated previously, it is important not to overdiagnose this event

* subchorionic blood clots
* chorioamniotic separations
* decidual pseudosac
* cystic uterine fibroid
* excessive transducer pressure on a thin woman
*Acute Intertwin Transfusion Syndrome

*After the first trimester, single fetal demise occurs in 2% to 5% of twin gestations and in 10% to 15% of triplet gestations

*in a dichorionic gestation, the risk to the surviving cotwin is minimal

*Antenatal demise of a monochorionic cotwin is associated with an approximate 25% mortality rate and a similarly high rate of morbidity for the surviving fetus
Injury to the surviving cotwin is that following fetal demise, there is an acute transfusion into the dead fetus through the shared placenta:

- severe fetal hypotension
  - hypoxic end-organ injury (most frequently neurologic)
- potentially lethal fetal exsanguination
management

*dichorionic*: no intervention

*monochorionic*:
  - maturity or near maturity: immediate delivery
  - earlier gestations: based on an assessment
Monoamniotic Twins

*They carry a fetal mortality rate that approaches 40%, primarily as a consequence of cord entanglement and subsequent occlusion

*they are at greater risk for other complications:  
  – congenital anomaly
  – TTTS

*Cesarean delivery is usually recommended*
Discordant Twin Growth

*birth weight differed by 500 to 999 g in 18% of twins, and the difference was greater than 1,000 g in 3%. Some 15% to 30% of twins exhibit birth-weight differences of 20%.

*Discordance between the largest and smallest triplet is 20% in more than 40% of triplet gestations, with 7% exceeding 40% discordance.
Etiology

1) constitutional factors such as the genetic dissimilarity of DZ twins

2) local placental implantation factors

Figure 14.4 DZ twins with significant growth disparity. The etiology of the growth discordance was attributed to a placental implantation abnormality resulting in placental dysmaturity affecting only one of the twins.
It is important to appreciate that birth-weight discordance and IUGR are interrelated. When birth-weight discordance exceeds 20%, one of the fetuses will be growth restricted in more than 50% of the cases.
Evaluation

*managed expectantly:
  - fetal well-being
  - absence of IUGR
  - presence of reassuring fetal testing

*delivery:
  - 20% to 25% growth discordance
  - IUGR of either twin at \( \geq 35 \) weeks gestation
Twin-to-Twin Transfusion Syndrome

*Chronic Intertwin Transfusion Syndrome

*It is a serious complication affecting multiple pregnancies and is sometimes referred to as chronic intertwin transfusion syndrome, a complication of MZ/monochorionic twins in which intraplacental arterial venous shunts are uncompensated and preferential blood flow exists.
Figure 14.5 Placenta (A) and infants (B) delivery from a monochorionic, diamniotic twin gestation complicated by TTTS. Note the larger placental area associated with the recipient twin and the palor and impaired growth of the donor twin. (See Color Plate)
*donor twin:
  - growth retarded
  - anemic
  - hypotensive
  - oligohydramniotic

!Stuck twin: If there is little or no amniotic fluid surrounding the smaller fetus, the amniotic membrane may lie in close apposition to the smaller fetus, restricting it to the uterine wall.
*recipient twin:
  – hypervolemic
  – hyperviscous
  – hypertensive
  – polyhydramniotic due to increased renal blood flow

*Either twin : hydrops
diagnosis

*ultrasonographic criteria including:

- Marked size disparity in fetuses of the same sex
- Disparity in size between the two amniotic sacs
- Disparity in size of the umbilical cords
- A single placenta
- Evidence of hydrops in either fetus
- Findings of congestive heart failure in the recipient

*Doppler ultrasound
*depending on the Quintero stage and the gestational age at which it is encountered

*The option of delivery will depend on fetal maturity and the potential morbidity that would be encountered

*At earlier gestational ages:
  – serial amniocentesis
  – tocolytic therapy
  – fetoscopy

! **Viable patient:** large volume-reduction amniocentesis

! **previable patient:** intrauterine laser ablation of placental surface vascular anastomoses, fetoscopic cord clamping, or termination
Fetal and Newborn Complications
Prematurity

*The risk of preterm birth increases with the number of fetuses in utero and is the single greatest threat to the health of the newborns*

*Premature labor and PPROM are responsible for more than 70% of these premature deliveries*

