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Disseminated Intravascular Coagulation (DIC)

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Course Description:

This course focuses on participants gaining a better understanding of Disseminated Intravascular Coagulation (DIC), the issues it brings to health care organizations, while providing participants with a practice setting to examine and develop their own skills. Education is empowering. DIC is a detrimental disease process that is life threatening for the women it effects.

Approximate Time to Complete: 100 minutes

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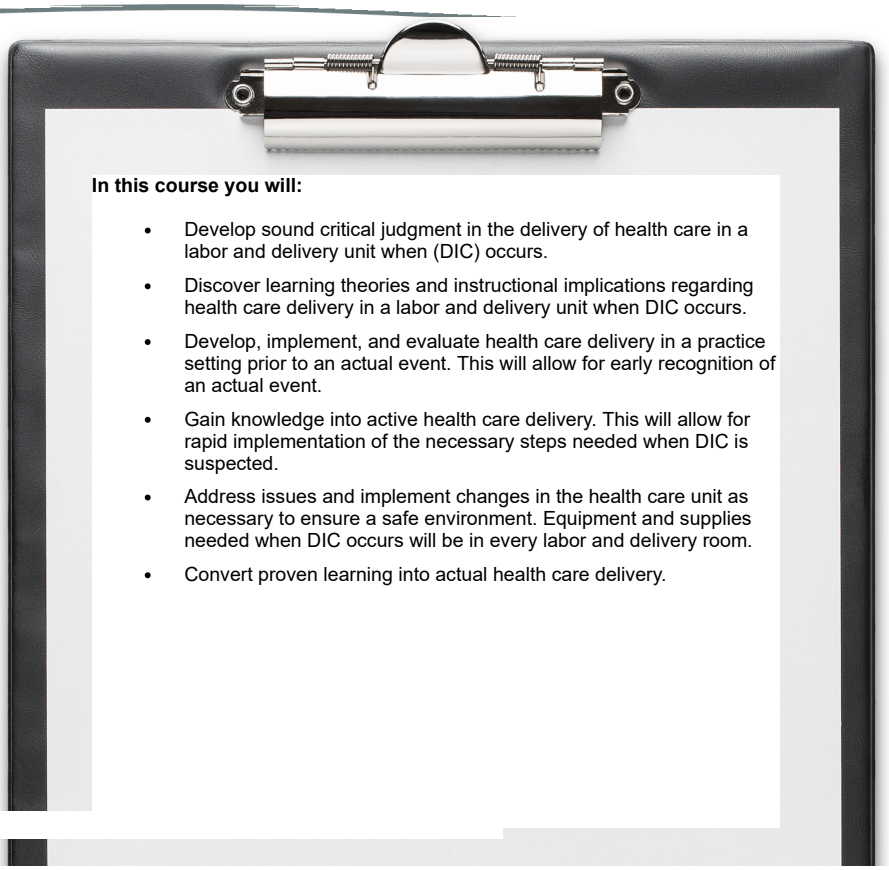


In this course you will:

- Develop sound critical judgment in the delivery of health care in a labor and delivery unit when (DIC) occurs.
- Discover learning theories and instructional implications regarding health care delivery in a labor and delivery unit when DIC occurs.
- Develop, implement, and evaluate health care delivery in a practice setting prior to an actual event. This will allow for early recognition of an actual event.
- Gain knowledge into active health care delivery. This will allow for rapid implementation of the necessary steps needed when DIC is suspected.
- Address issues and implement changes in the health care unit as necessary to ensure a safe environment. Equipment and supplies needed when DIC occurs will be in every labor and delivery room.
- Convert proven learning into actual health care delivery.

Disseminated Intravascular Coagulation (DIC)

A pathologic disruption of the finely-coordinated process of hemostasis

- Massive activation of the clotting cascade results in widespread thrombosis, which leads to depletion of platelets and coagulation factors and excessive thrombolysis.
- This can result in hemorrhage, thrombosis, and/or multi-organ failure.
- A major medical challenge occurs when a woman presents with DIC and is further challenging when she is carrying a viable fetus..
- In the interest of the pregnant woman with DIC and heavy bleeding, performing an emergency cesarean delivery may not be appropriate. However, a category fetal heart rate (FHR) tracing and delaying delivery to transfuse the woman may not be in the best interest of the fetus.
- Labor and delivery of a fetal demise in a woman with DIC has the possibility for disastrous hemorrhage.

Occurrence of Disseminated Intravascular Coagulation (DIC)

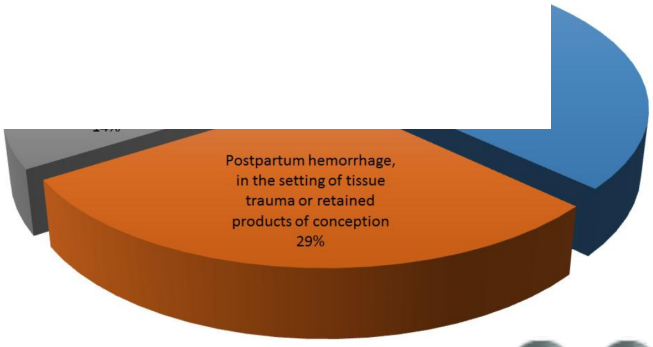
Rollover each marker to learn about studies in different countries.

- DIC in pregnancy has a prevalence of less than 0.5% [1, 2, & 3].
- Several large population - based studies illustrate the prevalence.

