Clinical Strategies for Avoiding and Controlling Hemorrhage and Anemia Without Blood Transfusion in Obstetrics and Gynecology*

GENERAL PRINCIPLES OF NONBLOOD OB/GYN MANAGEMENT

1. **Formulate an individualized management plan** to facilitate rapid decision making. Exercising clinical judgment, be prepared to modify routine practice (e.g., expeditious control of bleeding, early use of oxytocic drugs, erythropoietin therapy). Planning, prevention, and minimization of blood loss using appropriate multiple interventions are the cornerstones of management without blood transfusion.
2. **Discuss the risks and benefits** of anticipated or potential procedures with the patient.
3. **Ensure the availability of well-trained personnel,** drugs, and equipment for prevention and prompt control of hemorrhage. Considering the available blood management options, refer the patient to another institution if better resources are available elsewhere.
4. **Adopt an organized, multidisciplinary team approach.** Early recognition of complications and immediate involvement of appropriate specialists (e.g., obstetric, gynecologic, vascular, or general surgery; anesthesiology; hematology; intensive care; internal medicine; neonatology/perinatology; nursing; radiology; or urology) experienced in clinical management without transfusion may be essential.
5. **Communicate the plan of care** to all personnel, including the surgical backup team, to avoid treatment delays. Where there are multiple conditions treated by multiple physicians, ongoing interspecialty communication is particularly important.
6. **Maintain frequent, close surveillance for signs and symptoms of postpartum or postoperative bleeding** to facilitate early intervention. Recognition of risk factors before and during labor/delivery may help clinicians to identify women who require appropriate preventive measures and extra vigilance. Nonetheless, complications may occur suddenly and unexpectedly in any patient, even those thought to be at low risk.
7. **Prompt skillful intervention to prevent/control blood loss can be lifesaving.** The clinical urgency of low-level persistent bleeding may not be recognized until compensatory mechanisms fail and blood pressure falls. In general, avoid a "watch and wait" approach to the bleeding patient.
8. **Transfer** a stabilized patient to a major center, if necessary, **before the patient's condition deteriorates.**

GENERAL THERAPEUTIC PRINCIPLES

1. Thorough history taking, physical examination, and judicious laboratory investigation improve the estimation of risks and facilitate planning and preparation to prevent and control blood loss.
2. Optimize red cell mass preoperatively and during pregnancy. Institute early, aggressive treatment of anemia postoperatively or postpartum.
3. Rapid arrest of blood loss must be a management priority. In the face of severe obstetric hemorrhage, early recourse to definitive surgical or obstetric measures to control bleeding can be lifesaving.
4. In uncontrolled hemorrhage, avoid aggressive fluid resuscitation to restore blood pressure to a normal range until bleeding is controlled.
5. Prevent or treat coagulation disorders promptly.
6. Use appropriate intraoperative blood conservation techniques.
7. Minimize the volume of blood drawn for laboratory analysis during the perinatal or perioperative period.
8. Normovolemic anemia can be well tolerated in hemodynamically stable patients.

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1. CLINICAL EVALUATION/PREOPERATIVE PLANNING[1,2]

A. Medical History and Physical Examination

1. **History of Anemia**
2. **Hereditary or Acquired Bleeding Disorders**[3-5]
   a. Family and personal history of abnormal hemostasis or bleeding
      (1) Easy or spontaneous bruising
      (2) Frequent nosebleeds or unexplained bleeding gums
      (3) Bleeding after tooth extractions
      (4) Surgical history, including postoperative bleeding (e.g., after adenoidectomy)
      (5) Gynecologic history, including menstrual history, especially menorrhagia
      (6) Obstetrical history, including complications or previous antepartum or postpartum bleeding[6]
3. **Coexisting Disease**
   a. Identify disease or conditions that may affect coagulation, hematopoiesis, or clinical management (e.g., renal, hepatic, cardiac, or pulmonary)
4. **Medication History**
   a. Current medications and identification of prescription or nonprescription drugs that may adversely affect hemostasis (e.g., anticoagulants, platelet aggregation inhibitors, preparations containing ASA or NSAIDs, antibiotics, herbal medications)[7,8]
   b. Drug allergies
5. **Physical Examination**
   a. Investigate manifestations of disease known to be associated with hemostatic dysfunction (e.g., purpura, petechiae, ecchymosis, hepatomegaly, splenomegaly)

Note: Clinicians should have a high index of suspicion of a bleeding disorder in women with persistent menorrhagia sufficient to cause iron deficiency or a history of bleeding after hemostatic challenge.[9]

B. Selective Laboratory Assessment[10-14]

1. **Investigation of Anemia**
   a. Complete blood count (including red cell indices, reticulocyte count)
   b. Iron status[15] (e.g., serum ferritin, serum transferrin receptor)
2. **Assessment of Bleeding Risk**
   a. Bleeding risk may be suggested by the medical history, clinical data, current medications, or degree of hemostatic challenge
      (1) PT, PTT, template bleeding time
      (2) More detailed coagulation studies to identify clotting disorders, including specific coagulation factor assays (e.g., von Willebrand's disease)

Notes:

1. Specific laboratory tests may be suggested by the medical history and the degree of anticipated hemostatic challenge, e.g., major surgery, childbirth.
2. Women with mild coagulation abnormalities detected in early labor may be at higher risk of postpartum hemorrhage.[16]
3. Conditions that increase risks of complications may warrant prompt referral of the patient to a specialist with experience in management without blood transfusion.

2. OPTIMIZE RED BLOOD CELL MASS AND COAGULATION STATUS

A. Correct Hematinic Deficiencies

1. **Iron**[17-23] (oral/parenteral)
2. **Folic Acid**[24]
3. **Vitamin B_{12}**[25,26]

Notes:

1. Consider prophylactic hematinic administration.[27-31]
2. Bioavailability of oral iron may be improved with concomitant administration of ascorbic acid.[32,33] Oral iron absorption may be decreased by concurrent use of milk products, egg yolks, coffee, tea, antacids, calcium supplements, or fiber.[34]
3. Intravenous iron as a total dose infusion in normal saline may replenish iron stores more quickly and efficiently than oral iron therapy.[35-40]
4. Parenteral iron should be considered for patients with low iron stores, intolerance to oral iron, inadequate absorption, or chronic or severe blood loss or for patients who are noncompliant.[41] Consider iron sucrose, sodium ferric gluconate complex (or other parenteral iron products) instead of iron dextran to reduce risk of anaphylaxis. If iron dextran is used, administer a test dose.

B. Recombinant Erythropoietin (r-HuEPO) Therapy

1. **Preoperative Optimization of RBC Mass**
   a. Consider preoperative use of r-HuEPO to optimize red blood cell (RBC) mass in women scheduled for procedures associated with risk of significant blood loss[42-46]
2. **Erythropoietin Therapy in Pregnancy**
   a. r-HuEPO has been administered to pregnant patients in the third trimester to increase RBC mass without any maternal, fetal, or neonatal adverse effects[47-54]

Notes:

1. Rate of response to r-HuEPO is dose dependent and varies among patients. Poor response may be overcome by dose escalation.[55,56]
2. Iron deficiency (or other hematinic deficiency) may diminish or delay response to r-HuEPO therapy.[57-59] Virtually all patients should receive iron to support erythropoiesis stimulated by multiple-dose r-HuEPO therapy adequately. Consider r-HuEPO and intravenous iron for severely anemic patients.[60] (See notes following ***2.A.***)
3. Monitor for hypertension and consider initiation of or increase in antihypertensive therapy.

C. Minimize Iatrogenic Blood Loss

1. **Perform Only Essential Laboratory Tests**[61,62]
2. **Coordinate and Consolidate Blood Tests**
3. **Minimize Volume of Diagnostic Phlebotomy**

D. Treat Coexisting Conditions Associated With Blood Loss

1. **Menorrhagia/Dysfunctional Uterine Bleeding**
   a. History, physical exam, and systematic consideration of possible causes[63,64]

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b. Appropriate therapy[65,66] (See also ***3.C.***)

2. **Nongynecologic Blood Loss**

a. Treat other conditions associated with low-grade bleeding (e.g., hemorrhoids, gastrointestinal lesions) that may become clinically important in some surgical patients

E. Management of Coagulation Status[67]

1. **Medication Management**

a. Discontinue/substitute medications associated with bleeding complications (e.g., aspirin, NSAIDs)

b. Postpone nonurgent surgery for patients on anticoagulant/antiplatelet medications (See also ***7.B.9.***)

2. **Management of Congenital/Acquired Coagulation Disorders**[68,69]

3. **Thrombocytopenia in Pregnancy**[70]

a. Maternal

(1) Gestational thrombocytopenia

(i) *Monitor platelet counts; no specific therapy indicated*

(2) Drug-induced

(i) *Review current medications (e.g., heparin, quinine, quinidine, sulfonamides)*

(3) Idiopathic thrombocytopenic purpura[71] (ITP)

(i) *Corticosteroids*

(ii) *High-dose intravenous immunoglobulin (IVIG)*

(iii) *Combination of high-dose steroids (e.g., methylprednisolone) and IVIG*

(4) Preeclampsia and the HELLP syndrome[72] (hemolysis, elevated liver enzymes, low platelet count)

(i) *Judicious fluid and volume management*

(ii) *Corticosteroid therapy*[73-75]

Notes:

1. Mode of delivery should be based on obstetric indications. Cesarean section delivery has not been shown to reduce the risk of intracranial hemorrhage except in very low birth weight infants.[76]
2. Although limited, data supports the safety of epidural anesthesia in patients with platelet counts greater than 100,000/μL.

b. Perinatal

(1) Alloimmune thrombocytopenia[77] (antenatal)

(i) *Consider maternal administration of IVIG antepartum*[78]

(ii) *Corticosteroid therapy*[79]

4. **Anticoagulation Management**

a. If an obstetric or surgical patient is at high risk of thromboembolism or if a diagnosis of thromboembolism is established, consider using low-dose heparin to reduce risk of bleeding, close clinical and laboratory monitoring, or mechanical prophylaxis.[80] Consider use of low molecular weight heparin[81-83] (See also ***7.B.9.***)

b. Consider discontinuation of oral contraceptives at least one month before major elective surgery due to risk of thromboembolic complications

3. MANAGEMENT OF MENORRHAGIA

A. Medical Treatment for Acute Menorrhagia[84-88]

1. **Combination of Medications Used Concomitantly**

a. Conjugated estrogens (i.v.)

b. High-dose oral contraceptives

(1) Combined estrogen and progestin

c. Tranexamic acid

B. Surgical Management of Menorrhagia[89]

1. **Emergency Hysteroscopy and Curettage**
2. **Uterine Tamponade**

a. Consider use of Foley balloon catheter

3. **Endometrial Balloon Ablation**[90,91]
4. **Hysterectomy** (See also ***5.A.*** to ***5.H.***)

C. Medical Therapy for Chronic Menorrhagia[92]

1. **Tranexamic Acid**[93-95] (alone or with desmopressin[96,97])
2. **Prostaglandin Inhibitors/NSAIDs**[98]

Note: NSAIDs may cause gastrointestinal (GI) bleeding.

3. **Combined Oral Contraceptives**
4. **Progesterone-Releasing Intrauterine Device**[99-101]

Note: Because of their mechanism of action, such devices may not be acceptable to some patients as a contraceptive.

5. **Danazol**[102-104]
6. **GnRH Analogue**[105,106] (preoperative treatment)

4. OBSTETRIC HEMORRHAGE

Be prepared to use a combination of appropriate interventions to prevent or manage hemorrhage. Timely recognition and decisive action (e.g., hysterectomy) is essential for minimizing blood loss. Management of hemorrhagic emergencies requires a coordinated team effort with close cooperation between the obstetrician, anesthesiologist, pediatrician, hematologist, and other specialists.

A. Antepartum Hemorrhage[107]

1. **General Management**[108]

a. Clinical assessment (avoiding pelvic examination until a diagnosis of placenta previa is excluded). Evaluate maternal hemodynamic status and fetal health

b. Judicious fluid resuscitation for hypovolemia (See ***6.***)

c. Prompt testing to facilitate diagnosis (e.g., ultrasound to confirm placenta previa) and assess fetal status[109,110]

d. Management should be appropriate to the degree of severity, maternal and fetal health status, and gestational age of the fetus, with a lower threshold for intervention in patients who decline blood transfusion

e. Consider antepartum corticosteroid administration to women at risk of preterm delivery[111] (for fetal lung maturation)

f. Consider Rh immune globulin prophylaxis for at-risk mothers

g. If fetal blood monitoring is indicated, consider noninvasive or minimally-invasive fetal blood diagnostic measures to reduce or avoid invasive testing that may result in accidental maternal, fetal, or placental bleeding[112-115]

h. If preterm delivery or complications are anticipated, consult neonatologist with experience in clinical management without transfusion and pursue appropriate management as indicated (e.g., antibiotic prophylaxis, tocolytic therapy)

2. **Ectopic (Extrauterine) Pregnancy**[116]

a. Medical management[117-120]

b. Surgical management

(1) Ensure availability of blood salvage equipment[121-123]

(2) Hysterectomy may be indicated for certain forms of ectopic pregnancy (e.g., interstitial, cervical)

3. **Miscarriage (Spontaneous Abortion)**[124]

a. Inevitable and incomplete abortion

(1) Prompt evacuation of the uterus

(2) Administration of oxytocic drug (See ***4.C.6.***)

(3) Consider prophylactic angiographic embolization[125]

b. Missed abortion

(1) Standard management with appropriate precautions to facilitate rapid control of hemorrhage

4. **Placenta Previa**

a. Early and aggressive erythropoietin therapy (antepartum/postpartum) (See ***2.B.***)

b. Active treatment (rather than expectant) if there is sustained bleeding, if labor begins, or when the patient reaches 37-38 weeks gestation

c. Ensure availability of blood salvage equipment for cesarean section delivery (See ***4.E.1.***)

5. **Placental Abruption**

a. For mild/moderate (grade I/II) placental abruption, standard management, as appropriate

b. For severe (grade III) placental abruption

(1) Supplemental oxygen administration

(2) Judicious fluid resuscitation

(3) Immediate amniotomy to induce or expedite labor followed by carefully monitored oxytocin infusion

(4) Consider early use of aprotinin to treat uterine inertia, expedite delivery, and preempt onset of coagulopathy[126-129] (See also ***4.E.3.*** and ***7.B.5.***)

(5) Anticipate postpartum hemorrhage

Note: Cesarean section delivery is seldom indicated (e.g., fetal distress, unripe cervix preventing amniotomy, failed induction).