*The incidence of preterm birth at less than 37 weeks gestation in the United States is 30% to 55% for twins, 66% to 80% for triplets, and virtually 100% for quadruplets*

*The mean gestational age at delivery is inversely related to fetal number: 39 weeks for singletons, 35 to 36 weeks for twins, and 32 to 33 weeks for triplets.*
*Infants of multiple gestations account for approximately 20% of all NICU admissions. An admission to a NICU can be expected in approximately 25% of all twins, in 75% of all triplets, and in more than 90% of quadruplets. Respiratory distress syndrome occurs in approximately 14% of twins, more than 40% of triplets, and more than 60% of quadruplets.
the risk of dying before the first birthday is 5 times greater for twins and 14 times greater for triplets. Among survivors, the RR of severe handicap, controlling for both birth weight and gestational age is 1.7 (95% CI 1.6 to 2.0) for twins and 2.9 (95% CI 1.5 to 5.5) for triplets compared with singleton gestations.
Intrauterine Growth Restriction
Complications Unique to Multiples
*Vanishing Twin Syndrome

*Fetal Death in Utero (Acute Intertwin Transfusion Syndrome)

*Monoamniotic Twins

*Discordant Twin Growth

*Twin-to-Twin Transfusion Syndrome (Chronic Intertwin Transfusion Syndrome
Vanishing Twin Syndrome

Between 20% and 50% of multiple gestations identified by ultrasound in early pregnancy are lost either as a spontaneous abortion of all fetuses or by the spontaneous loss symptoms

*there usually are no symptoms
  *vaginal bleeding

5% of all patients with first-trimester bleeding
Fetal Death in Utero

After the first trimester, single fetal demise occurs in 2% to 5% of twin gestations and in 10% to 15% of triplet gestations.

Definition: Injury to the surviving cotwin is that following fetal demise, there is an acute transfusion into the dead fetus through the shared placenta.
Complications:

- severe fetal hypotension

- hypoxic end-organ injury (most frequently neurologic)

management

*dichorionic*: no intervention

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- earlier gestations: based on an assessment
Monoamniotic Twins

*They carry a fetal mortality rate that approaches 40%, primarily as a consequence of cord entanglement and subsequent occlusion*

*they are at greater risk for other complications:*
  – congenital anomaly
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<th>TABLE 14.1 Management Recommendations for Monoamniotic, Monochorionic Twin Gestations</th>
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<tbody>
<tr>
<td>Confirm monoamnionicity (exclude stuck twin syndrome)</td>
</tr>
<tr>
<td>Ultrasonographic evaluation at 18 to 20 weeks to exclude congenital anomalies and conjoining</td>
</tr>
<tr>
<td>Parental education regarding unique risks</td>
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<tr>
<td>Serial ultrasonographic assessment of fetal growth (TTTS common)</td>
</tr>
<tr>
<td>Daily fetal kick counts beginning at 26 weeks</td>
</tr>
<tr>
<td>Nonstress testing three times per week beginning at 26 weeks</td>
</tr>
<tr>
<td>Antenatal glucocorticoid administration</td>
</tr>
<tr>
<td>Amniocentesis for fetal lung maturity at 32 weeks</td>
</tr>
<tr>
<td>Elective delivery at 34 to 35 weeks if fetal lung maturity not previously confirmed</td>
</tr>
<tr>
<td>Cesarean delivery usually recommended</td>
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TTTS, twin-to-twin transfusion syndrome.
Discordant Twin Growth

Some 15% to 30% of twins exhibit birth-weight differences of 20%.

When birth-weight discordance exceeds 20%, one of the fetuses will be growth restricted in more than 50% of the cases.

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–Chronic Intertwin Transfusion Syndrome
–a complication of MZ/monochorionic twins in which intraplacental arterial venous shunt

*donor twin:
– growth retarded
– anemic
– hypotensive
– oligohydramniotic

Stuck twin syndrome
*recipient twin:

- hypervolemic
- hyperviscous
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- polyhydramniotic due to increased renal blood flow

*Either twin: hydrops
*ultrasonographic criteria including:

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  - Disparity in size of the umbilical cords
  - A single placenta
  - Evidence of hydrops in either fetus
  - Findings of congestive heart failure in the recipient