Occurrence

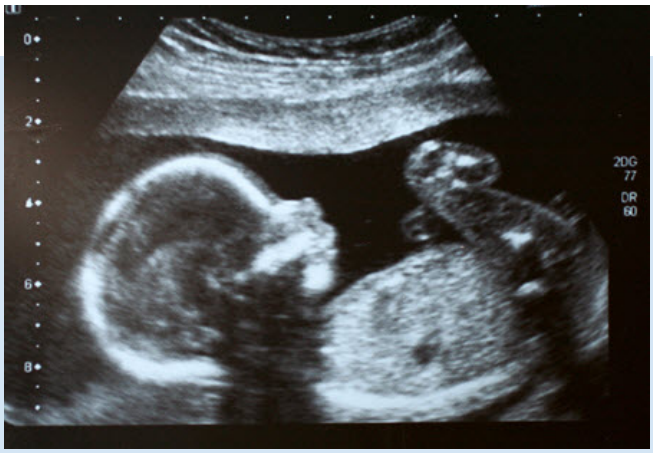
- DIC does not occur in isolation.
- Pregnancy complications that may trigger and propagate DIC were evaluated in a review of 49 cases of DIC [2].
- Antecedent conditions included the following:
- Abruptio placentae – 18 cases (37 percent)
- Postpartum hemorrhage, in the setting of tissue trauma or retained products of conception – 14 cases (29 percent)
- Preeclampsia/eclampsia/HELLP – 7 cases (14 percent)
- Acute fatty liver of pregnancy – 4 cases (8 percent)
- Amniotic fluid embolism – 3 cases (6 percent)
- Sepsis – 3 cases (6 percent)
- The fetus died in one-quarter of these cases

Click the chart to enlarge it.



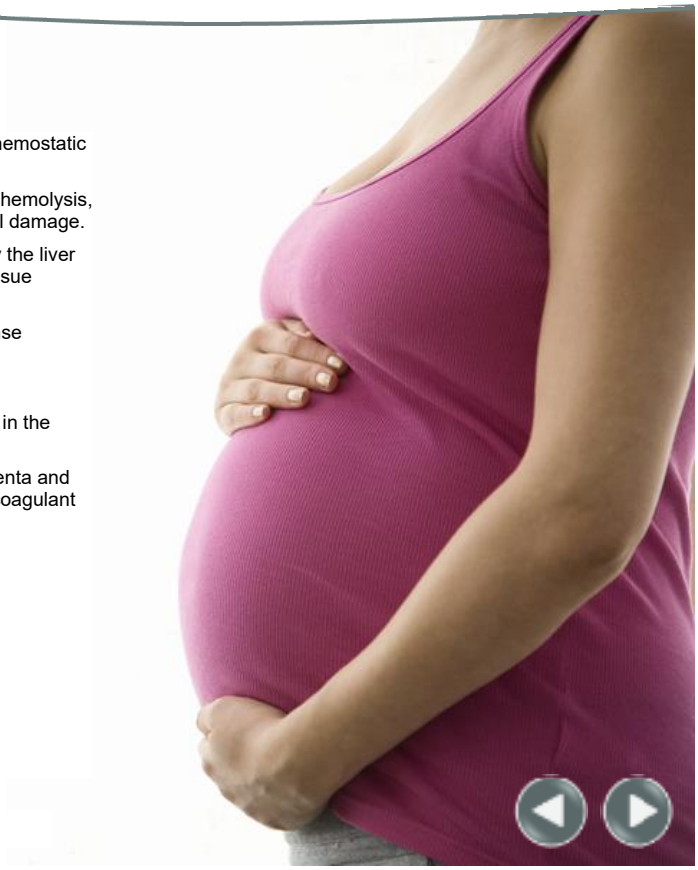
- Severe hemorrhage, itself, does not cause DIC but severe postpartum hemorrhage can be associated with DIC.
- The loss of clotting factors, platelets plus the generation of large amounts of fibrinogen products interfere with fibrin clot formation and platelet aggregation causing the bleeding in DIC.
- When severe postpartum hemorrhage occurs rapidly the depletion of clotting factors and platelets leads to consumptive coagulopathy; this is not DIC.
- When large amounts of tissue factor are released during severe postpartum hemorrhage it can be accompanied by true DIC [6].
- Following separation of the membranes and placenta, uterine decidual-derived tissue factor is normally released into the maternal circulation, activates the coagulation cascade, and generates thrombin [7,8].
- There are various causes (i.e. large laceration, placenta accreta) of postpartum hemorrhage that are associated with large release of tissue factor, resulting in intense physiologic intravascular coagulation process initiated by placental separation occasionally leading to DIC.
- Approximately 1-5% of all DIC cases are attributed to obstetric hemostatic emergencies in high - resource countries and even higher percent in low - resource countries [9].
- The remaining cases are due to nonobstetric causes.
- Causes of DIC not specific to pregnancy should be considered, especially when an obvious pregnancy-associated cause is absent [10,11].
- The most common events that initiate DIC in the general population are sepsis, tissue trauma/destruction, and cancer (Table 1).

Click on the image to view Table 1.



- Levels of some coagulation factors increase to prevent excessive peri-partum bleeding during pregnancy.
- In addition to systemic changes in coagulation factors, decidual cells lining the vascular bed of the placenta strongly express tissue factor, similar to other vascular endothelial cells [12,13].
- At the site of decidual trama the tissue factor is released to initiate the coagulation cascade which generates thrombin and thus crosslinked fibrin.
- Physiologic inhibitors of coagulation serve to prevent excessive fibrin generation.
- When DIC ensues the excessive production of thrombin leads to widespread intravascular fibrin deposition and widespread fibrinolysis.
- The result is a depletion of coagulation factors and platelets along with the production of fibrin degradation products leading to profound bleeding diathesis (**Figure 1**).
- These changes overwhelm and incapacitate the physiologic regulatory mechanisms and lead to thrombin not being contained.
- The uncontrolled and ongoing fibrin deposition may lead to thrombosis, end organ damage and failure.