B. Postpartum Hemorrhage (PPH) Risk Factors[130-135]

1. **Previous Obstetric Hemorrhage**
E.g., previous history of postpartum hemorrhage, manual removal of the placenta or retained products

2. **Abnormalities of Uterine Contraction**
E.g., overdistended uterus (associated with multiple gestation, polyhydramnios, macrosomia), high parity, rapid or prolonged labor

3. **Abnormalities of Placentation**
E.g., placenta previa, placenta accreta/increta/percreta, placental abruption

4. **Retained Products of Conception**
E.g., previous uterine surgery, high parity, abnormal placenta observed prenatally on diagnostic imaging, incomplete placenta at delivery

5. **Genital Tract Trauma**
E.g., previous uterine surgery, especially previous cesarean section, breech presentation, mid-forceps extraction or forceps rotation, lacerations at cesarean section

6. **Abnormalities of Coagulation**
E.g., congenital or acquired bleeding disorder (such as ITP, HELLP, DIC), therapeutic anticoagulation

7. **Other Factors**
Emergency or elective cesarean section delivery, preeclampsia or gestational hypertension, nulliparity, obesity

C. Active Management of Third Stage of Labor[136-141]

1. **Thirty Seconds to Deliver Anterior Shoulder**

Note: Unhurried delivery of the infant, allowing for slow uterine retraction, may facilitate smooth placental separation.

2. **Immediate Prophylactic Oxytocin Analogue**[142,143] (i.v.)

Note: Early oxytocin administration is associated with lower rates of PPH compared with administration after the third stage.[144]

3. **Thirty Seconds to Deliver Posterior Shoulder**

4. **Deliver Body Slowly, Head Down**

5. **Deliver Placenta by Controlled Cord Traction**[145]

a. Displace uterus upwards by suprapubic pressure

6. **Repeat Oxytocic Drug**

a. Oxytocin (or syntometrine)[146-148] (i.v.)

b. Ergot derivative[149-152] (i.m./intramyometrial/i.v.)

c. Prostaglandin analogues (alone or following other oxytocic agent)

(1) Carboprost[153,154] (intramyometrial injection/i.v.)

(2) Misoprostol[155-163] (rectal/oral)

Notes:

1. Observe precautions about administration of carboprost to patients with asthma.
2. Observe precautions about administration of ergot derivatives to patients with hypertension.
3. Misoprostol may be more stable than other oxytocic drugs in tropical climates.

7. **Examine Placenta for Completeness**

a. Inspect placenta for indications of retained tissue or abnormal placentation

8. **Monitor Closely Following Delivery**[164]

a. Maintain close observation, uterine palpation, assessment of bleeding, and sequential vital signs for 2-3 hours or longer following delivery

9. **Never Leave a Bleeding Postpartum Patient**

D. Control of Postpartum Hemorrhage[165-170]

1. **Continuous Uterine Massage**

Notes:

1. Fundal massage may be performed by assistants or the woman herself.
2. Elevation of uterus may improve venous drainage.

2. **Transabdominal Aortic Compression**[171,172]
3. **Bimanual Uterine Compression**
4. **Stimulate Nipple Manually/Suckle Infant**[173,174]

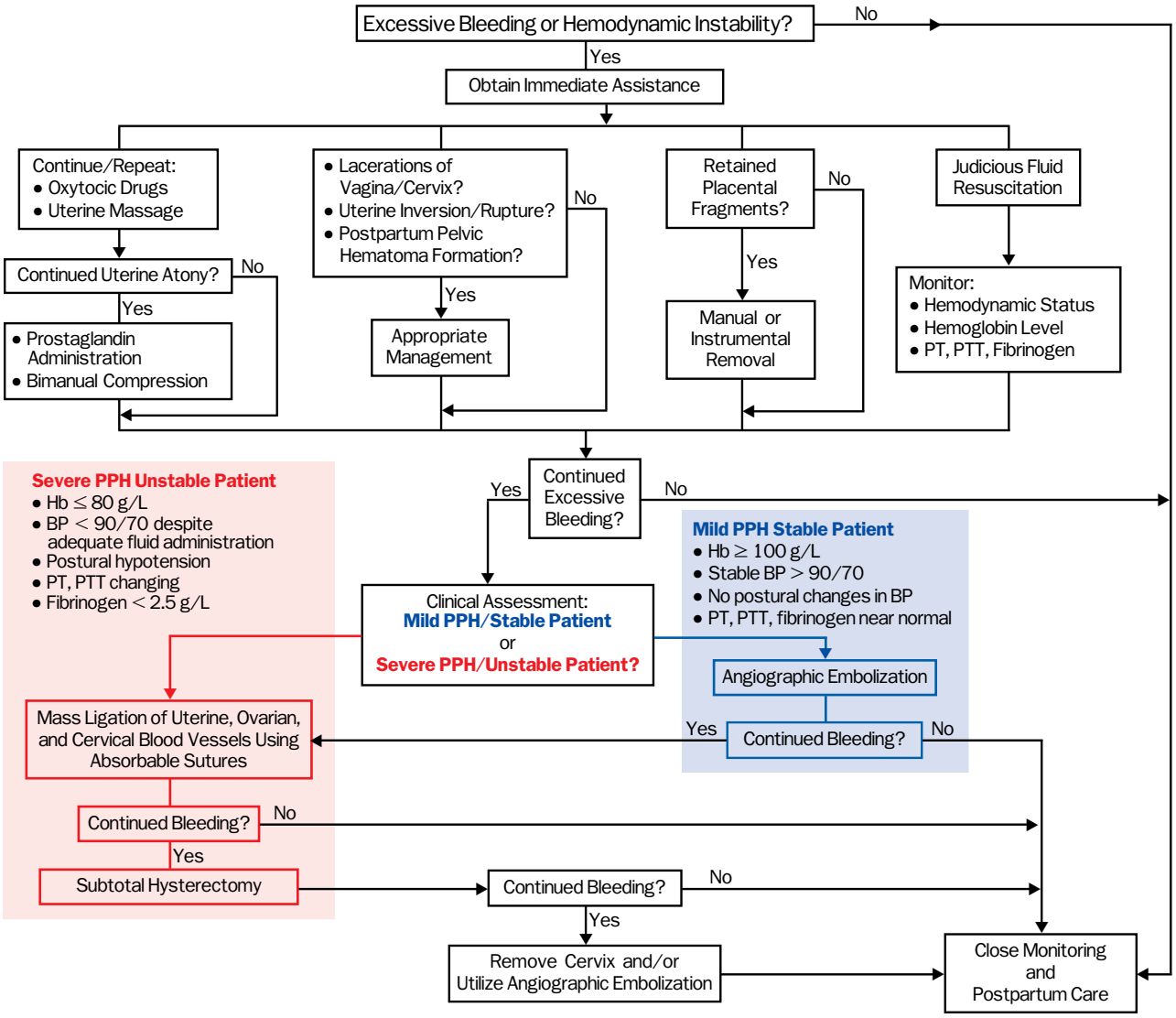
Note: This may stimulate release of endogenous oxytocin in settings where oxytocic drugs are not available.

5. **Repeat/Continue Oxytocic Drug(s)**
   a. Oxytocin[175] (or syntometrine) (i.v.)
   b. Ergot derivative (i.v.)
   c. Prostaglandin analogues
      (1) Carboprost[176-180] (intramyometrial/i.v.)
      (2) Misoprostol[181,182] (rectal)

Note: Consider use of prostaglandin analogue in patients unresponsive to oxytocin/ergot (or syntometrine).

6. **Judicious Fluid Resuscitation**
   a. Nonblood volume expanders, warmed if possible (See **6.**)
7. **Drain Bladder With Catheter**
8. **Prompt Extraction of Placenta or Retained Fragments**
   a. Manual exploration and removal (See Note 2 below.)
9. **Repair Lacerations**
   E.g., uterus, cervix, vagina, or perineum
10. **Uterine Tamponade**
    a. Tamponade should not delay preparation for definitive surgical intervention (See Note 3 below.)
       (1) Intrauterine balloon[183] (Rüsch[184] catheter or Sengstaken-Blakemore[185,186] tube)
       (2) Uterine packing[187-189] (See also ***5.I.6.***)

ALGORITHM FOR NONBLOOD MANAGEMENT OF POSTPARTUM HEMORRHAGE (PPH)



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11. Expeditious Angiographic Embolization

a. If angiography services can be accessed expeditiously, consider embolization for continuing slow blood loss that is not immediately life threatening in the hemodynamically stable patient[190-194]

12. Major Vessel Ligation

a. Bilateral high/low uterine and ovarian artery ligation[195-197]

(1) Consider internal iliac artery ligation[198]

Note: Internal iliac artery ligation has a lower rate of success than other surgical options for control of PPH. Arterial ligation, particularly hypogastric artery ligation, may preclude embolization.

b. Single-stage uterine "devascularization"[199,200]

13. Subtotal/Total Hysterectomy[201-207]

14. Pelvic Cavity Pressure Pack[208,209] or Angiographic Embolization[210-212]

a. Consider for posthysterectomy hemorrhage (See also ***5.I.6.***)

Notes:

1. If postpartum hemorrhage is suspected, transfer the patient to the OR and prepare for surgery immediately. **Obtain assistance,** e.g., a second obstetric, gynecologic, or general surgeon, an anesthesiologist, and/or associated staff. **Perform systematic inspection** under anesthesia with adequate lighting, starting from external genitalia, vaginal walls, and cervix, and **suture any lacerations regardless of size, whether bleeding or not.**
2. If retained placental fragments are suspected, consider i.v. nitroglycerin for *transient* uterine relaxation to facilitate manual removal of the placenta.[213-216] Hypovolemia should be corrected with intravenous fluids before administering nitroglycerin. Hemodynamic monitoring, a running i.v. infusion, and immediately available ephedrine are mandatory.[217]
3. **Temporizing or conservative measures to control blood loss** or preserve the uterus **should not delay definitive surgical intervention** to stop bleeding.[218] The immediate presence of an experienced obstetric surgeon is important to make an early decision to operate before the patient's condition deteriorates.
4. It is vital to identify and control the source of bleeding expeditiously. The choice of procedure to arrest hemorrhage depends on the availability of facilities and personnel, the extent of hemorrhage, and the condition of the patient.[219]
5. Perform frequent serial clinical monitoring. Assess hematocrit, coagulation profile, blood pressure, pulse, respiratory rate, core temperature, urine output, volume status (e.g., serial central venous pressure measurements, if indicated). In patients with unstable vital signs and little or no external bleeding, suspect concealed hemorrhage in the uterus or a pelvic hematoma.[220]
6. Do not delay operative intervention (or reexploration) for postpartum or postoperative hemorrhage that can be controlled surgically.[221] Early recourse to hysterectomy may be lifesaving. A subtotal hysterectomy requires less time to perform, thus reducing blood loss.
7. If there is delay before surgical intervention or transport, consider temporary uterine tamponade; use of an antishock garment (MAST) for temporary moderate circulatory support; external aortic compression; direct pressure for lacerations in the perineum, cervix, or vagina; and judicious fluid resuscitation.[222]
8. If gauze packing is used, care should be taken to pack the fundus tightly and systematically to avoid creating space where blood may accumulate.[223]
9. Although intrauterine use of Foley catheters for control of hemorrhage after vaginal delivery has been reported,[224] the volume of the immediate postpartum uterine cavity may be too large for effective tamponade.
10. Consider antibiotic prophylaxis.
11. Consider low molecular weight heparin for thromboembolic prophylaxis.

E. Other Hemorrhagic Emergencies

1. Cesarean Section

Note: Delivery by cesarean section is associated with an increased risk of PPH compared to vaginal birth and should be weighed carefully in women who decline blood transfusion.

a. Arrange for presence of skilled personnel and appropriate equipment and drugs

b. Appropriate surgical technique[225-229]

(1) Misgav Ladach (modified Cohen-Stark)[230-236]

(2) Pelosi[237-240]

c. Intraoperative blood salvage (autotransfusion)[241-244] (See also ***4.E.2.g.*** and ***5.G.***)

(1) Employ appropriate cell washing and filtration[245-247]

d. Acute normovolemic hemodilution[248] (ANH)

e. Aggressive management of PPH (See ***4.D.***)

(1) Oxytocic drugs[249-251]

f. Maintenance of normothermia[252]

g. Prevention and prompt treatment of infection[253]

2. Abnormal Placentation[254,255] (Placenta Previa and/or Accreta/Increta/Percreta)

a. Meticulous planning

(1) Optimal management includes detailed planning and collaboration of a multidisciplinary operative team prepared and equipped to prevent and manage hemorrhagic emergencies[256,257]

b. Early antenatal detection of abnormalities of placentation

(1) Employ ultrasound or magnetic resonance imaging[258-265]

c. Prophylactic embolotherapy[266-270] or intra-arterial balloon occlusion[271-273]

d. Consider erythropoietin therapy (See ***2.B.***)

e. Planned elective delivery and presence of skilled personnel and appropriate equipment and drugs

f. Acute normovolemic hemodilution[274]

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g. Intraoperative blood salvage[275-277] (See also ***4.E.1.c.*** and ***5.G.***)

3. **Disseminated Intravascular Coagulation (DIC)**[278,279]

a. Anticipation/preparation

(1) Obstetric causes of DIC include placental abruption, intrauterine fetal death, amniotic fluid embolism, gram-negative infections, and eclampsia

(2) Prolonged hypovolemia or hypothermia may trigger or exacerbate DIC

b. Urgent medical/hematological consultation

c. Identify and promptly treat the underlying process triggering the coagulopathy (e.g., early evacuation of the uterus for placental abruption) (See ***4.A.5.b.***)

d. Consider use of recombinant activated factor VII (r-FVIIa)[280] or clotting factor concentrates

e. Consider use of cryoprecipitate

5. PERIOPERATIVE BLOOD CONSERVATION[281-285]

A. Preoperative Planning

1. **Tolerance of Anemia**

a. Moderate levels of normovolemic anemia are well tolerated in hemodynamically stable patients[286-290]

b. 10/30 rule for minimum hemoglobin/hematocrit level has no scientific basis[291,292]

2. **Optimization of Preoperative RBC Mass**

a. If the expected surgical blood loss may render the patient significantly anemic, consider preoperative optimization of RBC mass as part of an overall blood conservation plan (See ***1.*** and ***2.***)

B. Operative Approaches to Minimize Blood Loss

1. **Meticulous Hemostasis and Surgical Technique**[293-295]

a. Minimize duration of surgery/use enlarged surgical team

b. Review and rehearse procedures for managing massive hemorrhage

c. Ensure availability of equipment to manage contingencies

d. Consider combining techniques for hemostasis

2. **Hemostatic Surgical Instruments**

a. Electrosurgery/electrocautery[296-298]

b. Laser

c. Microwave hemostatic instruments[299-301]

d. Ultrasonic scalpel[302-305]

3. **Mechanical Occlusion of Blood Vessels**

a. Prophylactic use of ligation, vascular clips, clamps[306,307]

C. Angiographic Embolization[308-316]

a. Consider prophylactic embolization for patients with high bleeding risk[317] (See also ***4.E.2.c.*** and ***5.I.7.***)

D. Minimally Invasive Approaches[318,319]

1. **Endometrial Resection/Ablation**[320-322]

a. Electrosurgical ball[323-325]

b. Laser[326,327]

c. Thermal balloon[328-331]

E. Spinal/Epidural/General Anesthesia[332-336]

Note: Regardless of the choice of anesthesia (general, regional), the anesthetic technique must be well planned and executed so as to minimize blood loss.