*Doppler ultrasound*
| Stage I: | Bladder of donor still visible |
| Stage II: | Bladder of donor no longer visible |
| Stage III: | Critically abnormal Doppler studies (absent/reversal end-diastolic flow in the umbilical artery, reverse flow in the ductus venosus, or pulsatile flow in the umbilical vein) in either twin |
| Stage IV: | Hydrops in one or both twins |
| Stage V: | Demise of one or both twins |

Donor, deepest vertical pocket $\geq 2$ cm; recipient, deepest vertical pocket $\geq 8$ cm.
treatment

*At earlier gestational ages:
 - serial amniocentesis
 - tocolytic therapy
 - fetoscopy

Viable patient: large volume-reduction amniocentesis
Preivable patient: intrauterine laser ablation of placental surface vascular anastomoses
Fetal and Newborn Complications
Prematurity

*The risk of preterm birth increases with the number of fetuses in utero

*The mean gestational age at delivery is inversely related to fetal number: 39 weeks for singletons, 35 to 36 weeks for twins, and 32 to 33 weeks for triplets

*Infants of multiple gestations account for approximately 20% of all NICU admissions

* the risk of dying before the first birthday is 5 times greater for twins and 14 times greater for triplets
Congenital Anomalies

*Congenital malformations occur approximately twice as often in multiples compared with singletons and are more common in MZ than in DZ Twins.

Diagnosis

*Transabdominal sonography

*Transvaginal sonography
Intrauterine Growth Restriction

* twin gestations: similar to that of singletons until approximately 30 to 32 weeks gestation

* triplet and quadruplet: begins to slow at 27 to 28 and 25 to 26 weeks
*reduced growth velocity:

- Relative placental insufficiency
- Abnormal placental implantation
- Umbilical cord abnormalities such as two-vessel cords
- Chromosomal or structural abnormalities
- Chronic intertwin transfusion syndrome

Prediction

- Ultrasonographic studies
- Abdominal circumference
- Dating of the pregnancy
Antepartum Care Of Multiple Gestation

Beneficial Interventions

Controversial Interventions

Nonbeneficial Interventions
Beneficial Interventions

- Maternal Nutrition
- Ultrasound
- Multifetal Pregnancy Reduction
- Corticosteroid Administration
- Fetal Surveillance
Nutrition is an important and modifiable variable that can improve intrauterine growth and potentially lengthen gestation.

We can influence birth weight and pregnancy outcome in multiple gestations by modifying maternal nutrition and by monitoring the rate of maternal weight gain.
Maternal nutrition cont’d

Maternal weight gains of 24 lb (10–11 kg) by 24 weeks and overall weight gains of 40 to 45 lb (18–20 kg) are associated with optimal pregnancy outcomes, defined as an average twin birth weight of greater than 2,500 g.

Investigators have emphasized the importance of adequate early weight gain (<24 weeks gestation).

Poor weight gain prior to 24 weeks (<0.85 lb per week), regardless of the rate of gain after 24 weeks, has been associated with both reduced intrauterine growth and higher perinatal morbidity.
Maternal nutrition cont’d

maternal weight gain prior to 20 weeks and between 20 to 28 weeks had a greater effect on birth weight in both twin and triplet pregnancies than did weight gain in the third trimester.

weight gain recommendations for twins need to be modified based on the maternal BMI, just as they are for singletons.
**BMI-specific weight gain recommendations for twin**

![Graph showing weight gain recommendations based on BMI.](image-url)
BMI–specific weight gain recommendations for twin pregnancies:

**BMI 26.1 - 29.0**
- 38 - 47 lb (17.2 - 21.3 kg) by 38 wk
- 28 - 37 lb (12.7 - 16.8 kg) by 28 wk
- 20 - 25 lb (9.1 - 11.3 kg) by 20 wk

**BMI >29.0**
- 29-38 lb (13.2 - 17.2 kg) by 38 wk
- 21 - 30 lb (9.5 - 13.6 kg) by 28 wk
- 15 - 20 lb (6.8 - 9.1 kg) by 20 wk

**Triplets**
- 55 to 74 lb by 34 wk
- 46 to 60 lb by 28 wk
- 34 to 44 lb by 22 wk

The graphs illustrate the weight gain recommendations based on BMI categories and gestational weeks.
Recommendations according to investigations of Luke and colleagues were made to bring the diet to 3,000 to 4,000 kcal per day depending on pregravid BMI, with the distribution of 20% of those calories from protein, 40% of the calories from carbohydrates, and 40% of the calories from fat.
# Recommended Daily Allowances for Nonpregnant Women and Women Pregnant with Singletons, Twins, Triplets, and Higher-order Multiples