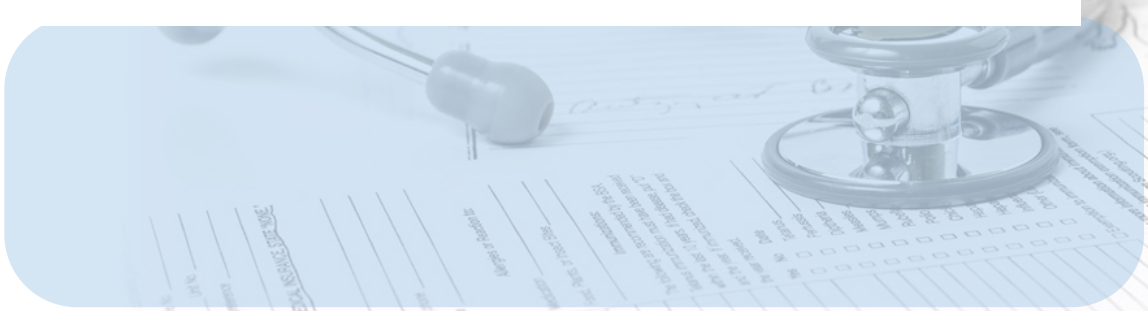
- DIC can be exacerbated by additional pregnancy complications and worsen hemostatic defects, although the mechanisms are not clear.
- Events occuring in pregnancy such as preeclampsia, eclampsia and HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome may contribute to endothelial damage.
- Acute fatty liver may impair the production of coagulation factors produced by the liver and impair clearance of fibrin degradation products and shock may reduce tissue perfusion.
- When sepsis occurs the interaction of DIC with systemic inflammatory response syndrome plays a role in the pathogenesis of DIC [15].
- Hemorrhage alone does not cause DIC.
- In the setting of shock, severe tissue hypoxemia has been proposed to result in the release of tissue factor from the damaged cells [14].
- When significant injury or necrosis of fetoplacental tissue, as in abruptio placenta and retained fetal demise, occurs this cascade may be initiated by release of procoagulant substances leading to fulminant DIC.
- Amniotic fluid is also rich in procoagulants and anticoagulants [14].



Etiology Cont'd

- One of the following pregnancy complications may be present with DIC:
  - Abruptio placentae
  - Severe preeclampsia/eclampsia/HELLP syndrome
  - Amniotic fluid embolism (AFE)
  - Acute fatty liver of pregnancy
  - Septic abortion
  - Retained dead fetus
  - Massive hemorrhage
- Patients may present with severe bleeding (i.e. vaginal, intrauterine, intraabdominal) and/or diffuse oozing of blood from skin (i.e. at intravenous sites) or mucosa (i.e. from a bladder catheter).
- Some patients have signs of shock
  - tachycardia
  - hypotension
  - weak peripheral pulses
  - altered mental status
  - cool extremities
  - narrow pulse pressure (< 25 mmHg)
  - organ dysfunction
    - acute renal failure
    - hepatic dysfunction
    - acute lung injury
    - neurologic dysfunction

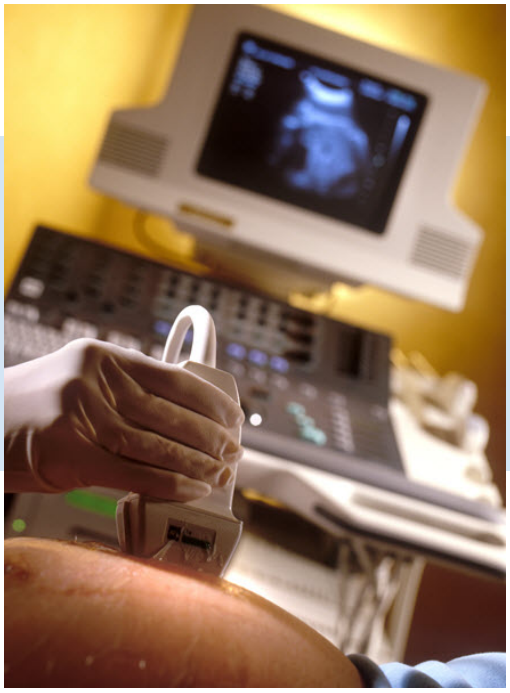
- Laboratory findings of DIC generally include prolongation of coagulation times and thrombocytopenia.
- These laboratory findings are interpreted for the pregnant woman which can be different from the nonpregnant woman (Table 2), which are sometimes different from values in nonpregnant women.
- **Prolongation of the prothrombin time (PT) and activated partial thromboplastin time (aPTT)**
- **Hypofibrinogenemia**
- **Increased D-dimer**
- **Thrombocytopenia**
- **Prolonged thrombin time**



Rollover the bold green words aboves to learn more about each.

Clinical Evaluation

- When there is ongoing hemorrhage, shock or fetal distress the evaluation for DIC may need to occur concurrently with initial management of the specific disorder(s).
- Many pregnancy-associated causes of DIC are obvious from the history and physical examination.
- Additional findings of sepsis, malignancy, and liver failure should be sought, especially if the cause is not obviously apparent.
- Maternal vital signs are monitored closely.
- Fetal assessment as with every pregnant women.