F. Intraoperative Hemodilution[337-340]

G. Blood Cell Salvage[341-347]

(See also ***4.E.1.c*** and ***4.E.2.g.***)

1. **Oncologic Surgery**[348,349]

a. For oncologic surgery with potential for high blood loss, consider use of blood salvage with leukocyte depletion filters[350,351] or intraoperative blood irradiation[352]

H. Controlled Hypotensive Anesthesia[353]

I. Management of Surgical Hemorrhage/Shock[354]

1. **Immediate Control of Hemorrhage**[355]

a. Apply direct pressure. Call for assistance

2. **Elevate Legs/Apply Blood Pressure Cuffs**

3. **Administer Oxygen**

4. **Consider Permissive Hypotension**

a. Until bleeding is controlled, consider use of permissive hypotension (moderate fluid therapy sufficient to maintain minimally acceptable perfusion) to avoid normalization of blood pressure, which may accelerate hemorrhage[356,357] (See also ***6.C.*** Note 2.)

b. Assess volume status by evaluating clinical signs, including mean arterial pressure, heart rate, and urine output, and by appropriate monitoring (e.g., central venous line, pulmonary artery catheter)

5. **Prompt Laparoscopy/Surgery/Vascular Ligation**

6. **Pelvic Packing**[358-360] (See also ***4.D.14.***)

Note: Packing or balloon catheterization may be used as a temporary measure while awaiting prompt surgical intervention to arrest bleeding or to tamponade persistent postoperative hemorrhage. Avoid premature packing for repairable major vascular injury.

7. **Angiographic Arterial Embolization**[361-363]

Notes:

1. Insert two large-bore intravenous catheters prior to major surgery and warm i.v. fluids to avoid hypothermia and coagulopathy.[364]
2. Laparoscopic surgery should be undertaken by an experienced operator with a rehearsed plan of action for immediate control of hemorrhage.
3. During the early postoperative hours, allow a slow, gradual return to normal blood pressure after bleeding is controlled.[365]
4. Consider postoperative serial monitoring of vital signs, urine output, and hemoglobin/hematocrit to facilitate early clinical recognition of ongoing bleeding.
5. Angiographic embolization should be undertaken by an experienced interventional radiologist when bleeding is not immediately life threatening.

6. NONBLOOD VOLUME EXPANDERS

A. Crystalloids

1. **Ringer's Lactate**
2. **Normal Saline**
3. **Hypertonic Saline**

B. Colloids

1. **Pentastarch**[366,367]**/Hetastarch**[368,369]
2. **Gelatin**
3. **Dextran** (See Note 7.)

C. Oxygen-Carrying Red Cell Substitutes

(when available for clinical use)

1. **Perfluorocarbon Solutions**
2. **Hemoglobin-Based Oxygen Carriers**

Notes:

1. In active bleeding or oozing, take prompt measures to arrest hemorrhage.
2. In the actively bleeding patient, excessive fluid resuscitation may accelerate hemorrhage by dilution of coagulation factors or disruption of clots. In uncontrolled hemorrhage, adequate perfusion can be achieved with moderate underresuscitation and permissive mild hypotension (in patients without severe head injuries).[370]
3. Avoid circulatory overload, especially in severely anemic patients. Closely monitor fluid balance and vital signs.
4. Maintain a high index of suspicion of bleeding when a patient shows evidence of hypovolemia despite reasonable hydration. Poor response to fluid therapy may indicate continuing hemorrhage.
5. Pentastarch and low molecular weight starches or starches in balanced electrolyte solutions may be more effective in optimizing macro- and microcirculation than crystalloids and other colloids. High molecular weight hydroxyethyl starches may increase the risk of bleeding in surgical patients who have either congenital or acquired coagulation abnormalities.[371,372]
6. Administration of large volumes of saline-based fluids has been associated with coagulation abnormalities, decreased urine output, and a hyperchloremic metabolic acidosis that may be clinically relevant.[373,374]
7. Dextrans should be avoided in obstetrics due to their anticoagulant effects and risk of anaphylactic reactions. In surgical patients, the anticoagulant effect of dextrans may be partially offset by desmopressin.[375]

7. PHARMACOLOGICAL ENHANCEMENT OF HEMOSTASIS

A. Topical Hemostatic Agents

1. **Tissue Adhesives/Fibrin Glue**[376-378]
2. **Collagen Hemostat** (e.g., Avitene®, Instat®)
3. **Oxidized Cellulose** (e.g., Oxycel®, Surgicel®)
4. **Gelatin Foam/Sponges** (e.g., Gelfoam®, Surgifoam®)
5. **Vasopressin**[379-381]
   a. Vasopressin infiltration or soaked uterine packing[382,383] (See also ***5.I.6.***)
6. **Thrombin**[384]

B. Systemic Hemostatic Agents

1. **Vitamin K**[385,386]

   Note: Consider prophylactic treatment of patients with vitamin K before invasive procedures.
2. **Tranexamic Acid**[387-389]
3. **Epsilon-Aminocaproic Acid**[390]
4. **Desmopressin**[391-394]
5. **Aprotinin**[395,396] (Use test dose.)

   Notes:
   1. Aprotinin or desmopressin may be used for control of bleeding due to drug-induced platelet dysfunction (e.g., due to ASA, NSAIDs, beta-lactam antibiotics, and antithrombotics).[397,398]
   2. Use of aprotinin has been reported for the management of obstetric bleeding due to fibrinolysis associated with severe placental abruption.[399,400]
6. **Conjugated Estrogens**[401,402]
7. **Recombinant Activated Factor VII (r-FVIIa)**[403-405] (e.g., eptacog alfa [activated], NovoSeven®, NiaStase®)
8. **Coagulation Factor Replacement Therapy**[406]
   a. Consider recombinant preparations of factors VIIa, VIII, IX[407,408]
9. **Prothrombin Complex Concentrate**[409]

   Note: Prothrombin complex concentrate and i.v. vitamin K have been used for urgent reversal of anticoagulation in surgical patients.[410,411] Consider protamine for reversal of heparin anticoagulation.
10. **Cryoprecipitate**

8. MANAGEMENT OF PROFOUND ANEMIA[412-416]

A. Stop Any Bleeding

1. **Permissive Mild Hypotension**
   a. Avoid aggressive normalization of blood pressure in the bleeding patient
2. **Surgical Control of Bleeding**
   a. Do not defer operative intervention if active bleeding can be controlled surgically, even if the patient is anemic
3. **Maintain/Restore Normothermia**

B. Restrict Diagnostic Phlebotomy[417]

C. Maximize Oxygen Delivery

1. **Optimize Circulating Volume**
2. **Supplemental Oxygen/Hyperbaric Oxygen Therapy**[418,419]

D. Minimize Oxygen Consumption

1. **Analgesia and Sedation**
2. **Mechanical Ventilation**

E. Stimulate Red Cell Production[420-426]

(See ***2.A.*** and ***2.B.***)

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References

Database Abbreviations:
PMID: Medline®/PubMed® Unique Identifier (Index Medicus)
EMBASE: Embase® Accession Number (Excerpta Medica)

Clinical Evaluation/Preoperative Planning

1. Thomas JM. The worldwide need for education in nonblood management in obstetrics and gynaecology. *J SOGC* (*J Soc Obstet Gynaecol Can*) 1994;16(3):1483-7. [ISSN: 0849-5831]
2. Boyd ME. The obstetrician and gynaecologist and the Jehovah's Witness [editorial]. *J SOGC* (*J Soc Obstet Gynaecol Can*) 1992;14(6):7-9. [ISSN: 0849-5831]
3. Hampton KK, Preston FE. Bleeding disorders, thrombosis, and anticoagulation. *BMJ* 1997;314(7086):1026-9. [PMID: 9112850]
4. Lusher JM. Screening and diagnosis of coagulation disorders. *Am J Obstet Gynecol* 1996;175(3 Pt 2):778-83. [PMID: 8828561]
5. Economides DL, Kadir RA, Lee CA. Inherited bleeding disorders in obstetrics and gynaecology. *Br J Obstet Gynaecol* 1999;106(1):5-13. [PMID: 10426253]
6. Rasmussen S, Irgens LM, Albrechtsen S, Dalaker K. Women with a history of placental abruption: when in a subsequent pregnancy should special surveillance for a recurrent placental abruption be initiated? *Acta Obstet Gynecol Scand* 2001;80(8):708-12. [PMID: 11531612]
7. Hepner DL, Harnett M, Segal S, et al. Herbal medicine use in parturients. *Anesth Analg* 2002;94(3):690-3. [PMID: 11867399]
8. Brigden M, Smith RE. Acetylsalicylic-acid-containing drugs and nonsteroidal anti-inflammatory drugs available in Canada. *CMAJ* 1997;156(7):1025-8. [PMID: 9099173]
9. Kadir RA, Economides DL, Sabin CA, et al. Frequency of inherited bleeding disorders in women with menorrhagia. *Lancet* 1998;351(9101):485-9. [PMID: 9482440]
10. Rapaport SI. Preoperative hemostatic evaluation: which tests, if any? *Blood* 1983;61(2):229-31. [PMID: 6821695]
11. Fausett B, Silver RM. Congenital disorders of platelet function. *Clin Obstet Gynecol* 1999;42(2):390-405. [PMID: 10370857]
12. Samama CM, Simon L. Detecting coagulation disorders of pregnancy: bleeding time or platelet count? [editorial]. *Can J Anaesth* 2001;48(6):515-8. [PMID: 11444442]
13. Simon L, Santi TM, Sacquin P, Hamza J. Pre-anaesthetic assessment of coagulation abnormalities in obstetric patients: usefulness, timing, and clinical implications. *Br J Anaesth* 1997;78(6):678-83. [PMID: 9215019]
14. Woo YL, White B, Corbally R, et al. von Willebrand's disease: an important cause of dysfunctional uterine bleeding. *Blood Coagul Fibrinolysis* 2002;13(2):89-93. [PMID: 11914650]
15. Åkesson A, Bjellerup P, Berglund M, et al. Serum transferrin receptor: a specific marker of iron deficiency in pregnancy. *Am J Clin Nutr* 1998;68(6):1241-6. [PMID: 9846853]
16. Howland EJ, Palmer J, Lumley M, Keay SD. Acquired factor VIII inhibitors as a cause of primary post-partum haemorrhage. *Eur J Obstet Gynecol Reprod Biol* 2002;103(1):97-8. [PMID: 12039476]

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17. Bayoumeu F, Subiran-Buisset C, Baka NE, et al. Iron therapy in iron deficiency anemia in pregnancy: intravenous route versus oral route. *Am J Obstet Gynecol* 2002;186(3):518-22. [PMID: 11904617]
18. Haram K, Nilsen ST, Ulvik RJ. Iron supplementation in pregnancy—evidence and controversies. *Acta Obstet Gynecol Scand* 2001;80(8):683-8. [PMID: 11531608]
19. Perewusnyk G, Huch R, Huch A, et al. Parenteral iron therapy in obstetrics: 8 years experience with iron-sucrose complex. *Br J Nutr* 2002;88(1):3-10. [PMID: 12117422]
20. Carretti N, Paticchio MR, Eremita GA. Intravenous iron therapy for severe pregnancy anemia with high erythropoietin levels. *Obstet Gynecol* 1997;90 (4 Pt 2):650-3. [PMID: 11770580]
21. Hallak M, Sharon AS, Diukman R, et al. Supplementing iron intravenously in pregnancy. A way to avoid blood transfusions. *J Reprod Med* 1997;42(2):99-103. [PMID: 9058345]
22. al-Momen AK, al-Meshari A, al-Nuaim L, et al. Intravenous iron sucrose complex in the treatment of iron deficiency anemia during pregnancy. *Eur J Obstet Gynecol Reprod Biol* 1996;69(2):121-4. [PMID: 8902444]
23. Singh K, Fong YF. Intravenous iron polymaltose complex for treatment of iron deficiency anaemia in pregnancy resistant to oral iron therapy [letter]. *Eur J Haematol* 2000;64(4):272-4. [PMID: 10776700]
24. Williams MD, Wheby MS. Anemia in pregnancy. *Med Clin North Am* 1992;76(3):631-47. [PMID: 1578961]
25. Van de Velde A, Van Droogenbroecka J, Tjalmab W, et al. Folate and vitamin B12 deficiency presenting as pancytopenia in pregnancy: a case report and review of the literature. *Eur J Obstet Gynecol Reprod Biol* 2002;100(2):251-4. [PMID: 11750975]
26. Carretti NG, Ditto A, Guidoni CG. Vitamin B12 levels in pregnancy influence erythropoietin response to anemia. *Eur J Obstet Gynecol Reprod Biol* 1998;80(1):63-6. [PMID: 9758261]
27. Mahomed K. Iron supplementation in pregnancy. *Cochrane Database Syst Rev* 2000;(2):CD000117. [PMID: 10796140]
28. Milman N, Byg KE, Agger AO. Hemoglobin and erythrocyte indices during normal pregnancy and postpartum in 206 women with and without iron supplementation. *Acta Obstet Gynecol Scand* 2000;79(2):89-98. [PMID: 10696955]
29. Allen LH. Anemia and iron deficiency: effects on pregnancy outcome. *Am J Clin Nutr* 2000;71 (5 Suppl):1280S-4S. [PMID: 10799402]
30. Bergmann RL, Gravens-Müller L, Hertwig K, et al. Iron deficiency is prevalent in a sample of pregnant women at delivery in Germany. *Eur J Obstet Gynecol Reprod Biol* 2002;102(2):155-60. [PMID: 11950483]
31. Gadowsky SL, Gale K, Wolfe SA, et al. Biochemical folate, B12, and iron status of a group of pregnant adolescents accessed through the public health system in southern Ontario. *J Adolesc Health* 1995;16(6):465-74. [PMID: 7669797]
32. Cook JD, Reddy MB. Effect of ascorbic acid intake on nonheme-iron absorption from a complete diet. *Am J Clin Nutr* 2001;73(1):93-8. [PMID: 11124756]
33. Remacha AF. Strategies for the prevention and treatment of iron deficiency during pregnancy. *Clin Drug Invest* 2000;19 Suppl 1: 29-43. [EMBASE: 2000132298]
34. Hallberg L, Hulthén L. Prediction of dietary iron absorption: an algorithm for calculating absorption and bioavailability of dietary iron. *Am J Clin Nutr* 2000;71(5):1147-60. [PMID: 10799377]
35. Krafft A, Breymann C, Huch R, Huch A. Intravenous iron sucrose in two pregnant women with inflammatory bowel disease and severe iron deficiency anemia. *Acta Obstet Gynecol Scand* 2000;79(8):720-2. [PMID: 10949245]