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<tr>
<th></th>
<th>(kilocalories)</th>
<th>(grams)</th>
<th>(grams)</th>
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<tbody>
<tr>
<td>Nonpregnant</td>
<td>2,200</td>
<td>110</td>
<td>220</td>
</tr>
<tr>
<td>Singletons</td>
<td>2,500</td>
<td>126</td>
<td>248</td>
</tr>
<tr>
<td>Underweight twins (&lt;19.8 kg/m²)</td>
<td>4,000</td>
<td>200</td>
<td>400</td>
</tr>
<tr>
<td>Normal-weight twins (19.8≤”26.0 kg/m²)</td>
<td>3,500</td>
<td>175</td>
<td>350</td>
</tr>
<tr>
<td>Overweight twins (26.1≤”29.0 kg/m²)</td>
<td>3,250</td>
<td>163</td>
<td>325</td>
</tr>
<tr>
<td>Obese twins (&gt;29.0 kg/m²)</td>
<td>3,000</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>Triplet and higher-order multiples</td>
<td>4,500</td>
<td>225</td>
<td>450</td>
</tr>
</tbody>
</table>

Recommendations for the twin gestations are provided in a BMI-specific format.
It is advisable that all women with a multiple gestation should receive in-depth education regarding fetal growth, nutrition, diet, avoidance of smoking, drugs and alcohol, and individualized BMI-specific weight gain recommendations.
Maternal anemia, both from iron and folate deficiency, are common in multiples.

Many have recommended supplementation of the standard prenatal vitamin with iron (60 mg per day) and folic acid (1 mg per day) when a multiple pregnancy is diagnosed. Folate-containing green leafy vegetables and Heme-iron rich sources such as red meat, pork, poultry, fish, and eggs are emphasized because of both their better iron absorption and the higher quality and quantity of protein and other nutrients. Other nutrients often lacking in women's diets include calcium, magnesium, and zinc, and their specific supplementation has been recommended.
Roles of ultrasound in the antepartum care of multiples:

- Diagnosis,
- Determination of amnionicity and chorionicity,
- Identification of fetal or placental anomalies,
- Evaluation of fetal growth,
- Evaluation of amniotic fluid volume,
- Evaluation of fetal biophysical parameters,
- and Determination of presentation
Accurate determination of *chorionicity* and *amnionicity* is important in antepartum management. *Monochorionic pregnancies* are at substantially higher risk for IUGR, growth discordance, congenital anomalies, and intrauterine fetal death. *Monoamniotic placentation* represents an extreme risk, with high rates of twin-to-twin transfusion, cord entanglement, and fetal demise. *Dichorionic* twins are at lower risk, as this placentation does not carry the potential for vascular communication and is associated with a lower risk of congenital anomaly.
Determination of chorionicity is most accurate in the **first trimester**

If two separate placentas are identified or if the fetuses are of different sex, the placentation is dichorionic.

A thin, wispy membrane along with a single placenta and same sex fetuses suggest monochorionicity.

A thick dividing membrane composed of four layers suggests dichorionicity.

Another helpful characteristic is the **twin peak or lambda sign**. The twin peak represents a wedge-shaped projection of placental tissue extending above the fused chorionic surface and separating the diamniotic, dichorionic intertwin membrane
Ultrasound cont’d

Ultrasound is critical to the management of both twin and triplet gestations. **In the second half of gestation**, fetal growth should be assessed periodically by serial ultrasound examinations.

Most clinicians repeat these ultrasounds on a **monthly** basis, although the appropriate interval between scans is not specifically known.
Multifetal pregnancy reduction has emerged as a procedure meant to improve the overall chances of survival and health in higher-order multiple gestations. The preferred technique is the transabdominal, ultrasound-guided fetal intracardiac injection of potassium chloride.