- Laboratory testing includes the following:
  - Complete blood count with platelet count
  - Coagulation studies including prothrombin time (PT), activated partial thromboplastin time (aPTT), fibrinogen level, and D-dimer.
  - BUN and creatinine
  - Liver function tests (LFT)
  - Urine output and blood loss should be monitored closely.
- Prior to the return of the first set of laboratory studies, a red top tube (ie, no additives) containing 5 mL of blood can be observed for clotting (Lee and White test).
  - At room temperature, if the blood in the tube clots within 8 to 10 minutes and the clot remains intact, the patient likely has adequate fibrinogen stores.
  - If the blood in the tube does not clot or an initial clot dissolves, it is likely that the patient is markedly deficient in key clotting factors.
- Although rarely necessary in the obstetric setting where DIC is typically fulminant, serial laboratory assessments over a few hours showing progressively prolonged coagulation times, decreasing platelet counts, increasing values for D-dimer and/or fibrin-degradation products, and falling fibrinogen levels can help distinguish mild DIC from normal pregnancy-related changes in these laboratory values.
- Blood and urine cultures should be performed in patients with suspected sepsis.
- In cases where intrauterine infection is suspected, amniotic fluid culture is appropriate.

Criteria for Diagnosis

- DIC is a clinical diagnosis
- There is no single highly sensitive or specific test.
- The diagnosis of acute DIC is made in a pregnant woman when the clinical setting is appropriate such as placenta abruption, AFE, or sepsis, and there is thrombocytopenia, prolonged PT, aPTT, low fibrinogen, and fibrinolysis (increased D-dimer) when another cause in not evident.
- When DIC is suspected, collaborating and consulting with specialists is recommended to confirm the diagnosis and to eliminate other possibly life-threatening causes of the findings such as thrombotic thrombocytopenic purpura (TTP).

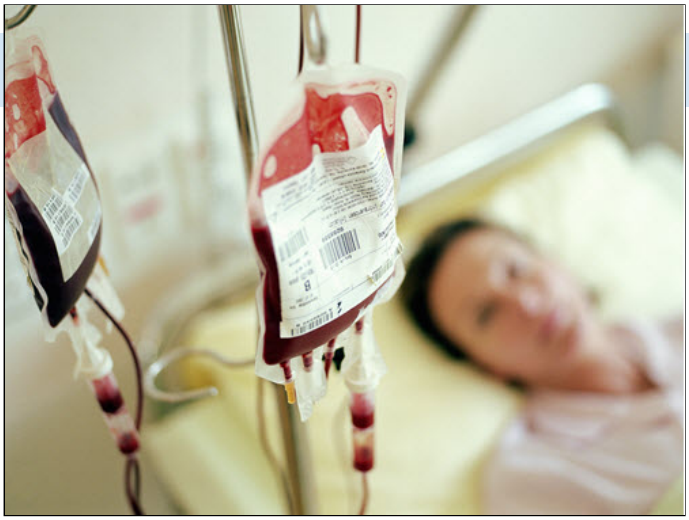
Scoring Systems

- Scoring systems have been developed and have been used in research studies to diagnose DIC in nonpregnant women as there is no single diagnostic test to confirm or reject this diagnosis.
  - The scoring system usefulness in pregnancy in unknown.
- An important limitation for any DIC scoring system is that these systems are only intended to be used in the appropriate clinical setting.

Differential Diagnosis

- When considering the differential diagnosis, other causes of bleeding, thrombosis, and organ damage must be consider in the pregnant woman.
  - Bleeding, thrombosis, and/or organ damage can accompany DIC or contribute to DIC pathogenesis
- Resolution of DIC may result with treatment for the underlying cause.

There are numerous factors with the management of pregnant women with vaginal bleeding in the second and third trimesters including gestational age, the cause of bleeding, the severity and fetal status.



Management - Quick Overview

Notify staff and services that will or may be needed:

- Anesthesia
- Neonatology
- Blood bank
- Surgery
- Obstetrics
- Pelvic Surgery
- Maternal Fetal Medicine
- Gynecologic Oncology
- Interventional Radiology
- General Surgery

Many of the interventions will be appropriate in acutely ill patients even if the etiology of hemorrhage is uncertain, and these can be initiated while the diagnostic evaluation is ongoing.

1	2	3	4	5	6	7	8	9	10	11	12

Click each number in order to learn more.

- DIC, when pregnant, often leads to severe hemorrhage and the mortality depends on the ability to reverse the underlying cause as rapidly as possible.
- Most patients with DIC due to pregnancy-related complications rapidly improve with delivery and treatment of coagulopathy.
- In cases of acute fatty liver of pregnancy, however, resolution of DIC can take as long as four to five days postpartum because of ongoing liver dysfunction [32]