36. Carretti N, Paticchio MR. Intravenous iron therapy in pregnancy anemia: hematological response in relation to gestational age. *Gynecol Obstet Invest* 1999;47(4):217-22. [PMID: 10352380]

37. Kaisi M, Ngwalle EW, Runyoro DE, Rogers J. Evaluation of tolerance of and response to iron dextran (Imferon®) administered by total dose infusion to pregnant women with iron deficiency anemia. *Int J Gynaecol Obstet* 1988;26(2):235-43. [PMID: 2898400]

38. Barton JC, Barton EH, Bertoli LF, et al. Intravenous iron dextran therapy in patients with iron deficiency and normal renal function who failed to respond to or did not tolerate oral iron supplementation. *Am J Med* 2000;109(1):27-32. [PMID: 10936475]

39. Mays T, Mays T. Intravenous iron-dextran therapy in the treatment of anemia occurring in surgical, gynecologic and obstetric patients. *Surg Gynecol Obstet* 1976;143(3):381-4. [PMID: 959957]

40. Monaghan MS, Glasco G, St. John G, et al. Safe administration of iron dextran to a patient who reacted to the test dose. *South Med J* 1994;87(10):1010-2. [PMID: 7939912]

41. Swain RA, Kaplan B, Montgomery E. Iron deficiency anemia. When is parenteral therapy warranted? *Postgrad Med* 1996;100(5):181-2, 185, 188-93. [PMID: 8917332]

42. Larson B, Bremme K, Clyne N, Nordström L. Preoperative treatment of anemic women with epoetin beta. *Acta Obstet Gynecol Scand* 2001;80(6)559-62. [PMID: 11380294]

43. Rock WA Jr, Meeks GR. Managing anemia and blood loss in elective gynecologic surgery patients. *J Reprod Med* 2001;46(5 Suppl): 507-14. [PMID: 11396384]

44. Goldberg MA. Perioperative epoetin alfa increases red blood cell mass and reduces exposure to transfusions: results of randomized clinical trials. *Semin Hematol* 1997;34(3 Suppl 2): 41-7. [PMID: 9253783]

45. Kurz Ch, Marth Ch, Windbichler G, et al. Erythropoietin treatment under polychemotherapy in patients with gynecologic malignancies: a prospective, randomized, double-blind placebo-controlled multicenter study. *Gynecol Oncol* 1997;65(3):461-6. [PMID: 9190976]

46. Ford PA, Henry DH. Using r-HuEPO in patients unwilling to accept blood transfusions. *Erythropoiesis* 1996;7(3):63-8. [EMBASE: 1997033905]

47. Sifakis S, Angelakis E, Vardaki E, et al. Erythropoietin in the treatment of iron deficiency anemia during pregnancy. *Gynecol Obstet Invest* 2001;51(3):150-6. [PMID: 11306899]

48. Kalu E, Wayne C, Croucher C, et al. Triplet pregnancy in a Jehovah's Witness: recombinant human erythropoietin and iron supplementation for minimising the risks of excessive blood loss. *BJOG* 2002;109(6):723-5. [PMID: 12118656]

49. Vora M, Gruslin A. Erythropoietin in obstetrics. *Obstet Gynecol Surv* 1998;53(8):500-8. [PMID: 9702790]

50. Harris SA, Payne G, Putman JM. Erythropoietin treatment of erythropoietin-deficient anemia without renal disease during pregnancy. *Obstet Gynecol* 1996;87(5 Pt 2):812-4. [PMID: 8677097]

51. Braga J, Marques R, Branco A, et al. Maternal and perinatal implications of the use of human recombinant erythropoietin. *Acta Obstet Gynecol Scand* 1996;75(5):449-53. [PMID: 8677769]

52. Breymann C, Major A, Richter C, et al. Recombinant human erythropoietin and parenteral iron in the treatment of pregnancy anemia: a pilot study. *J Perinat Med* 1995;23(1-2):89-98. [PMID: 7658327]

53. Huch R, Huch A. Erythropoietin in obstetrics. *Hematol Oncol Clin North Am* 1994;8(5):1021-40. [PMID: 7852210]

54. Bourantas K, Makrydimas G, Georgiou J, et al. Preliminary results with administration of recombinant human erythropoietin in sickle cell/β-thalassemia patients during pregnancy [letter]. *Eur J Haematol* 1996;56(5):326-8. [PMID: 8641410]

55. Busuttil D, Copplestone A. Management of blood loss in Jehovah's Witnesses [editorial]. *BMJ* 1995;311(7013):1115-6. [PMID: 7580701]

56. Schreiber S, Howaldt S, Schnoor M, et al. Recombinant erythropoietin for the treatment of anemia in inflammatory bowel disease. *N Engl J Med* 1996;334(10):619-23. [PMID: 8592524]

57. Breymann C, Visca E, Huch R, Huch A. Efficacy and safety of intravenously administered iron sucrose with and without adjuvant recombinant human erythropoietin for the treatment of resistant iron-deficiency anemia during pregnancy. *Am J Obstet Gynecol* 2001;184(4):662-7. [PMID: 11262469]

58. Goodnough LT, Skikne B, Brugnara C. Erythropoietin, iron, and erythropoiesis. *Blood* 2000;96(3):823-33. [PMID: 10910892]

59. Danielson B. R-HuEPO hyporesponsiveness—who and why? *Nephrol Dial Transplant* 1995;10 (Suppl 2):69-73. [PMID: 7644109]

60. Breymann C, Richter C, Hüttner C, et al. Effectiveness of recombinant erythropoietin and iron sucrose vs. iron therapy only, in patients with postpartum anaemia and blunted erythropoiesis. *Eur J Clin Invest* 2000;30(2):154-61. [PMID: 10651841]

61. Sherard GB 3rd, Newton ER. Is routine hemoglobin and hematocrit testing on admission to labor and delivery needed? *Obstet Gynecol* 2001;98(6):1038-40. [PMID: 11755550]

62. Ampil FL, Burton GV, Li BD. "Routine" weekly blood counts during breast irradiation for early stage cancer: are they really necessary? [letter]. *Breast J* 2001;7(6):450-2. [PMID: 11843862]

63. Long CA. Evaluation of patients with abnormal uterine bleeding. *Am J Obstet Gynecol* 1996;175(3 Pt 2):784-6. [PMID: 8828562]

64. Brenner PF. Differential diagnosis of abnormal uterine bleeding. *Am J Obstet Gynecol* 1996;175(3 Pt 2):766-9. [PMID: 8828559]

65. Sheth SS, Das SB. Preoperative management of anemia to avoid blood transfusion. *Int J Gynaecol Obstet* 2002;77(3):245-7. [PMID: 12065137]

66. Chavez NF, Stewart EA. Medical treatment of uterine fibroids. *Clin Obstet Gynecol* 2001;44(2):372-84. [PMID: 11347559]

67. Walker ID, Walker JJ, Colvin BT, et al, on behalf of the Haemostasis and Thrombosis Task Force. Investigation and management of haemorrhagic disorders in pregnancy. *J Clin Pathol* 1994;47(2):100-8. [PMID: 8132822]

68. Martlew VJ. Peri-operative management of patients with coagulation disorders. *Br J Anaesth* 2000;85(3):446-55. [PMID: 11103188]

69. Koscielny J, Blaicher AM, Felfernig D, et al. Consensus use of desmopressin and antifibrinolytics in three university clinics. *Anaesthesia* 1998;53 Suppl 2:60-2. [PMID: 9659072]

70. McCrae KR, Bussel JB, Mannucci PM, et al. Platelets: an update on diagnosis and management of thrombocytopenic disorders. *Hematology Am Soc Hematol Educ Program* 2001;(1):282-305. [PMID: 11722989] Available at: http://www.asheducationbook.org/ (Accessed February 10, 2016)

71. Kelton JG. Idiopathic thrombocytopenic purpura complicating pregnancy. *Blood Rev* 2002;16(1):43-6. [PMID: 11913994]

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72. Magann EF, Martin JN Jr. Twelve steps to optimal management of HELLP syndrome. *Clin Obstet Gynecol* 1999;42(3):532-50. [PMID: 10451769]

73. Isler CM, Barrilleaux PS, Magann EF, et al. A prospective, randomized trial comparing the efficacy of dexamethasone and betamethasone for the treatment of antepartum HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome. *Am J Obstet Gynecol* 2001;184(7):1332-9. [PMID: 11408849]

74. O'Brien JM, Milligan DA, Barton JR. Impact of high-dose corticosteroid therapy for patients with HELLP (hemolysis, elevated liver enzymes, and low platelet count) syndrome. *Am J Obstet Gynecol* 2000;183(4):921-4. [PMID: 11035338]

75. Magann EF, Martin JN Jr. Critical care of HELLP syndrome with corticosteroids. *Am J Perinatol* 2000;17(8):417-22. [PMID: 11142392]

76. Kahn DJ, Richardson DK, Billett HH. Association of thrombocytopenia and delivery method with intraventricular hemorrhage among very-low-birth-weight infants. *Am J Obstet Gynecol* 2002;186(1):109-16. [PMID: 11810095]

77. Kaplan C. Alloimmune thrombocytopenia of the fetus and the newborn. *Blood Rev* 2002;16(1):69-72. [PMID: 11914000]

78. Bussel JB, Berkowitz RL, Lynch L, et al. Antenatal management of alloimmune thrombocytopenia with intravenous gamma-globulin: a randomized trial of the addition of low-dose steroid to intravenous gamma-globulin. *Am J Obstet Gynecol* 1996;174(5):1414-23. [PMID: 9065105]

79. Bussel JB. Alloimmune thrombocytopenia in the fetus and newborn. *Semin Thromb Hemost* 2001;27(3):245-52. [PMID: 11446658]

80. Maxwell GL, Synan I, Dodge R, et al. Pneumatic compression versus low molecular weight heparin in gynecologic oncology surgery: a randomized trial. *Obstet Gynecol* 2001;98(6):989-95. [PMID: 11755543]

81. Davis JD. Prevention, diagnosis, and treatment of venous thromboembolic complications of gynecologic surgery. *Am J Obstet Gynecol* 2001;184(4):759-75. [PMID: 11262484]

82. Eldor A. Thrombophilia and its treatment in pregnancy. *J Thromb Thrombolysis* 2001;12(1):23-30. [PMID: 11711685]

83. Anonymous. ACOG committee opinion. Anticoagulation with low-molecular-weight heparin during pregnancy. Number 211, November 1998. Committee on Obstetric Practice. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet* 1999;65(1):89-90. [PMID: 10390110]

Management of Menorrhagia

84. Bevan JA, Maloney KW, Hillery CA, et al. Bleeding disorders: A common cause of menorrhagia in adolescents. *J Pediatr* 2001;138(6):856-61. [PMID: 11391329]

85. Rimsza ME. Dysfunctional uterine bleeding. *Pediatr Rev* 2002;23(7):227-33. [PMID: 12093932]

86. Mitan LA, Slap GB. Adolescent menstrual disorders. Update. *Med Clin North Am* 2000;84(4):851-68. [PMID: 10928192]

87. Falcone T, Desjardins C, Bourque J, et al. Dysfunctional uterine bleeding in adolescents. *J Reprod Med* 1994;39(10):761-4. [PMID: 7837120]

88. Chuong CJ, Brenner PF. Management of abnormal uterine bleeding. *Am J Obstet Gynecol* 1996;175 (3 Pt 2):787-92. [PMID: 8828563]

89. Abbott JA, Garry R. The surgical management of menorrhagia. *Hum Reprod Update* 2002;8(1):68-78. [PMID: 11866242]

90. Zurawin RK, Pramanik S. Endometrial balloon ablation as a therapy for intractable uterine bleeding in an adolescent. *J Pediatr Adolesc Gynecol* 2001;14(3):119-21. [PMID: 11675228]

91. Milad MP, Valle RF. Emergency endometrial ablation for life-threatening uterine bleeding as a result of a coagulopathy. *J Am Assoc Gynecol Laparosc* 1998;5(3):301-3. [PMID: 9668155]

92. Farquhar CM, Crengle S, Douthett M, et al. An evidence-based guideline for the management of heavy menstrual bleeding. Working Party for Guidelines for the Management of Heavy Menstrual Bleeding. *N Z Med J* 1999;112(1088):174-7. [PMID: 10391640]

93. Winkler UH. The effect of tranexamic acid on the quality of life of women with heavy menstrual bleeding. *Eur J Obstet Gynecol Reprod Biol* 2001;99(2):238-43. [PMID: 11788179]

94. Bonnar J, Sheppard BL. Treatment of menorrhagia during menstruation: randomised controlled trial of ethamsylate, mefenamic acid, and tranexamic acid. *BMJ* 1996;313(7057):579-82. [PMID: 8806245]

95. Coulter A, Kelland J, Peto V, Rees MC. Treating menorrhagia in primary care. An overview of drug trials and a survey of prescribing practice. *Int J Technol Assess Health Care* 1995;11(3):456-71. [PMID: 7591547]

96. Edlund M, Blomback M, Fried G. Desmopressin in the treatment of menorrhagia in women with no common coagulation factor deficiency but with prolonged bleeding time. *Blood Coagul Fibrinolysis* 2002;13(3):225-31. [PMID: 11943936]

97. Musso R, Cabibbo S, Cultrera D, et al. Subcutaneous concentrated desmopressin for treatment of menorrhagia of the puberty in girls without any bleeding disorder [abstract]. 16th Annual Meeting of the European Society for Paediatric Haematology and Immunology; 1997 May 14-17; Thessaloniki, Greece. *Pediatr Res* 1997;41(5):783. [ISSN: 0031-3998]

98. Lethaby A, Augood C, Duckitt K. Nonsteroidal anti-inflammatory drugs for heavy menstrual bleeding. *Cochrane Database Syst Rev* 2002;(1):CD000400. [PMID: 11869575]

99. Hurskainen R, Teperi J, Rissanen P, et al. Quality of life and cost-effectiveness of levonorgestrel-releasing intrauterine system versus hysterectomy for treatment of menorrhagia: a randomised trial. *Lancet* 2001;357(9252):273-7. [PMID: 11214131]

100. Lähteenmäki P, Haukkamaa M, Puolakka J, et al. Open randomised study of use of levonorgestrel releasing intrauterine system as alternative to hysterectomy. *BMJ* 1998;316(7138):1122-6. [PMID: 9552948]

101. Irvine GA, Campbell-Brown MB, Lumsden MA, et al. Randomized comparative trial of the levonorgestrel intrauterine system and norethisterone for treatment of idiopathic menorrhagia. *Br J Obstet Gynaecol* 1998;105(6):592-8. [PMID: 9647148]

102. Dunphy BC, Goerzen J, Greene CA, et al. A double-blind randomised study comparing danazol and medroxyprogesterone acetate in the management of menorrhagia. *J Obstet Gynaecol* 1998;18(6):553-5. [EMBASE: 1998386937] [PMID: 15512177]

103. Beaumont H, Augood C, Duckitt K, Lethaby A. Danazol for heavy menstrual bleeding. *Cochrane Database Syst Rev* 2002;(2):CD001017. [PMID: 12076401]

104. Sowter MC, Lethaby A. Singla AA. Pre-operative endometrial thinning agents before endometrial destruction for heavy menstrual bleeding. *Cochrane Database Syst Rev* 2002;(3):CD001124. [PMID: 12137619]

105. Lethaby A, Vollenhoven B, Sowter M. Pre-operative GnRH analogue therapy before hysterectomy or myomectomy for uterine fibroids. *Cochrane Database Syst Rev* 2001;(2):CD000547. [PMID: 11405968]

---

106. Jasonni VM, D'Anna R, Mancuso A, et al. Randomized double-blind study evaluating the efficacy on uterine fibroids shrinkage and on intra-operative blood loss of different length of leuprolide acetate depot treatment before myomectomy. *Acta Obstet Gynecol Scand* 2001;80(10):956-8. [PMID: 11580742]

Obstetric Hemorrhage

107. Baskett TF. Antepartum haemorrhage. In: *Essential Management of Obstetric Emergencies*. 3rd ed. Redland (England): Clinical Press; 1999. p. 64-76. [ISBN: 978-1-854-57042-0]

108. Bodnaruk ZM, Burrows D. Clinical Strategies for Avoiding Blood Transfusion in Neonatology and Perinatology [poster presentation]. The 78th Canadian Paediatric Society Annual Meeting; 2001 Jun 13-17; Vancouver, Canada.