Two most important factors determining perinatal morbidity and mortality are Gestational age and Birth weight at delivery, and both are inversely related to the number of fetuses present. 

average birth weight and gestational age for

- singletons is 3,358 g at 39.3 weeks
- twins is 2,500 g at 36.2 weeks
- Triplets is 1,698 g at 32.2 weeks
The overall pregnancy loss rate prior to 24 weeks gestation following multifetal pregnancy reduction has dropped from initially reported rates of 15% to 20% to approximately 5% to 8% as experience with the procedure has increased.

The loss rate prior to 24 weeks is related to both the starting and finishing number of fetuses. A higher starting number is associated with a greater pregnancy loss rate.
The optimal finishing number of fetuses appears to be **twins**, with loss rates prior to 24 weeks of 10.9% compared with 13.7% and 18.0%, respectively, for singletons and triplets.

A meta-analysis of the effect of multifetal pregnancy reduction on pregnancy outcome demonstrated that reduction to twins is associated with longer gestations, higher birth weights, and lower NICU admission rates. The incidence of maternal antenatal hospitalization, preterm labor, and cesarean birth also are reduced, although incidences of preeclampsia, gestational diabetes, and other pregnancy complications are not.
the psychologic implications for mothers who are undergoing multifetal pregnancy reduction is important.

70% of these women mourned for the reduced fetus(es), but most of the depressive symptoms were mild and lasted only 1 month.

Ultimately, over 90% of the women concluded that they would make the same decision again.
selective fetal termination sometimes can be offered following identification of a serious or life-threatening malformation or abnormality of one twin.

The most common indications for selective fetal termination include:
DZ twins discordant for fetal chromosome abnormality,
serious fetal structural malformation,
or one twin affected by a single gene disorder.

Multifetal pregnancy reduction should be included in the counseling of all women with triplets and higher-order multiples.
The efficacy of antenatal corticosteroid administration in multiple gestations has not been specifically examined. However, antenatal corticosteroids significantly reduce respiratory distress syndrome, intraventricular hemorrhage, and other neonatal complications of prematurity in singleton gestations.

As a result, the NIH consensus conference statement on corticosteroids recommended that they be administered to women with preterm labor prior to 34 weeks gestation and to women with preterm PROM at <30 to 32 weeks gestation regardless of plurality, provided there are no contraindication to steroid use. It is recommended that they receive only a single course.
Multiple gestations have an increased risk of stillbirth compared with singletons at any gestational age. Because of this increased stillbirth risk, clinicians frequently initiate antepartum fetal surveillance.

Nonstress test and the biophysical profile have been shown to be effective in identifying the growth-retarded multiple, the multiple at risk for hypoxic/asphyxycic injury, and the multiple at risk for perinatal mortality.
surveillance certainly is indicated in those gestations identified as being at higher risk. These would include those with IUGR, abnormal fluid volumes, growth discordance, decreased fetal movement, pregnancy–induced hypertension, fetal anomalies, monoamnionicity, or with any other pregnancy complications placing one or more of the fetuses at risk for hypoxic/asphyxic injury.
The other recommended method of fetal surveillance are:

- fetal kick ✓
- counting
- Umbilical cord ✓
- Doppler velocimetry
- Ultrasonography ✓
The authors initiate fetal surveillance at 32 weeks in monochorionic twins and at 34 weeks in dichorionic twins, assuming there is no additional indication to initiate testing earlier. Fetal testing generally is performed on a weekly basis except in the presence of severe IUGR, abnormal umbilical artery Doppler studies, or monoamnionicity, which may require either twice weekly or even more frequent testing.
Controversial Interventions

Preterm Birth Risk Refinement
Serial Digital Cervical Examination
Transvaginal Ultrasound Cervical Length Measurements
Ultrasound Indicated Cerclage
Cervical and Vaginal Fetal Fibronectin
Reduced Activities and Rest
Home Uterine Activity Monitoring
Tocolytic Therapy
Serial Digital Cervical Examination

The value of antepartum digital cervical examination lies in its ability to provide ongoing risk assessment, especially in the late second and third trimester.

**CS (cervical score):** cervical length (in centimeters) minus cervical dilation at the internal os (in centimeters).

- **CS ≤0** → a marker of abnormal cervical status and increased preterm delivery risk.
- **CS >0** → good candidates for continued observation without obstetric intervention.

Predicted preterm labor within 14 days in 69% of one cohort of women with twin gestations. When only multiparous women were considered, the predictive value rose to 80%.