Maternal

Neonatal

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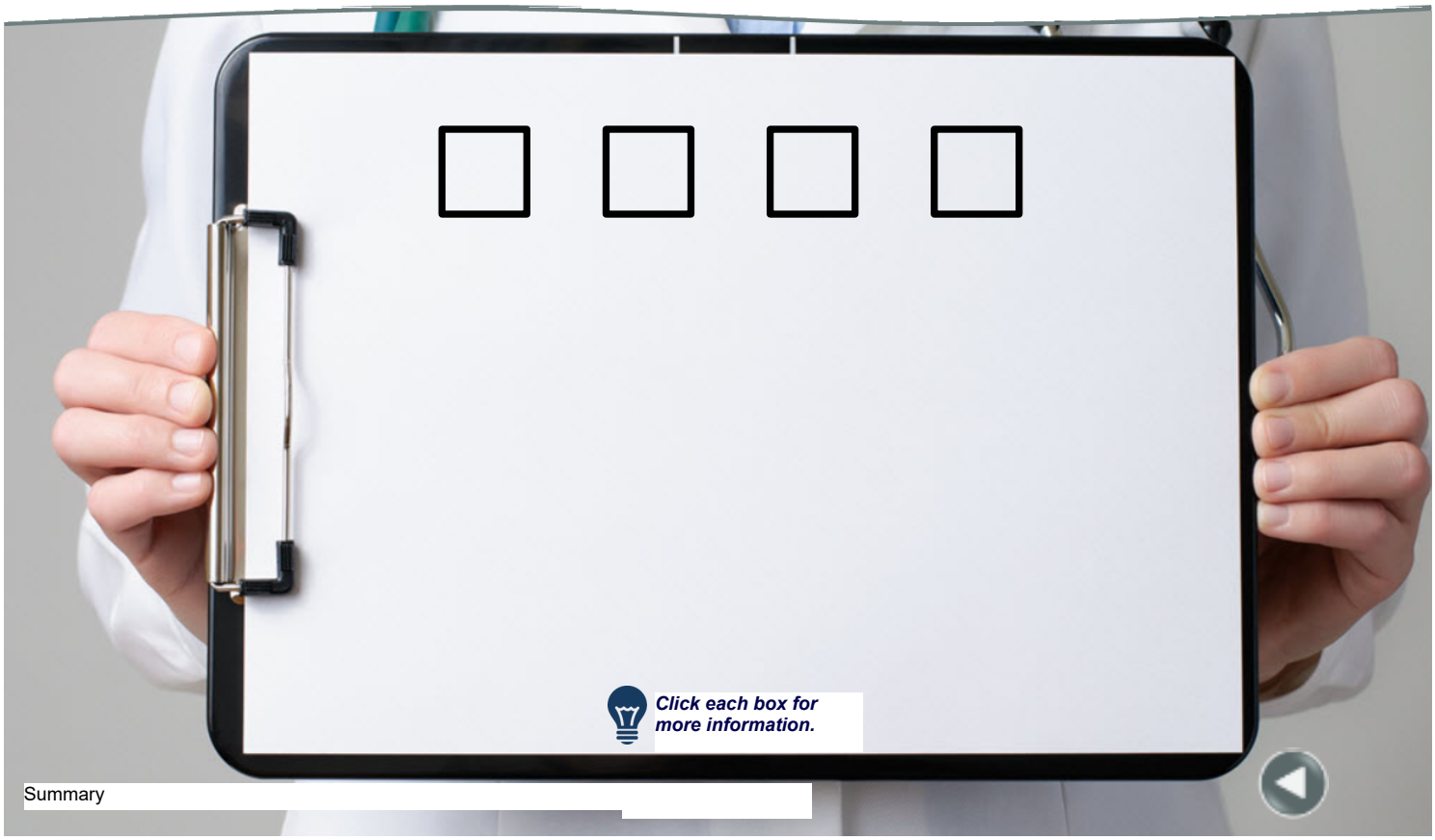

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Click on the above 'X' to take the post-test for this course.
If you do not attain a passing score after two attempts at the post-test the entire program must be repurchased.

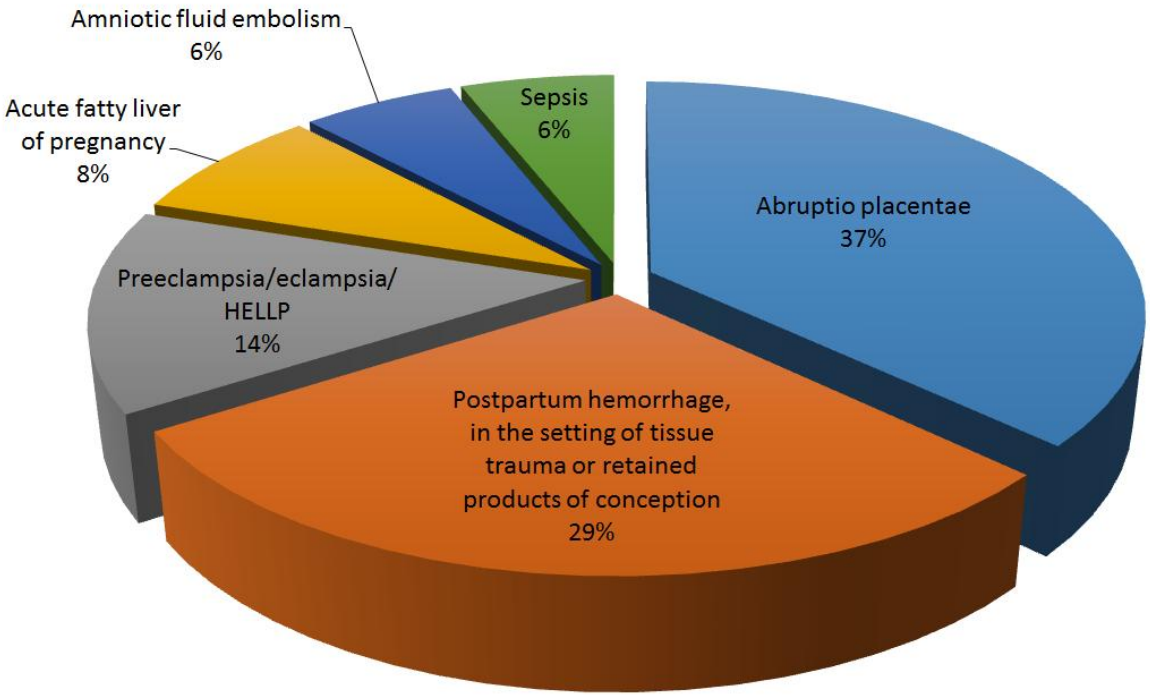
Amniotic fluid embolism
6%
Sepsis
6%
Acute fatty liver
of pregnancy
8%
Abruptio placentae
37%
Preeclampsia/eclampsia/
HELLP
14%
Postpartum hemorrhage,
in the setting of tissue
trauma or retained
products of conception
29%