109. Becker RH, Vonk R, Mende BC, et al. The relevance of placental location at 20-23 gestational weeks for prediction of placenta previa at delivery: evaluation of 8650 cases. *Ultrasound Obstet Gynecol* 2001;17(6):496-501. [PMID: 11422970]

110. Chaoui R, Kalache KD, Hartung J. Application of three-dimensional power Doppler ultrasound in prenatal diagnosis. *Ultrasound Obstet Gynecol* 2001;17(1):22-9. [PMID: 11244651]

111. Caughey AB, Parer JT. Recommendations for repeat courses of antenatal corticosteroids: a decision analysis. *Am J Obstet Gynecol* 2002;186(6):1221-9. [PMID: 12066102]

112. Mari G, Deter RL, Carpenter RL, et al, for the Collaborative Group for Doppler Assessment of the Blood Velocity in Anemic Fetuses. Noninvasive diagnosis by Doppler ultrasonography of fetal anemia due to maternal red-cell alloimmunization. *N Engl J Med* 2000;342(1):9-14. [PMID: 10620643]

113. Roberts AB, Mitchell JM, Lake Y, Pattison NS. Ultrasonographic surveillance in red blood cell alloimmunization. *Am J Obstet Gynecol* 2001;184(6):1251-5. [PMID: 11349197]

114. Teixeira JM, Duncan K, Letsky E, Fisk NM. Middle cerebral artery peak systolic velocity in the prediction of fetal anemia. *Ultrasound Obstet Gynecol* 2000;15(3):205-8. [PMID: 10846775]

115. Oepkes D. Invasive versus non-invasive testing in red-cell alloimmunized pregnancies. *Eur J Obstet Gynecol Reprod Biol* 2000;92(1):83-9. [PMID: 10986439]

116. Baskett TF. Ectopic pregnancy. In: *Essential Management of Obstetric Emergencies*. 3rd ed. Redland (England): Clinical Press; 1999. p. 37-51. [ISBN: 978-1-854-57042-0]

117. Lipscomb GH, Stovall TG, Ling FW. Nonsurgical treatment of ectopic pregnancy. *N Engl J Med* 2000;343(18):1325-9. [PMID: 11058678]

118. Lipscomb GH, McCord ML, Stovall TG, et al. Predictors of success of methotrexate treatment in women with tubal ectopic pregnancies. *N Engl J Med* 1999;341(26):1974-8. [PMID: 10607814]

119. Ankum WM. Diagnosing suspected ectopic pregnancy. HCG monitoring and transvaginal ultrasound lead the way [editorial]. *BMJ* 2000;321(7271):1235-6. [PMID: 11082067]

120. Lecuru F, Robin F, Chasset S, et al. Direct cost of single dose methotrexate for unruptured ectopic pregnancy. Prospective comparison with laparoscopy. *Eur J Obstet Gynecol Reprod Biol* 2000;88(1):1-6. [PMID: 10659909]

121. Selo-Ojeme DO, Onwudiegwu U, Durosinmi MA, Owolabi AT. Emergency autologous blood transfusion in the management of ruptured ectopic pregnancy. *J Obstet Gynaecol* 1997;17(4):353-5. [EMBASE: 1997263010] [PMID: 15511882]

122. Ansaloni L, Gaines C, Tocalli E. 'Soup ladle' autotransfusion. *Br J Surg* 1996;83(1):104. [PMID: 8653328]

123. Merrill BS, Mitts DL, Rogers W, Weinberg PC. Autotransfusion: intraoperative use in ruptured ectopic pregnancy. *J Reprod Med* 1980;24(1):14-6. [PMID: 7359497]

124. Baskett TF. Abortion. In: *Essential Management of Obstetric Emergencies*. 3rd ed. Redland (England): Clinical Press; 1999. p. 24-36. [ISBN: 978-1-854-57042-0]

125. Borgatta L, Chen AY, Reid SK, et al. Pelvic embolization for treatment of hemorrhage related to spontaneous and induced abortion. *Am J Obstet Gynecol* 2001;185(3):530-6. [PMID: 11568773]

126. Sher G. Trasylol in cases of accidental haemorrhage with coagulation disorder and associated uterine inertia. *S Afr Med J* 1974;48(34):1452-5. [PMID: 4546969]

127. Sher G. Pathogenesis and management of uterine inertia complicating abruptio placentae with consumption coagulopathy. *Am J Obstet Gynecol* 1977;129(2):164-70. [PMID: 302645]

128. Sher G, Statland BE. Abruptio placentae with coagulopathy: a rational basis for management. *Clin Obstet Gynecol* 1985;28(1):15-23. [PMID: 2580657]

129. Svanberg L, Åstedt B, Nilsson IM. Abruptio placentae —treatment with the fibrinolytic inhibitor tranexamic acid. *Acta Obstet Gynecol Scand* 1980;59(2):127-30. [PMID: 6157298]

130. Waterstone M, Bewley S, Wolfe C. Incidence and predictors of severe obstetric morbidity: case-control study. *BMJ* 2001;322(7294):1089-94. [PMID: 11337436]

131. Stones RW, Paterson CM, Saunders NJ. Risk factors for major obstetric haemorrhage. *Eur J Obstet Gynecol Reprod Biol* 1993;48(1):15-8. [PMID: 8449256]

132. Stanco LM, Schrimmer DB, Paul RH, Mishell DR Jr. Emergency peripartum hysterectomy and associated risk factors. *Am J Obstet Gynecol* 1993;168(3 Pt 1):879-83. [PMID: 8456896]

133. Combs CA, Murphy EL, Laros RK Jr. Factors associated with postpartum hemorrhage with vaginal birth. *Obstet Gynecol* 1991;77(1):69-76. [PMID: 1984230]

134. Combs CA, Murphy EL, Laros RK Jr. Factors associated with hemorrhage in cesarean deliveries. *Obstet Gynecol* 1991;77(1):77-82. [PMID: 1984231]

135. Conde-Agudelo A, Belizan JM. Maternal morbidity and mortality associated with interpregnancy interval: cross sectional study. *BMJ* 2000;321(7271):1255-9. [PMID: 11082085]

136. Prendiville WJ, Elbourne D, McDonald S. Active versus expectant management in the third stage of labour. *Cochrane Database Syst Rev* 2000;(3):CD000007. [PMID: 10908457]

137. Nordström L, Fogelstam K, Fridman G, et al. Routine oxytocin in the third stage of labour: a placebo controlled randomised trial. *Br J Obstet Gynaecol* 1997;104(7):781-6. [PMID: 9236641]

138. Rogers J, Wood J, McCandlish R, et al. Active versus expectant management of third stage of labour: the Hinchingbrooke randomised controlled trial. *Lancet* 1998;351(9104):693-9. [PMID: 9504513]

139. Enkin M, Keirse MJNC, Neilson J, et al. The third stage of labour. In: *A Guide to Effective Care in Pregnancy and Childbirth*. 3rd ed. New York: Oxford University Press; 2000. p. 300-9. [ISBN: 978-0-192-63173-2]

140. McCormick ML, Sanghvi HC, Kinzie B, McIntosh N. Preventing postpartum hemorrhage in low-resource settings. *Int J Gynaecol Obstet* 2002;77(3):267-75. [PMID: 12065142]

141. Geelhoed D, Visser L, Agordzo P, et al. Active versus expectant management of the third stage of labor in rural Ghana. *Acta Obstet Gynecol Scand* 2002;81(2):172-3. [PMID: 11942910]

---

* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

142. Elbourne DR, Prendiville WJ, Carroli G, Wood J, McDonald S. Prophylactic use of oxytocin in the third stage of labour. *Cochrane Database Syst Rev* 2001;(4):CD001808. [PMID: 11687123]

143. Munn MB, Owen J, Vincent R, et al. Comparison of two oxytocin regimens to prevent uterine atony at cesarean delivery: a randomized controlled trial. *Obstet Gynecol* 2001;98(3):386-90. [PMID: 11530117]

144. Abu-Omar AA. Prevention of postpartum hemorrhage, safety and efficacy. *Saudi Med J* 2001;22(12):1118-21. [PMID: 11802188]

145. Khan GQ, John IS, Wani S, et al. Controlled cord traction versus minimal intervention techniques in delivery of the placenta: a randomized controlled trial. *Am J Obstet Gynecol* 1997;177(4):770-4. [PMID: 9369817]

146. Choy CMY, Lau WC, Tam WH, Yuen PM. A randomised controlled trial of intramuscular syntometrine and intravenous oxytocin in the management of the third stage of labour. *BJOG* 2002;109(2):173-7. [PMID: 11905429]

147. Ng PS, Chan AS, Sin WK, et al. A multicentre randomized controlled trial of oral misoprostol and i.m. syntometrine in the management of the third stage of labour. *Hum Reprod* 2001;16(1):31-5. [PMID: 11139532]

148. McDonald S, Prendiville WJ, Elbourne D. Prophylactic syntometrine versus oxytocin for delivery of the placenta. *Cochrane Database Syst Rev* 2000;(2):CD000201. [PMID: 10796180]

149. de Groot AN, van Dongen PW, Vree TB, et al. Ergot alkaloids. Current status and review of clinical pharmacology and therapeutic use compared with other oxytocics in obstetrics and gynaecology. *Drugs* 1998;56(4):523-35. [PMID: 9806101]

150. Soriano D, Dulitzki M, Schiff E, et al. A prospective cohort study of oxytocin plus ergometrine compared with oxytocin alone for prevention of postpartum haemorrhage. *Br J Obstet Gynaecol* 1996;103(11):1068-73. [PMID: 8916990]

151. McDonald SJ, Prendiville WJ, Blair E. Randomised controlled trial of oxytocin alone versus oxytocin and ergometrine in active management of third stage of labour. *BMJ* 1993;307(6913):1167-71. [PMID: 8251842]

152. Dwyer N. Managing the third stage of labour. Nausea is a fair price for preventing haemorrhage [letter]. *BMJ* 1994;308(6920):59. [PMID: 8298364]

153. Lamont RF, Morgan DJ, Logue M, Gordon H. A prospective randomised trial to compare the efficacy and safety of Hemabate and Syntometrine for the prevention of primary postpartum haemorrhage. *Prostaglandins Other Lipid Mediat* 2001;66(3):203-10. [PMID: 11577783]

154. Gülmezoglu AM, Forna F, Villar J, Hofmeyr GJ. Prostaglandins for prevention of postpartum haemorrhage. *Cochrane Database Syst Rev* 2002;(3):CD000494. [PMID: 12137613]

155. Gülmezoglu AM, Villar J, Ngoc NT, et al. WHO multicentre randomised trial of misoprostol in the management of the third stage of labour. *Lancet* 2001;358(9283):689-95. [PMID: 11551574]

156. Bugalho A, Daniel A, Faundes A, Cunha M. Misoprostol for prevention of postpartum hemorrhage. *Int J Gynaecol Obstet* 2001;73(1):1-6. [PMID: 11336714]

157. Kundodyiwa TW, Majoko F, Rusakaniko S. Misoprostol versus oxytocin in the third stage of labor. *Int J Gynaecol Obstet* 2001;75(3):235-41. [PMID: 11728483]

158. El-Refaey H, Nooh R, O'Brien P, et al. The misoprostol third stage of labour study: a randomised controlled comparison between orally administered misoprostol and standard management. *BJOG* 2000;107(9):1104-10. [PMID: 11002953]

159. Walley RL, Wilson JB, Crane JM, et al. A double-blind placebo controlled randomised trial of misoprostol and oxytocin in the management of the third stage of labour. *BJOG* 2000;107(9):1111-5. [PMID: 11002954]

160. Surbek DV, Fehr PM, Hosli I, Holzgreve W. Oral misoprostol for third stage of labor: a randomized placebo-controlled trial. *Obstet Gynecol* 1999;94(2):255-8. [PMID: 10432138]

161. Bamigboye AA, Hofmeyr GJ, Merrell DA. Rectal misoprostol in the prevention of postpartum hemorrhage: a placebo-controlled trial. *Am J Obstet Gynecol* 1998;179(4):1043-6. [PMID: 9790395]

162. Hofmeyr GJ, Nikodem VC, de Jager M, Gelbart BR. A randomised placebo controlled trial of oral misoprostol in the third stage of labour. *Br J Obstet Gynaecol* 1998;105(9):971-5. [PMID: 9763047]

163. Goldberg AB, Greenberg MB, Darney PD. Misoprostol and pregnancy. *N Engl J Med* 2001;344(1):38-47. [PMID: 11136959]

164. Baskett TF. Complications of the third stage of labour. In: *Essential Management of Obstetric Emergencies*. 3rd ed. Redland (England): Clinical Press; 1999. p. 196-217. [ISBN: 978-1-854-57042-0]

165. Boyd ME. Transfusion alternatives in obstetrics/gynecology. In: Contreras M, Baron JF, Carson J, et al, editors (NATA). *Transfusion Medicine and Alternatives to Blood Transfusion*. Paris: R and J—Éditions Médicales; 2000. p. 468-80. [ISBN: 978-2-910-05212-6] Available at: http://nataonline.com/node/448 (Accessed February 10, 2016)