Ideally, these examinations should be done by a consistent examiner on an every 1– to 2–week basis between 22 and 35 weeks gestation.

There are no prospective studies or cohort series demonstrating that antepartum digital cervical examination is associated with obstetric complications or adverse perinatal outcomes.
Of all the potential predictors of preterm delivery, a cervical length $\leq 25$ mm at 24 weeks gestation was the best predictor of preterm birth before 32 weeks (27%), 35 weeks (54%), or 37 weeks (73%) gestation in twin pregnancies.

Again, there is little evidence that endovaginal sonography has improved outcomes in multiples.
placement of a cerclage for twins with a midtrimester TVCL $\leq 25$ mm has not successfully prolonged gestation or improved neonatal outcomes.

The evidence is insufficient at present to recommend cerclage placement for a TVCL $\leq 25$ mm or even $<15$ mm, although this clearly is an area for continued investigation.
As women with multiples are often highly symptomatic, one valuable aspect of the FFN test is its high negative predictive value. A negative FFN is associated with <3% risk of delivery in the next 2 weeks despite maternal symptoms assuming the absence of advanced cervical dilation.

FFN in cervical/vaginal secretions in the late second and early third trimester is associated with an increased risk of preterm birth in multiples.
Activity restriction and increased rest at home commonly is recommended for women with multiples although there are no prospective randomized data evaluating this intervention.

Maternal rest has been associated with:

- Reduced baseline uterine contraction frequency.
- Pregnancy prolongation for women with multiples deemed to be at increased risk of preterm birth.
- The birth weights of twins and triplets may be increased.

Further research is needed to define the impact of restricted activity and rest on both the duration of pregnancy, fetal growth, and the risk of pregnancy-induced hypertension.
Home Uterine Activity Monitoring

Home uterine activity monitoring (HUAM) has been advocated for multiples due to their increased risk of premature labor combined with observations that multiples may be less accurate in the self-detection of their own prelabor uterine activity compared with women with a singleton.

At present, the benefits of HUAM in twins remain controversial, and its use should be highly individualized. There are no prospective data addressing the use of HUAM in triplets.
Tocolytic therapy can be relied on only to provide a short-term prolongation of pregnancy.

Even a short-term prolongation, however, can be beneficial in terms of allowing tertiary care transport; administration of corticosteroids for enhancement of fetal lung maturity; and in some cases, a modest extension of gestation.

For gestations <32 weeks, a prolongation of even 1 week will be associated with measurable and significant reductions in neonatal morbidity and mortality.
Tocolytic therapy cont’d

Tocolytic use in multiples must be accompanied by very careful monitoring of both maternal and fetal condition. Women who are pregnant with multiples are at higher risk for a number of tocolytic–related complications: most notably pulmonary edema, myocardial ischemia, cardiac arrhythmias.

Contributing to this risk is an increased maternal blood volume, a lower colloid oncotic pressure, and anemia, concomitant intravenous fluid administration and corticosteroid therapy.

Tocolytic factors that increase the risk of pulmonary edema include the use of β-adrenergic agents and prolonging tocolytic therapy for more than 24 hours. β-Adrenergic agents are also known to increase maternal glucose levels, aggravating either pregestational or gestational diabetes.
Acute tocolytic therapy was undertaken most often by using intravenous **magnesium sulfate**. Although frequently associated with:

- lethargy, weakness, nausea, vomiting, and blurred vision,
- magnesium sulfate has a significantly lower risk of severe hemodynamic, cardiopulmonary, or metabolic disturbances.

When necessary, the authors use oral **indomethacin** in patients <32 weeks gestation as an adjunct to magnesium sulfate or as a second-line agent if magnesium sulfate cannot be tolerated in order to allow for an initial 48 hours for corticosteroid administration.

When increased uterine activity is identified by monitoring and the patient is felt to be at higher risk for preterm birth, attempts are sometimes made to reduce that uterine activity without resorting to intravenous therapy. The authors' choices for this sort of therapy are either oral **nifedipine** (10 to 20 mg every 6 hours) or oral (2.5 to 5.0 mg every 4 hours) or **subcutaneous terbutaline sulfate**.
Multiple Gestation
Nonbeneficial Interventions

Prophylactic Cerclage; Cerclage should be reserved for patients with a significant clinical history suggesting cervical incompetence.