Table 1

Events that Initiate DIC				
Septiciemia-Gram Negative and Gram Positive	Crush injury or complicated surgery	Severe Head Injury	Abdominal aortic aneurysm	Peritoneovenous shunt
Cancer procoagulant (Trusseau's Syndrome)	Acute leukemia, especially promyelocytic	Amphetamine overdose	Giant hemangioma (Kasaback-Merritt Syndrome)	Acute hemolytic transfusion reaction (ABO incompatibility)
Complications of pregnancy: • Amniotic fluid embolism • Abruption • HELLP syndrome • Eclampsia and severe preeclampsia • Septic abortion	Paroxysmal nocturnal hemoglobinuria	Snake or viper venoms	Liver disease: Fulminant hepatic failure Reperfusion after liver transplant	Heat Stroke
Burns	Pupurs fulminans	Events that propagate and complicate DIC: • Shock • Complement pathway activation		

Table 2

Test	Normal (reference) range		
	First trimester	Second trimester	Third trimester
Prothrombin time (seconds)	9.7 to 13.5	9.5 to 13.4	9.6 to 12.9
Activated partial thromboplastin time (seconds)	23.0 to 38.9	22.9 to 38.1	22.6 to 35.0
Platelet count ($x10^9$/L)	174 to 391	155 to 409	146 to 429
Fibrinogen (mg/dL)	244 to 510	291 to 538	301 to 696
D-dimer (micrograms/mL)	0.05 to 0.95	0.32 to 1.29	0.13 to 1.7

Table 3

Product (mL)	Contents	Uses and effects
Whole blood (1 unit = 500mL)	RBCs, Platelets, Plasma	Rarely required. Consider when massive bleeding requires transfusion of more than 5 to 7 units of packed red cells.
Red cells + additive solution (1 unit = 350 mL)	Red cells	One unit increases hematocrit by 3 percentage points and hemoglobin by 1g/dL
Frozen plasma (1 unit = 350mL)	All clotting factors, but no platelets	Best uses to correct deficiencies of multiple coagulation factors such as DIC, liver disease, warfarin overdose. When FFP is used to replace a clotting factor, the dose is 10 to 20 mg/kg. The level of any factor, including fibrinogen will raise by approximately 30% which is appropriate for hemostatis.
Cryoprecipitate (1 unit = 10 to 20 mL)	Fibrinogen, factors VIII, XIII, VWF	One unit of cryoprecipitate/10kg body weight will raise plasma fibrinogen by about 50 mg/dL in the absence of heavy bleeding or consumption. The formula for raising plasma fibrinogen by 50 to 100mg/dL is: number of units = 0.2 x bodyweight in kg. Cryoprecipitate is generally provided in pools containing 5 units and most patients receive two pools.
Whole blood-derived and apheresis-derived platelets (1 unit = 200 to 300mL)	Platelets	Five to six units of whole blood derived or one unit of apheresis-derived platelets will raise the platelet count by approximately 30,000/microL in an average size adult.

Table 5

Product (mL)	Contents	Uses and effects
Whole blood (1 unit = 500 mL)	All components	Rarely required. Consider when massive bleeding requires transfusion of more than 5 to 7 units of packed red cells.
Red cells + additive solution (1 unit = 350 mL)	Red cells	One unit increases hematocrit by 3 percentage points and hemoglobin by 1 g/dL.
Frozen plasma (1 unit = 200 to 300 mL)	All clotting factors, but no platelets	Best used to correct deficiencies fo multiple coagulation factors such as DIC, liver disease, massive transfusion, anticoagulation with warfarin or warfarin overdose. If FFP used to replace a clotting factor, the dose is 10 to 20 mg/kg. This dose will increase fibrinogen by approximately 30% which will generally be sufficient for hemostasis.
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Abruption

- Mild to moderate vaginal bleeding, abdominal pain, back pain, and uterine contractions are characteristics of placenta abruption.
- No vaginal bleeding may be present in concealed placental abruption.
- The woman may complain of uterine tenderness during and between contractions. The uterus will have increased tone and rigidity.
- Typical symptom; abnormalities of fetal heart rate (FHR) or fetal demise, and/or DIC support the clinical diagnosis of abruptio placentae.

Preeclampsia

Preeclampsia with severe features has hypertension associated with one or more signs or symptoms with increased maternal and fetal morbidity/mortality.

- When seizures the diagnosis is eclampsia
- Women with hemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome have clinical findings of preeclampsia and the laboratory findings that establish the syndrome.

Preeclampsia with Severe Features

Symptoms of central nervous system dysfunction:

- Altered mental status:
- New onset cerebral or visual disturbance, such as:
- Photopsia, scotomata, cortical blindness, retinal vasospasm
- Severe headache (i.e. incapacitating, "the worst headache I've ever had") or headache that persists and progresses despite analgesic therapy
- Hepatic abnormality:
- Severe persistent right upper quadrant or epigastric pain unresponsive to medication and not accounted for by an alternative diagnosis or serum transaminase concentration ≥ twice normal, or both
- Severe blood pressure elevation:
- Systolic blood pressure ≥160 mmHg or diastolic blood pressure ≥110 mmHg on two occasions at least four hours apart while the patient is on bedrest (unless the patient is on antihypertensive therapy)
- Thrombocytopenia:
- <100,000 platelets/microL
- Renal abnormality:
- Progressive renal insufficiency (serum creatinine >1.1 mg/dL or doubling of serum creatinine concentration in the absence of other renal disease)
- Pulmonary edema

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Amniotic Fluid Embolism

Amniotic fluid embolism (AFE) is characterized by the exceedingly sudden onset of hypotension due to cardiogenic shock, hypoxemia, respiratory failure, and coma or seizures during labor or immediately postpartum.

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Acute Fatty Liver of Pregnancy

- The initial presentation of acute fatty liver of pregnancy (AFLP) includes nausea or vomiting in 75 percent of women, abdominal pain in 50 percent of women, and anorexia, and jaundice.
- Signs of preeclampsia present at some time during the course of illness in approximately one-half of the women.