166. Hibbard BM. The treatment of obstetric haemorrhage in women who refuse blood transfusion. In: Hibbard BM, Anderson MM, Drife JO, et al, editors. *Report on confidential enquiries into maternal deaths in the United Kingdom. 1991-1993*. London: HMSO; 1996. p. 44-7. [ISBN: 978-0-113-21983-4]

167. Schuurmans N, MacKinnon C, Lane C, Etches D. Prevention and management of postpartum haemorrhage. [Clinical Practice Guideline No. 88] *J SOGC* (*J Soc Obstet Gynaecol Can*) 2000;22(4):271-81. [ISSN: 0849-5831]

168. Mousa HA, Walkinshaw S. Major postpartum haemorrhage. *Curr Opin Obstet Gynecol* 2001;13(6):595-603. [PMID: 11707663]

169. Drife J. Management of primary postpartum haemorrhage. *Br J Obstet Gynaecol* 1997;104(3):275-7. [PMID: 9091001]

170. Norris TC. Management of postpartum hemorrhage. *Am Fam Physician* 1997;55(2):635-40. [PMID: 9054229]

171. Riley DP, Burgess RW. External abdominal aortic compression: a study of a resuscitation manoeuvre for postpartum haemorrhage. *Anaesth Intensive Care* 1994;22(5):571-5. [PMID: 7818062]

172. Keogh J, Tsokos N. Aortic compression in massive postpartum haemorrhage—an old but lifesaving technique. *Aust N Z J Obstet Gynaecol* 1997;37(2):237-8. [PMID: 9222477]

173. Chua S, Arulkumaran S, Lim I, et al. Influence of breastfeeding and nipple stimulation on postpartum uterine activity. *Br J Obstet Gynaecol* 1994;101(9):804-5. [PMID: 7947531]

174. Irons DW, Sriskandabalan P, Bullough CH. A simple alternative to parenteral oxytocics for the third stage of labor. *Int J Gynaecol Obstet* 1994;46(1):15-8. [PMID: 7805977]

175. Gazvani MR, Luckas MJ, Drakeley AJ, et al. Intraumbilical oxytocin for the management of retained placenta: a randomized controlled trial. *Obstet Gynecol* 1998;91(2):203-7. [PMID: 9469276]

176. Kelly L, Kapasi H. Hemabate® for the management of post-partum haemorrhage in a rural hospital. *J SOGC* (*J Soc Obstet Gynaecol Can*) 1999;21(3):259-64. [ISSN: 0849-5831]

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* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

177. Kupferminc MJ, Gull I, Bar-Am A, et al. Intrauterine irrigation with prostaglandin F_2 alpha for management of severe postpartum hemorrhage. *Acta Obstet Gynecol Scand* 1998;77(5):548-50. [PMID: 9654178]

178. Bigrigg A, Chui D, Chissell S, Read MD. Use of intra myometrial 15-methyl prostaglandin F_2 alpha [Prestinfenem®] to control atonic postpartum haemorrhage following vaginal delivery and failure of conventional therapy. *Br J Obstet Gynaecol* 1991;98(7):734-6. [PMID: 1883806]

179. Oleen MA, Mariano JP. Controlling refractory atonic postpartum hemorrhage with Hemabate sterile solution. *Am J Obstet Gynecol* 1990;162(1):205-8. [PMID: 2405676]

180. Ananthasubramaniam L, Rao K, Sivaraman R, Raghavan KS. Management of intractable postpartum hemorrhage secondary to uterine atony with intramuscular 15(S)15 methyl $PGF_{2\alpha}$. *Acta Obstet Gynecol Scand* 1988;67(Suppl 145):17-9.

181. Lokugamage AU, Sullivan KR, Niculescu I, et al. A randomized study comparing rectally administered misoprostol versus Syntometrine combined with an oxytocin infusion for the cessation of primary post partum hemorrhage. *Acta Obstet Gynecol Scand* 2001;80(9):835-9. [PMID: 11531635]

182. O'Brien P, El-Refaey H, Gordon A, et al. Rectally administered misoprostol for the treatment of postpartum hemorrhage unresponsive to oxytocin and ergometrine: a descriptive study. *Obstet Gynecol* 1998;92(2):212-4. [PMID: 9699753]

183. Bakri YN, Amri A, Abdul Jabbar F. Tamponade-balloon for obstetrical bleeding. *Int J Gynaecol Obstet* 2001;74(2):139-42. [PMID: 11502292]

184. Johanson R, Kumar M, Obhrai M, Young P. Management of massive postpartum haemorrhage: use of a hydrostatic balloon catheter to avoid laparotomy. *BJOG* 2001;108(4):420-2. [PMID: 11305551]

185. Chan C, Razvi K, Tham KF, Arulkumaran S. The use of a Sengstaken-Blakemore tube to control post-partum hemorrhage. *Int J Gynaecol Obstet* 1997;58(2):251-2. [PMID: 9252266]

186. Katesmark M, Brown R, Raju KS. Successful use of a Sengstaken-Blakemore tube to control massive postpartum haemorrhage. *Br J Obstet Gynaecol* 1994;101(3):259-60. [PMID: 8193105]

187. Maier RC. Control of postpartum hemorrhage with uterine packing. *Am J Obstet Gynecol* 1993;169(2 Pt 1):317-23. [PMID: 8362942]

188. Hallak M, Dildy GA 3rd, Hurley TJ, Moise KJ Jr. Transvaginal pressure pack for life-threatening pelvic hemorrhage secondary to placenta accreta. *Obstet Gynecol* 1991;78(5 Pt 2):938-40. [PMID: 1923235]

189. Druzin ML. Packing of the lower uterine segment for control of postcesarean bleeding in instances of placenta previa. *Surg Gynecol Obstet* 1989;169(6):543-5. [PMID: 2814771]

190. Deux JF, Bazot M, Le Blanche AF, et al. Is selective embolization of uterine arteries a safe alternative to hysterectomy in patients with postpartum hemorrhage? *AJR Am J Roentgenol* 2001;177(1):145-9. [PMID: 11418416]

191. Deux JF, Bazot M, Berkane N, et al. Postpartum hemorrhage: treatment by embolization [French]. *Gynecol Obstet Fertil* 2000;28(10):711-8. [PMID: 11244632]

192. Pelage JP, Le Dref O, Mateo J, et al. Life-threatening primary postpartum hemorrhage: treatment with emergency selective arterial embolization. *Radiology* 1998;208(2):359-62. [PMID: 9680559]

193. Mason BA. Postpartum hemorrhage and arterial embolization. *Curr Opin Obstet Gynecol* 1998;10(6):475-9. [PMID: 9866016]

194. Gilbert WM, Moore TR, Resnik R, et al. Angiographic embolization in the management of hemorrhagic complications of pregnancy. *Am J Obstet Gynecol* 1992;166(2):493-7. [PMID: 1536217]

195. O'Leary JA. Uterine artery ligation in the control of postcesarean hemorrhage. *J Reprod Med* 1995;40(3):189-93. [PMID: 7776302]

196. AbdRabbo SA. Stepwise uterine devascularisation: a novel technique for management of uncontrollable postpartum hemorrhage with preservation of the uterus. *Am J Obstet Gynecol* 1994;171(3):694-700. [PMID: 8092217]

197. Fahmy K. Uterine artery ligation to control postpartum hemorrhage. *Int J Gynaecol Obstet* 1987;25(5):363-7. [PMID: 2889629]

198. Anonymous. ACOG educational bulletin. Postpartum hemorrhage. Number 243, January 1998. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet* 1998;61(1):79-86. [PMID:9622181]

199. Thomas JM. The treatment of obstetric haemorrhage in women who refuse blood transfusion [letter]. *Br J Obstet Gynaecol* 1998;105(1):127-8. [PMID: 9442181] Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.1471-0528.1998.tb09370.x/full (Accessed February 10, 2016)

200. Thomas JM. Women who refuse blood transfusion: uterine devascularization for post-partum haemorrhage [letter]. *J SOGC (J Soc Obstet Gynaecol Can)* 1999;21(12):1140-1. [ISSN: 0849-5831]

201. Wenham J, Matijevic R. Post-partum hysterectomies: revisited. *J Perinatal Med* 2001;29(3):260-5. [PMID: 11447932]

202. Castaneda S, Karrison T, Cibils LA. Peripartum hysterectomy. *J Perinat Med* 2000;28(6):472-81. [PMID: 11155434]

203. Tamizian O, Arulkumaran S. The surgical management of postpartum haemorrhage. *Curr Opin Obstet Gynecol* 2001;13(2):127-31. [PMID: 11315865]

204. Thakur A, Heer MS, Thakur V, et al. Subtotal hysterectomy for uterine rupture. *Int J Gynaecol Obstet* 2001;74(1):29-33. [PMID: 11430938]

205. Chew S, Biswas A. Caesarean and postpartum hysterectomy. *Singapore Med J* 1998;39(1):9-13. [PMID: 9557096]

206. Zorlu CG, Turan C, Isik AZ, et al. Emergency hysterectomy in modern obstetric practice. Changing clinical perspective in time. *Acta Obstet Gynecol Scand* 1998;77(2):186-90. [PMID: 9512325]

207. Sturdee DW, Rushton DI. Caesarean and post-partum hysterectomy 1968-1983. *Br J Obstet Gynaecol* 1986;93(3):270-4. [PMID: 3485995]

208. Dildy GA, Scott JR, Saffer CS, Belfort MA. Pelvic pressure pack for catastrophic postpartum hemorrhage [abstract]. 48th Annual Meeting of the American College of Obstetricians and Gynecologists; 2000 May 20-24; San Francisco, USA. *Obstet Gynecol* 2000;95(4 Suppl 1):7S. [ISSN: 0029-7844]

209. Ghourab S, Al-Nuaim L, Al-Jabari A, et al. Abdomino-pelvic packing to control severe haemorrhage following caesarean hysterectomy. *J Obstet Gynaecol* 1999;19(2):155-8. [EMBASE: 1999140465] [PMID: 15512258]

210. Murakami R, Ichikawa T, Kumazaki T, et al. Transcatheter arterial embolization for postpartum massive hemorrhage: a case report. *Clin Imaging* 2000;24(6):368-70. [PMID: 11368940]

211. Pelage JP, Soyer P, Repiquet D, et al. Secondary postpartum hemorrhage: treatment with selective arterial embolization. *Radiology* 1999;212(2):385-9. [PMID: 10429694]

---

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212. Hsu YR, Wan YL. Successful management of intractable puerperal hematoma and severe postpartum hemorrhage with DIC through transcatheter arterial embolization—two cases. *Acta Obstet Gynecol Scand* 1998;77(1):129-31. [PMID: 9492736]

213. Caponas G. Glyceryl trinitrate and acute uterine relaxation: a literature review. *Anaesth Intensive Care* 2001;29(2):163-77. [PMID: 11314836]

214. Hicks JC. Use of nitroglycerin spray in uterine inversion. *J Am Board Fam Pract* 2000;13(5):374-5. [PMID: 11001010] Available at: http://www.jabfm.org/content/13/5/374.full.pdf+html (Accessed February 10, 2016)

215. Baskett TF. Emergency uterine relaxation. In: *Essential Management of Obstetric Emergencies*. 3rd ed. Redland (England): Clinical Press; 1999. p. 110-4. [ISBN: 978-1-854-57042-0]

216. Vinatier D, Dufour P, Berard J. Utilization of intravenous nitroglycerin for obstetrical emergencies. *Int J Gynaecol Obstet* 1996;55(2):129-34. [PMID:8960993]

217. Dufour P, Vinatier D, Puech F. The use of intravenous nitroglycerin for cervico-uterine relaxation: a review of the literature. *Arch Gynecol Obstet* 1997;261(1):1-7. [PMID: 9451516]

218. Wax JR, Channell JC, Vandersloot JA. Packing of the lower uterine segment—new approach to an old technique [letter]. *Int J Gynaecol Obstet* 1993;43(2):197-8. [PMID: 7905439]

219. Gilstrap LC 3rd, Ramin SM. Postpartum hemorrhage. *Clin Obstet Gynecol* 1994;37(4): 824-30. [PMID:7842550]

220. Jain KA, Olcott EW. Magnetic resonance imaging of postpartum pelvic hematomas: early experience in diagnosis and treatment planning. *Magn Reson Imaging* 1999;17(7):973-7. [PMID: 10463646]

221. deCastro RM. Bloodless surgery: establishment of a program for the special medical needs of the Jehovah's Witness community—the gynecologic surgery experience at a community hospital. *Am J Obstet Gynecol* 1999;180 (6 Pt 1):1491-8. [PMID: 10368496]

222. Andrae B, Eriksson LG, Skoog G. Anti-shock trousers (MAST) and transcatheter embolization in the management of massive obstetric hemorrhage. A report of two cases. *Acta Obstet Gynecol Scand* 1999;78(8):740-1. [PMID: 10468071]

223. Dildy GA 3rd. Postpartum hemorrhage: new management options. *Clin Obstet Gynecol* 2002;45(2):330-44. [PMID: 12048393]

224. Marcovici I, Scoccia B. Postpartum hemorrhage and intrauterine balloon tamponade. A report of three cases. *J Reprod Med* 1999;44(2):122-6. [PMID: 10853443]

225. Wahab MA, Karantzis P, Eccersley PS, et al. A randomised, controlled study of uterine exteriorisation and repair at caesarean section. *Br J Obstet Gynaecol* 1999;106(9):913-6. [PMID: 10492101]

226. Magann EF, Chauhan SP, Bufkin L, et al. Intra-operative haemorrhage by blunt versus sharp expansion of the uterine incision at caesarean delivery: a randomised clinical trial. *BJOG* 2002;109(4):448-52. [PMID: 12013167]

227. Kwawukume EY. Caesarean section in developing countries. *Best Prac Res Clin Obstet Gynaecol* 2001;15(1):165-78. [PMID: 11359321]

228. Hema KR, Johanson R. Techniques for performing caesarean section. *Best Prac Res Clin Obstet Gynaecol* 2001;15(1):17-47. [PMID: 11359313]

229. Tewari K, Cappuccini F, Balderston KD, et al. Pregnancy in a Jehovah's Witness with cervical cancer and anemia. *Gynecol Oncol* 1998;71(2):330-2. [PMID: 9826482]

230. Holmgren G, Sjöholm L, Stark M. The Misgav Ladach method for cesarean section: method description. *Acta Obstet Gynecol Scand* 1999;78(7):615-21. [PMID: 10422908]

231. Holmgren G, Sjöholm L, Stark M. Modifications to the Misgav Ladach technique for cesarean section [reply to Ayres-de-Campos D, Patricio B.]. *Acta Obstet Gynecol Scand* 2000;79(4):326-7. [PMID: 10746852]