Routine Hospitalization; neither stillbirth, neonatal death, or preterm birth were reduced by elective hospitalized bed rest. In fact, significantly more women delivered VLBW infants and infants prior to 34 weeks gestation in the hospitalized cohort.
Intrapartum Management

Presence of skilled obstetric attendants for labor and delivery
Sufficient nursing and neonatal care personnel
Dual-monitoring cardiotocograph
Intrapartum ultrasonic scanning capability
Intravenous access (16–18 gauge)
Premixed oxytocin infusion
Nitroglycerin or terbutaline for uterine relaxation
Methergine or 15–methyl PGF$_2$ a readily available to treat postpartum hemorrhage
Obstetric forceps and vacuum extractor available
Immediate availability of blood and blood products
Anesthesiologist available at delivery and capability for emergency cesarean
Timing of Delivery

The ideal time for delivery of uncomplicated multiple gestations is uncertain but is an important issue in terms of optimizing perinatal outcome.

The incidence of both stillbirth and early neonatal death gradually declined until 37 to 38 weeks gestation for multiples and increased thereafter.
safely prolonging pregnancy requires reliable ultrasonographic evidence of adequate fetal growth, normal amniotic fluid volumes, and reassuring fetal testing as well as a stable maternal condition.

The identification of IUGR, significant discordance, oligohydramnios, maternal preeclampsia, or any other significant maternal-fetal complication after 36 weeks with twins or after 34 weeks with triplets should be a specific indication for delivery.
Route of Delivery

The preferred route of delivery for multiples usually is determined based on presentation, which for twins is generally categorized into three large groups:

Twin A vertex, twin B vertex
Twin A vertex, twin B nonvertex
Twin A nonvertex
40% of twin gestations
More than 80% of vertex/vertex-presenting twin gestations are successfully delivered vaginally
vaginal delivery is associated with a lesser degree of respiratory distress and pulmonary disease in the neonatal period
40% of twin gestations

Vaginal delivery of the nonvertex second twin by breech extraction appears to be the best approach for infants over 1,500 g.
Decisions on cesarean birth versus vaginal birth for nonvertex second twins less than 1,500 g should be based on the specific clinical situation and the experience of the staff involved.

A successful vaginal delivery rate of 98% with an overall complication rate of only 1%, which represented three fractured humeri, two episodes of fetal distress, and two cord prolapses.
20% of twin gestations

the most commonly employed mode of delivery is cesarean. Vaginal delivery may be an option based on the experience of the staff, the consent of the patient, and the capability for emergency cesarean delivery.
Triplets and Higher-Order Multiples

Cesarean is the most commonly recommended mode of delivery for triplets. Optimal cases for vaginal delivery would be those with triplets estimated to weigh more than 1,500 g each and with at least the first two triplets in a vertex presentation.
Interval Between Deliveries

Delays of more than 1 hour have not been associated with adverse outcomes for the second twin as long as continuous fetal heart rate monitoring is employed.

Complications: premature placental separation and prolapse of the umbilical cord

Oxytocin infusion

The amniotic sac can be ruptured grossly if the fetal head is well applied to the cervix or leaked with a spinal needle if the vertex is not well applied
Delayed Interval Delivery

diamniotic, dichorionic twin gestation where the loss of the presenting fetus is the consequence of extrusion following either PPROM or true cervical incompetence

separate implantations associated with mullerian anomalies, such as didelphic uterus

deliveries complicated by advanced preterm labor vaginal bleeding suggestive of placental abruption
Contraindications; significant hemorrhage, hemodynamic instability, intraamniotic infection, and monochorionic placentation

Risks; intrauterine infection, maternal sepsis, hemorrhage, and prolonged hospitalization

Delayed interval delivery;
- rescue cerclage
- perioperative tocolysis (indomethacin)
- broad-spectrum antibiotic; Specific pathogens such as gonorrhea, chlamydia, and group B streptococci should be identified and treated
- Following delivery of the first fetus, the umbilical cord is tied, cut short, and allowed to retract back into the uterus
mother should be monitored closely during the initial hours after delivery
Intravenous oxytocin should be administered
fundus should be regularly assessed
Lactation consultation
Follow-up and support for the mother in the early weeks after delivery are important
Postpartum depression is more common in women who are delivering multiples, and surveillance for this important complication should be ongoing.