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Retained Fetal Demise

Retained fetal demise is diagnosed by ultrasound imaging that confirms the absence of the fetal heart rate, overlapping skull bones, gross distortion of fetal anatomy due to maceration, and soft tissue edema.

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Septic Abortion

Characteristics of septic abortion include abdominal and/or pelvic pain, malodorous vaginal discharge, fever and chills, bleeding or spotting, and uterine or adnexal tenderness following a spontaneous or induced abortion.

Hemodynamically stable mother with dead or nonviable fetus

- The goal is to minimize maternal morbidity and mortality risk when the fetus is dead or has a very poor prognosis (gestation is less than 23-24 weeks, lethal or life threatening congenital anomaly, preterminal FHR tracing).
- This often, but not always, means avoiding cesarean delivery due to the risk of uncontrollable hemorrhage from surgical incisions and lacerations.
- Delivery is initiated and the mother is supported with crystalloid, with or without colloids, and blood products.
- The trigger for DIC is removed upon delivery in many obstetrical cases, causing the myometrium to contract (involution of the uterus), thus removing both the major sources and site of hemorrhage.
- Dilation and extraction (D&E) is a good option in the second trimester for rapid uterine evacuation if the clinician is skilled in this procedure.
- Women able to labor should be induced if not already in labor or augmented if not progressing rapidly.
- When the cervix is not favorable, the use of either a mechanical method of ripening (balloon catheter or hygroscopic dilator) or a pharmacologic method of induction (misoprostol or oxytocin).

Vaginal Delivery

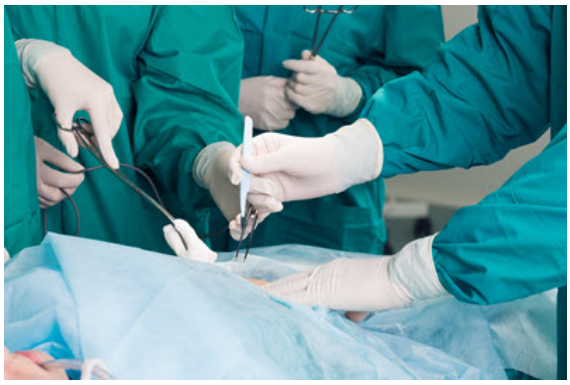
- The safest maternal option may not be vaginal delivery when hemodynamic instability from ongoing brisk uterine bleeding is occurring, nor if the mother would be endangered by vaginal delivery (for example, prior classical hysteretomy).
- In these cases, cesarean delivery is indicated to save the mother's life.
- Cesarean delivery is also indicated if prompt delivery has the potential to reduce fetal morbidity and mortality.

Cesarean Delivery

- Not always possible, but desirable to correct and improve the clotting abnormality prior to cesarean delivery.
- If there were a delay in operative intervention this could lead to worsening of coagulopathy, further blood loss, and potential fetal death.
- However, immediate operative intervention in a woman with severe hypovolemia and DIC could prove fatal to the woman.
- When cesarean delivery is imminent, then RBC's, FFP, platelets, and cryoprecipitate should be readily available in the operating room and administer if there is clinical or laboratory evidence of impaired coagulation. With cesarean birth, bleeding without clotting from the incision and needle sites is a clinical sign of coagulopathy.
- When bleeding is severe there is no need to wait for laboratory studies, the FFP and cryoprecipitate should be given immediately.

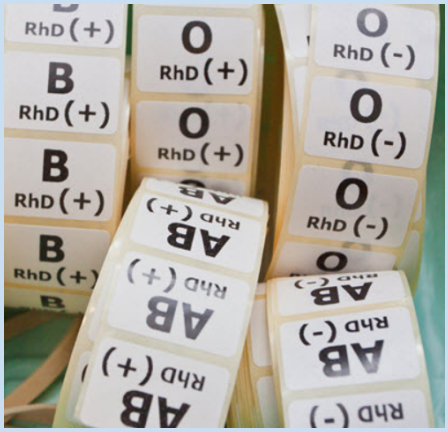
Hysterectomy

- As a last resort in a woman desiring childbearing preservation, hysterectomy is performed, but should be initiated sooner than later when future pregnancy is not planned.
- Delaying hysterectomy increases blood loss and frequency of complications.
- Despite rescue measures some patients will enter a lethal downward spiral characterized by hypothermia, coagulopathy and metabolic acidosis.
- Criteria proposed for this moribund state include pH <7.30, temperature <35 degrees Celsius, combined resuscitation and procedural time >90 minutes, non-mechanical bleeding, and transfusion requirement >10 units packed RBCs [29]
- To stop the cycle, the bleeding area can be tightly packed using a pelvic pressure pack or lap sponges [30].
- The abdominal wound, including the fascia, is left open and a pressure dressing is applied.
- Towel clips have been utilized to temporarily re-approximate the skin/subcutaneous tissue.



Management - Transfusion

- Fully typed and cross-matched red blood cells (RBCs) requires at least 20 minutes.
- Transfusion may begin immediately using type 0, Rh(D)-negative RBCs. When fully typed and cross-matched RBCs are available switch to this type specific.
- When transfusion is necessary prior to obtain type-specific fresh frozen plasma (FFP), type AB FFP, either Rh(D) positive or negative can be safely used.



Bedside Responsibilities

Blood Bank Responsibilities

Nursing Responsibilities

Transfusion Targets

Laboratory Testing

Review of massive transfusion protocol events by transfusion services

Attending Physician, Surgeon, or Anesthesiologist Responsibilities

Click each blue term above to learn more.