232. Björklund K, Kimaro M, Urassa E, Lindmark G. Introduction of the Misgav Ladach caesarean section at an African tertiary centre: a randomised controlled trial. *BJOG* 2000;107(2):209-16. [PMID: 10688504]

233. Ansaloni L, Brundisini R, Morino G, Kiura A. Prospective, randomized, comparative study of Misgav Ladach versus traditional cesarean section at Nazareth Hospital, Kenya. *World J Surg* 2001;25(9):1164-72. [PMID: 11571954]

234. Wallin G, Fall O. Modified Joel-Cohen technique for caesarean delivery. *Br J Obstet Gynaecol* 1999;106(3):221-6. [PMID: 10426640]

235. Darj E, Nordstrom ML. The Misgav Ladach method for cesarean section compared to the Pfannenstiel method. *Acta Obstet Gynecol Scand* 1999;78(1):37-41. [PMID: 9926890]

236. Federici D, Lacelli B, Muggiasca L, et al. Cesarean section using the Misgav Ladach method. *Int J Gynaecol Obstet* 1997;57(3):273-9. [PMID: 9215490]

237. Pelosi MA 3rd, Pelosi MA. Modified cesarean hysterectomy for placenta previa percreta with bladder invasion: retrovesical lower uterine segment bypass. *Obstet Gynecol* 1999;93(5 Pt 2):830-3. [PMID: 10912411]

238. Wood RM, Simon H, Oz AU. Pelosi-type vs. traditional cesarean delivery. A prospective comparison. *J Reprod Med* 1999;44(9):788-95. [PMID: 10509303]

239. Hohlagschwandtner M, Ruecklinger E, Husslein P, Joura EA. Is the formation of a bladder flap at cesarean necessary? A randomized trial. *Obstet Gynecol* 2001;98(6):1089-92. [PMID: 11755558]

240. Pelosi MA, Ortega I. Cesarean section: Pelosi's simplified technique [Spanish]. *Rev Chil Obstet Ginecol* 1994;59(5):372-7. [PMID: 7569153]

241. Rebarber A, Lonser R, Jackson S, et al. The safety of intraoperative autologous blood collection and autotransfusion during cesarean section. *Am J Obstet Gynecol* 1998;179(3 Pt 1): 715-20. [PMID: 9757977]

242. Potter PS, Waters JH, Burger GA, Mraović B. Application of cell-salvage during cesarean section. *Anesthesiology* 1999;90(2):619-21. [PMID: 9952170]

243. Jackson SH, Lonser RE. Safety and effectiveness of intracesarean blood salvage [letter]. *Transfusion* 1993;33(2):181. [PMID: 8430460]

244. Catling SJ, Freites O, Krishnan S, Gibbs R. Clinical experience with cell salvage in obstetrics: 4 Cases from one UK centre. *Int J Obstet Anesth* 2002;11(2):128-34. [PMID: 15321566]

245. Waters JH, Biscotti C, Potter PS, Phillipson E. Amniotic fluid removal during cell salvage in the cesarean section patient. *Anesthesiology* 2000;92(6):1531-6. [PMID: 10839901]

246. Catling SJ, Williams S, Fielding AM. Cell salvage in obstetrics: an evaluation of the ability of cell salvage combined with leucocyte depletion filtration to remove amniotic fluid from operative blood loss at caesarean section. *Int J Obstet Anesth* 1999;8(2):79-84. [EMBASE: 1999155300] [PMID: 15321149]

247. Bernstein HH, Rosenblatt MA, Gettes M, Lockwood C. The ability of the Haemonetics® 4 Cell Saver System to remove tissue factor from blood contaminated with amniotic fluid. *Anesth Analg* 1997;85(4):831-3. [PMID: 9322464]

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* This *Clinical Strategies* document is an informational resource and reference for medical practitioners only. It provides neither medical advice nor treatment recommendations and does not substitute for an appropriately qualified health-care professional. The editor does not recommend or endorse any test, physician, product, or procedure, and has endeavored to include accurate, timely information. However, not all listed strategies are appropriate or acceptable to all patients. It is the responsibility of each provider to maintain awareness of new information, discuss options for care, and assist patients in making choices in accord with their wishes, values, and beliefs. Patients should always seek the advice of a qualified health-care professional regarding a medical condition or treatment.

248. Grange CS, Douglas MJ, Adams TJ, Wadsworth LD. The use of acute hemodilution in parturients undergoing cesarean section. *Am J Obstet Gynecol* 1998;178(1 Pt 1):156-60. [PMID: 9465821]

249. Dansereau J, Joshi AK, Helewa ME, et al. Double-blind comparison of carbetocin versus oxytocin in prevention of uterine atony after cesarean section. *Am J Obstet Gynecol* 1999;180(3 Pt 1):670-6. [PMID: 10076146]

250. Boucher M, Horbay GL, Griffin P, et al. Double-blind, randomized comparison of the effect of carbetocin and oxytocin on intraoperative blood loss and uterine tone of patients undergoing cesarean section. *J Perinatol* 1998;18(3):202-7. [PMID: 9659650]

251. Acharya G, Al-Sammarai MT, Patel N, et al. A randomized, controlled trial comparing effect of oral misoprostol and intravenous syntocinon on intra-operative blood loss during cesarean section. *Acta Obstet Gynecol Scand* 2001;80(3):245-50. [PMID: 11207490]

252. Horn EP, Schroeder F, Gottschalk A, et al. Active warming during cesarean delivery. *Anesth Analg* 2002;94(2):409-14. [PMID: 11812709]

253. Bagratee JS, Moodley J, Kleinschmidt I, Zawilski W. A randomised controlled trial of antibiotic prophylaxis in elective caesarean delivery. *BJOG* 2001;108(2):143-8. [PMID: 11236113]

254. Frederiksen MC, Glassenberg R, Stika CS. Placenta previa: a 22-year analysis. *Am J Obstet Gynecol* 1999;180(6 Pt 1):1432-7. [PMID: 10368483]

255. Hudon L, Belfort MA, Broome DR. Diagnosis and management of placenta percreta: a review. *Obstet Gynecol Surv* 1998;53(8):509-17. [PMID: 9702791]

256. Harnett MJ, Miller AD, Hurley RJ, Bhavani-Shankar K. Pregnancy, labour and delivery in a Jehovah's Witness with esophageal varices and thrombocytopenia. *Can J Anaesth* 2000;47(12):1253-5. [PMID: 11132750]

257. Zaki ZM, Bahar AM. Massive hemorrhage due to placenta praevia accreta: a useful role for vasopressin. *J Obstet Gynaecol* 1997;17(5):486-7. [EMBASE: 1997312716] [PMID: 15511932]

258. Hull AD, Salerno CC, Saenz CC, Pretorius DH. Three-dimensional ultrasonography and diagnosis of placenta percreta with bladder involvement. *J Ultrasound Med* 1999;18(12):853-6. [PMID:10591451]

259. Kirkinen P, Helin-Martikainen HL, Vanninen R, Partanen K. Placenta accreta: imaging by gray-scale and contrast-enhanced color Doppler sonography and magnetic resonance imaging. *J Clin Ultrasound* 1998;26(2):90-4. [PMID: 9460637]

260. Maldjian C, Adam R, Pelosi M, et al. MRI appearance of placenta percreta and placenta accreta. *Magn Reson Imaging* 1999;17(7):965-71. [PMID: 10463645]

261. Chen YJ, Wang PH, Liu WM, et al. Placenta accreta diagnosed at 9 weeks' gestation. *Ultrasound Obstet Gynecol* 2002;19(6):620-2. [PMID: 12047545]

262. Thorp JM Jr, Wells SR, Wiest HH, et al. First-trimester diagnosis of placenta previa percreta by magnetic resonance imaging. *Am J Obstet Gynecol* 1998;178(3):616-8. [PMID: 9539538]

263. Chou MM, Tseng JJ, Ho ESC, Hwang JI. Three-dimensional color power Doppler imaging in the assessment of uteroplacental neovascularization in placenta previa increta/percreta. *Am J Obstet Gynecol* 2001;185(5):1257-60. [PMID: 11717667]

264. Chou MM, Ho ESC, Lee YH. Prenatal diagnosis of placenta previa accreta by transabdominal color Doppler ultrasound. *Ultrasound Obstet Gynecol* 2000;15(1):28-35. [PMID: 10776009]

265. Nagayama M, Watanabe Y, Okumura A, et al. Fast MR imaging in obstetrics. *Radiographics* 2002;22(3):563-80. [PMID: 12006687]

266. Mitty HA, Sterling KM, Alvarez M, Gendler R. Obstetric hemorrhage: prophylactic and emergency arterial catheterization and embolotherapy. *Radiology* 1993;188(1):183-7. [PMID: 8511294]

267. Alvarez M, Lockwood CJ, Ghidini A, et al. Prophylactic and emergent arterial catheterization for selective embolization in obstetric hemorrhage. *Am J Perinatol* 1992;9(5-6):441-4. [PMID: 1418152]

268. Descargues G, Douvrin F, Degré S, et al. Abnormal placentation and selective embolization of the uterine arteries. *Eur J Obstet Gynecol Reprod Biol* 2001;99(1):47-52. [PMID: 11604185]

269. Dubois J, Garel L, Grignon A, et al. Placenta percreta: balloon occlusion and embolization of the internal iliac arteries to reduce intraoperative blood losses. *Am J Obstet Gynecol* 1997; 176(3): 723-6. [PMID: 9077641]

270. Walker WJ. Case report: successful internal iliac artery embolisation with glue in a case of massive obstetric haemorrhage. *Clin Radiol* 1996;51(6):442-4. [PMID:8654014]

271. Kidney DD, Nguyen AM, Ahdoot D, et al. Prophylactic perioperative hypogastric artery balloon occlusion in abnormal placentation. *AJR Am J Roentgenol* 2001;176(6):1521-4. [PMID: 11373225]

272. Weeks SM, Stroud TH, Sandhu J, et al. Temporary balloon occlusion of the internal iliac arteries for control of hemorrhage during cesarean hysterectomy in a patient with placenta previa and placenta increta. *J Vasc Interv Radiol* 2000;11(5):622-4. [PMID: 10834494]

273. Paull JD, Smith J, Williams L, et al. Balloon occlusion of the abdominal aorta during cesarean hysterectomy for placenta percreta. *Anaesth Intensive Care* 1995;23(6):731-4. [PMID: 8669612]

274. Estella NM, Berry DL, Baker BW, et al. Normovolemic hemodilution before cesarean hysterectomy for placenta percreta. *Obstet Gynecol* 1997;90(4 Pt 2):669-70. [PMID: 11770589]

275. Rainaldi MP, Tazzari PL, Scagliarini G, et al. Blood salvage during caesarean section. *Br J Anaesth* 1998;80(2):195-8. [PMID: 9602584]

276. MacDonald JM, Sethi B. Blood transfusion for caesarean section [letter]. *Br J Anaesth* 1998;81(5):825-6. [PMID: 10193302]

277. Anonymous. ACOG committee opinion. Placenta accreta. Number 266, January 2002. Committee on Obstetric Practice. American College of Obstetricians and Gynecologists. *Obstet Gynecol* 2002 Jan;99(1):169-70. [PMID: 11777527]

278. Baglin T. Disseminated intravascular coagulation: diagnosis and treatment. *BMJ* 1996;312(7032):683-7. [PMID: 8597738]

279. Riewald M, Riess H. Treatment options for clinically recognized disseminated intravascular coagulation. *Semin Thromb Hemost* 1998;24(1):53-9. [PMID: 9515780]

280. Moscardo F, Perez F, de La Rubia J, et al. Successful treatment of severe intra-abdominal bleeding associated with disseminated intravascular coagulation using recombinant activated factor VII. *Br J Haematol* 2001;114(1):174-6. [PMID: 11472364]

Perioperative Blood Conservation

281. Bonakdar MI, Eckhous AW, Bacher BJ, et al. Major gynecologic and obstetric surgery in Jehovah's Witnesses. *Obstet Gynecol* 1982;60(5):587-90. [PMID: 7145251]

282. Heyman HJ. Blood conservation in special situations —anesthesiologists' viewpoints. In: Salem MR, editor. *Blood Conservation in the Surgical Patient*. Baltimore: Williams & Wilkins; 1996. p. 337-40. [ISBN: 978-0-683-07531-1]

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283. Baker BW. Blood conservation, obstetrics, and Jehovah's Witnesses. *Anesthesiol Clin North Am* 1998;16(2):375-84. [EMBASE: 1998213923] [ISSN: 0889-8537]

284. Ozawa S, Shander A, Ochani TD. A practical approach to achieving bloodless surgery. *AORN J* 2001;74(1):34-40, 42-7. [PMID: 11460783]

285. Wong CJ, Thomas JM, Shander A, et al. Clinical Strategies for Avoiding and Controlling Hemorrhage and Anemia Without Blood Transfusion in Anesthesiology [poster presentation]. The 12th World Congress of Anaesthesiologists; 2000 Jun 4-9; Montréal, Canada.