Massive Transfusion Policy

- The massive transfusion protocol (MTP) is a multidisciplinary process whereby blood and blood components are obtained rapidly for an exsanguinating patient.
- The MTP is initiated as soon as possible reporting to the physician in charge of the transfusion service (TS MD) by the blood bank staff or patient care provider.
- The TS MD serves as a consultant in the evaluation and management of the patient's transfusion therapy during the massive transfusion episode.

Example reasons for initiation:

- Replacement of at least one blood volume (8 to 10 red blood cell units in a 70 kg adult) within 24 hours or at least one half blood volume within 2 hours
- Life-threatening trauma presenting to the emergency department
- Unexpected or anticipated surgical blood emergencies
- Severe obstetrical hemorrhage

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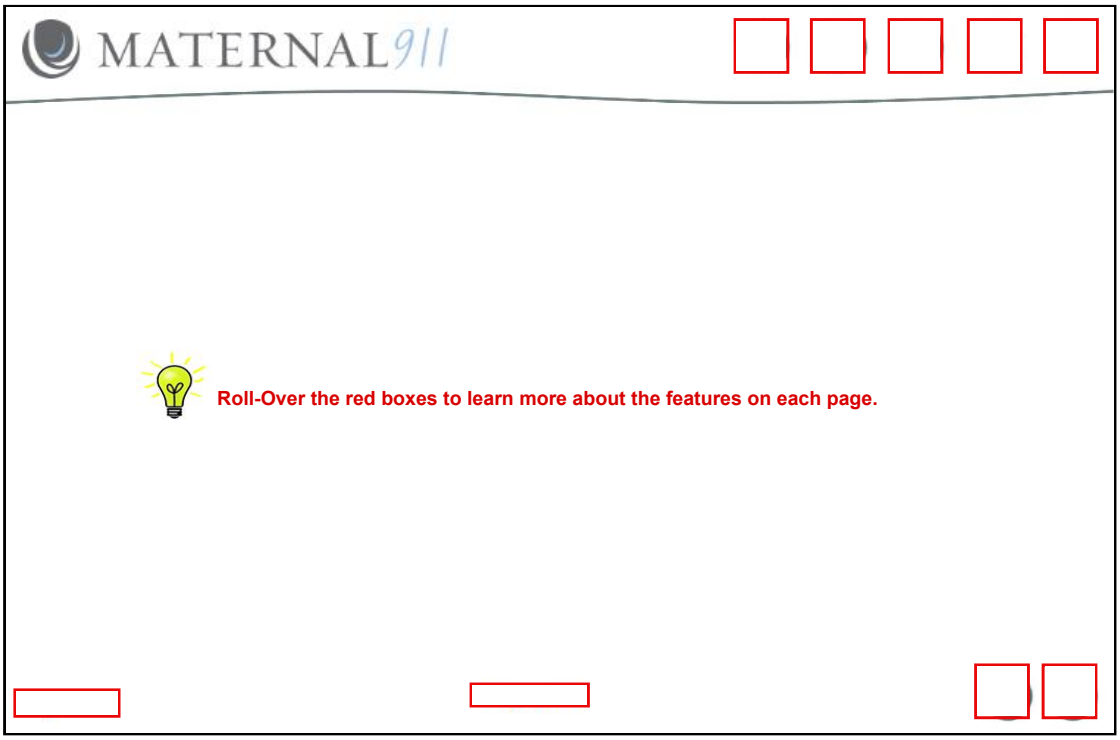

References

1. Callaghan Creanga AA, Kukllina EV. Severe maternal morbidity among delivery and postpartum hospitalisations in the US. Obstet Gynecol 2012; 120: 1029

2. Rattray DD, O'Connel CM, Baskett TF. Acute disseminaqted intrqavascular coagulation in obstetrics: a tertiary centre population review (1980 to 2009). J Obstet Gynaecol Can 2012; 34:341.

3. Erez O, Novack L, Beer-Weisel R, et al. DIC score in pregnant women-- a population based modification of the International Society on Thrombosis and Hemostasis score. PLoS One 2014; 9:e93240.

4. Gilbers WM, Danielsen B. Amniotic fluid embolism: decreased mortality in a population-based study. Obstet Gynecol 1999; 93:973.

5. Sibai BM, Ramdan MK, Usta I, et al. Maternal Maternal morbidity and mortality in 442 pregnancies with hemolysis, elevated liver enzymes, and low platelets (HELLP syndrome). Am J bstet Gynecol 1993; 169: 1000.

6. Earez O, Mastrolia SA, Thachil J. Disseminated Intravascular coagulations in pregnancy: insights in pathophysiology, diagnosis and management. Am J Obstet Gynecol 2015.

7. Bonnar J, Prentice CR, McNicol GP, Douglas AS. Haemostatic mechanism in the uterine circulation during placental separation. Br Med J 1970; 2:564.4.

8. Bonnar J, McNicol GP, Douglas AS. Coagulation and fibrinolytic mechanisms during and after normal childbirth. Br Med J 1970; 2:200.

9. Levi M. Disseminated intravascular coagulation (DIC) in pregnancy and the peri-partum period. Thromb Res 2009; 123 Supple2:263.

10. Takai H, Kondoh E, Sato Y, et al. Disseminated intravascular coagulation as the presenting sign of gastric cancer during pregnancy. J Obstet Gynaecol Res 2011; 37:1717.

11. Morimatsu Y, Matsubara S, Hirose N, et al. Acute promyelocytic leukemia: an unusual cause showing prolonged disseminated intravascular coagulation after placental abruption. Arch Gynecol Obstet 2008; 277:267.

12. Lockwood CJ, Murk W, Kayisli UA, et al. Progestin and thrombin regulate tissue factor expression in human term decidual cells. J Clin Endocrinol Metab 2009; 94:2164.

Links

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