286. Hébert PC, Wells G, Blajchman MA, et al, for the Transfusion Requirements in Critical Care Investigators, Canadian Critical Care Trials Group. A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. *N Engl J Med* 1999;340(6):409-17. [PMID: 9971864]

287. Spence RK. Preoperative packed cell volume necessary for patients undergoing elective surgery. *Br J Anaesth* 1998;81 Suppl 1: 50-5. [PMID: 10318989]

288. Lieberman JA, Weiskopf RB, Kelley SD, et al. Critical oxygen delivery in conscious humans is less than 7.3 ml $O_2 \cdot kg^{-1} \cdot min^{-1}$. *Anesthesiology* 2000;92(2):407-13. [PMID: 10691227]

289. Tuman KJ. Tissue oxygen delivery: the physiology of anemia. *Anesthesiol Clin North Am* 1990;8(3):451-69. [EMBASE: 1990303631]

290. Dietrich KA, Conrad SA, Hebert CA, et al. Cardiovascular and metabolic response to red blood cell transfusion in critically ill volume-resuscitated nonsurgical patients. *Crit Care Med* 1990;18(9):940-4. [PMID: 2394117]

291. Stehling LC, Doherty DC, Faust RJ, et al. Practice guidelines for blood component therapy. A report by the American Society of Anesthesiologists Task Force on blood component therapy. *Anesthesiology* 1996;84(3):732-47. [PMID: 8659805]

292. Boyd ME, Soucy R, Falcone T. The morbidity of hysterectomy among Jehovah's Witnesses. *J Pelvic Surg* 1996;2(2):63-7. [ISSN: 1077-2847]

293. Gostout BS, Cliby WA, Podratz KC. Prevention and management of acute intraoperative bleeding. *Clin Obstet Gynecol* 2002;45(2):481-91. [PMID: 12048406]

294. Staradub VL, Morrow M. Modified radical mastectomy with knife technique. *Arch Surg* 2002;137(1):105-10. [PMID: 11772228]

295. Boyd ME. Management of operative and postoperative hemorrhage. In: *Practical Gynecologic Surgery: Principles in Practice*. Baltimore-Munich: Urban & Schwarzenberg; 1990. p. 235-42. [ISBN: 978-0-806-72541-3]

296. Dessole S, Rubattu G, Capobianco G, et al. Utility of bipolar electrocautery scissors for abdominal hysterectomy. *Am J Obstet Gynecol* 2000;183(2)396-9. [PMID: 10942476]

297. Scarantino SE, Reilly JG, Moretti ML, Pillari VT. Argon beam coagulation in the management of placenta accreta. *Obstet Gynecol* 1999;94(5 Pt 2):825-7. [PMID: 10546744]

298. Kurtz SB, Frost DB. A comparison of two surgical techniques for performing mastectomy. *Eur J Surg Oncol* 1995;21(2):143-5. [PMID: 7720886]

299. Bain C, Cooper KG, Parkin DE. Microwave endometrial ablation versus endometrial resection: a randomized controlled trial. *Obstet Gynecol* 2002;99(6):983-987. [PMID: 12052586]

300. Hodgson DA, Feldberg IB, Sharp N, et al. Microwave endometrial ablation: development, clinical trials and outcomes at three years. *Br J Obstet Gynaecol* 1999;106(7):684-94. [PMID: 10428525]

301. Pilnik S, Steichen F. The use of the hemostatic scalpel in operations upon the breast. *Surg Gynecol Obstet* 1986;162(6):589-91. [PMID: 3715691]

302. Grassie K, Makii M. The use of the harmonic scalpel to reduce morbidity during open total abdominal hysterectomies with bilateral salpingo-oophorectomy (TAH/BSO). *Curr Surg* 2001;58(3):319-22. [PMID:11397494]

303. Deo SVS, Shukla NK. Modified radical mastectomy using harmonic scalpel. *J Surg Oncol* 2000;74(3)204-7. [PMID: 10951418]

304. Stringer NH. One hundred laparoscopic myomectomies with ultrasonic energy: surgical evaluation of a new energy source. *Gynaecol Endosc* 1998;7(2):85-93. [EMBASE: 1998140598] [ISSN: 1365-2508]

305. van Dam PA, Tjalma W, Weyler J, et al. Ultraradical debulking of epithelial ovarian cancer with the ultrasonic surgical aspirator: a prospective randomized trial. *Am J Obstet Gynecol* 1996; 174(3): 943-50. [PMID: 8633674]

306. Gharoro EP, Abedi HO, Isiavwe JO. Prophylactic internal iliac artery ligation in gynecologic pelvic surgery. *Int J Gynaecol Obstet* 1999;65(3):307-9. [PMID: 10428355]

307. Thiel I, Lang PFJ, Tamussino KF, Winter R. Thumbtack application for control of presacral hemorrhage at pelvic lymphadenectomy: a case report. *J Pelvic Surg* 2001;7(5):303-4. [ISSN: 1077-2847]

308. Watson GM, Walker WJ. Uterine artery embolisation for the treatment of symptomatic fibroids in 114 women: reduction in size of the fibroids and women's views of the success of the treatment. *BJOG* 2002;109(2):129-35. [PMID: 11905428]

309. Goodwin SC, Wong GC. Uterine artery embolization for uterine fibroids: a radiologist's perspective. *Clin Obstet Gynecol* 2001;44(2):412-24. [PMID:11345002]

310. Brunereau L, Herbreteau D, Gallas S, et al. Uterine artery embolization in the primary treatment of uterine leiomyomas: technical features and prospective follow-up with clinical and sonographic examinations in 58 patients. *AJR Am J Roentgenol* 2000;175(5):1267-72. [PMID: 11044020]

311. Pelage JP, Le Dref O, Soyer P, et al. Fibroid-related menorrhagia: treatment with superselective embolization of the uterine arteries and midterm follow-up. *Radiology* 2000;215(2):428-31. [PMID: 10796920]

312. Worthington-Kirsch RL, Popky GL, Hutchins FL. Uterine arterial embolization for the management of leiomyomas: quality-of-life assessment and clinical response. *Radiology* 1998;208(3):625-9. [PMID: 9722838]

313. Bradley EA, Reidy JF, Forman RG, et al. Transcatheter uterine artery embolisation to treat large uterine fibroids. *Br J Obstet Gynaecol* 1998;105(2):235-40. [PMID: 9501794]

314. Kwon JH, Kim GS. Obstetric iatrogenic arterial injuries of the uterus: diagnosis with US and treatment with transcatheter arterial embolization. *Radiographics* 2002;22(1):35-46. [PMID: 11796896]

315. Mihmanli I, Cantasdemir M, Kantarci F, et al. Percutaneous embolization in the management of intractable vaginal bleeding. *Arch Gynecol Obstet* 2001;264(4):211-4. [PMID: 11205712]

316. Lingam K, Hood V, Carty MJ. Angiographic embolisation in the management of pelvic haemorrhage. *BJOG* 2000;107(9):1176-8. [PMID: 11002967]

317. Mitty HA. Emergency uterine artery embolization. *Sem Interv Radiol* 2000;17(3):271-6. [EMBASE: 2000361113]

318. Cameron IM, Mollison J, Pinion SB, et al. A cost comparison of hysterectomy and hysteroscopic surgery for the treatment of menorrhagia. *Eur J Obstet Gynecol Reprod Biol* 1996;70(1):87-92. [PMID: 9031926]

319. de Perrot M, Jenny A, Morales M, et al. Laparoscopic appendectomy during pregnancy. *Surg Laparosc Endosc Percutan Tech* 2000;10(6):368-71. [PMID: 11147911]

---

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320. Lethaby A, Shepperd S, Cooke I, Farquhar C. Endometrial resection and ablation versus hysterectomy for heavy menstrual bleeding. *Cochrane Database Syst Rev* 2000;(2):CD000329. [PMID: 10796528]

321. O'Connor H, Broadbent JA, Magos AL, McPherson K. Medical Research Council randomised trial of endometrial resection versus hysterectomy in management of menorrhagia. *Lancet* 1997;349(9056):897-901. [PMID: 9093249]

322. Hart R, Magos A. The alternatives to hysterectomy. *Baillieres Best Pract Res Clin Obstet Gynecol* 1999;13(2):271-90. [PMID: 10755042]

323. Boujida VH, Philipsen T, Pelle J, Joergensen JC. Five-year follow-up of endometrial ablation: endometrial coagulation versus endometrial resection. *Obstet Gynecol* 2002;99(6):988-92. [PMID: 12052587]

324. Mousa HA, Abou El Senoun GM, Mahmood TA. Medium-term clinical outcome of women with menorrhagia treated by rollerball endometrial ablation versus abdominal hysterectomy with conservation of at least one ovary. *Acta Obstet Gynecol Scand* 2001;80(5):442-6. [PMID: 11328222]

325. Vilos GA, Vilos EC, King JH. Experience with 800 hysteroscopic endometrial ablations. *J Am Assoc Gynecol Laparosc* 1996;4(1):33-8. [PMID: 9050709]

326. Bhattacharya S, Cameron IM, Parkin DE, et al. A pragmatic randomised comparison of transcervical resection of the endometrium with endometrial laser ablation for the treatment of menorrhagia. *Br J Obstet Gynaecol* 1997;104(5):601-7. [PMID: 9166205]

327. Baggish MS, Sze EHM. Endometrial ablation: a series of 568 patients treated over an 11-year period. *Am J Obstet Gynecol* 1996;174(3):908-13. [PMID: 8633667]

328. Meyer WR, Walsh BW, Grainger DA, et al. Thermal balloon and rollerball ablation to treat menorrhagia: a multicenter comparison. *Obstet Gynecol* 1998;92(1):98-103. [PMID: 9649102]

329. Aletebi FA, Vilos GA, Eskandar MA. Thermal balloon endometrial ablation to treat menorrhagia in high-risk surgical candidates. *J Am Assoc Gynecol Laparosc* 1999;6(4):435-9. [PMID: 10548701]

330. Gervaise A, Fernandez H, Capella-Allouc S, et al. Thermal balloon ablation versus endometrial resection for the treatment of abnormal uterine bleeding. *Hum Reprod* 1999;14(11):2743-7. [PMID: 10548614]

331. Amso NN, Stabinsky SA, McFaul P, et al. International Collaborative Uterine Thermal Balloon Working Group. Uterine thermal balloon therapy for the treatment of menorrhagia: the first 300 patients from a multi-centre study. *Br J Obstet Gynaecol* 1998;105(5):517-23. [PMID: 9637121]

332. Parekh N, Husaini SW, Russell IF. Caesarean section for placenta praevia: a retrospective study of anaesthetic management. *Br J Anaesth* 2000;84(6):725-30. [PMID: 10895745]

333. Andrews WW, Ramin SM, Maberry MC, et al. Effect of type of anesthesia on blood loss at elective repeat cesarean section. *Am J Perinatol* 1992;9(3):197-200. [PMID: 1575842]

334. Gilstrap LC 3rd, Hauth JC, Hankins GD, Patterson AR. Effect of type of anesthesia on blood loss at cesarean section. *Obstet Gynecol* 1987;69(3 Pt 1):328-32. [PMID: 3822280]

335. Flood P. Postdural puncture headache in obstetrics. *Semin Perinatol* 2002;26(2):146-53. [PMID: 12005472]

336. Adudu OP. Anaesthesia for bilateral mastectomy in a Jehovah's Witness patient with epilepsy and review of alternatives to homologous blood transfusion. *Middle East J Anesthesiol* 2002;16(4):443-55. [PMID: 11949206]

337. Santoso JT, Hannigan EV, Levine L, et al. Effect of hemodilution on tissue perfusion and blood coagulation during radical hysterectomy. *Gynecol Oncol* 2001;82(2):252-6. [PMID: 11531275]

338. Rehm M, Orth V, Kreimeier U, et al. Four cases of radical hysterectomy with acute normovolemic hemodilution despite low preoperative hematocrit values. *Anesth Analg* 2000;90(4):852-5. [PMID:10735787]

339. Goodnough LT, Monk TG, Brecher ME. Acute normovolemic hemodilution should replace the preoperative donation of autologous blood as a method of autologous-blood procurement. *Transfusion* 1998;38(5):473-6. [PMID: 9633561]

340. Oberhauser M, Bardenheuer HJ, Bernasconi H, et al. Isovolemic hemodilution for avoiding homologous blood transfusions: effectiveness in large gynecologic interventions [German]. *Infusionsther Transfusionsmed* 1996;23(1):15-23. [PMID:8653011]

341. Joseph NJ, Kamaryt J, Paulissian R. Blood salvage techniques: blood salvage for obstetrical and gynecological surgery. In: Salem MR, editor. *Blood Conservation in the Surgical Patient*. Baltimore: Williams & Wilkins; 1996. p. 288-91. [ISBN: 978-0-683-07531-1]

342. Silva PD. Intraoperative autotransfusion in gynecologic surgery. In: Tawes RL Jr, editor. *Autotransfusion: Therapeutic Principles and Trends*. Detroit: Appleton; 1997. p. 169-72. [ISBN: 978-1-567-57061-8]

343. Yamada T, Yamashita Y, Terai Y, Ueki M. Intraoperative blood salvage in abdominal uterine myomectomy. *Int J Gynaecol Obstet* 1997;56(2):141-5. [PMID: 9061388]

344. Yamada T, Ikeda A, Okamoto Y, et al. Intraoperative blood salvage in abdominal simple total hysterectomy for uterine myoma. *Int J Gynaecol Obstet* 1997;59(3):233-6. [PMID: 9486513]

345. Giordano GF, Giordano DM, Wallace BA, et al. An analysis of 9,918 consecutive perioperative autotransfusions. *Surg Gynecol Obstet* 1993;176(2):103-10. [PMID: 8421795]

346. Silva PD, Beguin EA Jr. Intraoperative rapid autologous blood transfusion. *Am J Obstet Gynecol* 1989;160(5 Pt 1):1226-7. [PMID: 2729398]

347. Waters JH, Potter PS. Cell salvage in the Jehovah's Witness patient [letter]. *Anesth Analg* 2000;90(1):229-30. [PMID: 10625014]

348. Connor JP, Morris PC, Alagoz T, et al. Intraoperative autologous blood collection and autotransfusion in the surgical management of early cancers of the uterine cervix. *Obstet Gynecol* 1995;86(3):373-8. [PMID: 7651645]

349. Thomas MJ. Infected and malignant fields are an absolute contraindication to intraoperative cell salvage: fact or fiction? *Transfus Med* 1999;9(3):269-78. [PMID: 10555821]

350. Mirhashemi R, Averette HE, Deepika K, et al. The impact of intraoperative autologous blood transfusion during type III radical hysterectomy for early-stage cervical cancer. *Am J Obstet Gynecol* 1999;181(6):1310-6. [PMID: 10601905]

351. Elias D, Lapierre V, Billard V. Perioperative autotransfusion with salvage blood in cancer surgery [French]. *Ann Fr Anesth Reanim* 2000;19(10):739-44. [PMID: 11200761]

352. Hansen E, Knuechel R, Altmeppen J, Taeger K. Blood irradiation for intraoperative autotransfusion in cancer surgery: demonstration of efficient elimination of contaminating tumor cells. *Transfusion* 1999;39(6):608-15. [PMID: 10378841]

353. Powell JL, Mogelnicki SR, Franklin EW 3rd, et al. A deliberate hypotensive technique for decreasing blood loss during radical hysterectomy and pelvic lymphadenectomy. *Am J Obstet Gynecol* 1983;147(2):196-202. [PMID: 6412554]

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354. Gallup DG, Hinton AC. Tips on controlling pelvic hemorrhage. *J Pelvic Surg* 2001;7(5):294-6. [ISSN: 1077-2847]

355. Anonymous. ACOG educational bulletin. Hemorrhagic shock. Number 235, April 1997. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet* 1997;57(2):219-26. [PMID: 9184969]

356. Martel MJ, MacKinnon KJ, Arsenault MY, et al. Hemorrhagic shock [English and French]. [Clinical Practice Guideline No. 115] *J Obstet Gynaecol Can* 2002;24(6):504-20. [PMID: 12196857]

357. Jackson SH, Liebermann MC, Smith DE. Sodium nitroprusside-induced hypotension as a supplemental therapeutic modality in postpartum hemorrhage. *Obstet Gynecol* 1981;58(5):649-51. [PMID: 6975451]

358. Shen GK, Rappaport W. Control of nonhepatic intra-abdominal hemorrhage with temporary packing. *Surg Gynecol Obstet* 1992;174(5):411-3. [PMID: 1570620]

359. Gyamfi C, Pietro PA, Medina CA. Effectiveness of intraabdominal packing for intractable surgical hemorrhage in patients with disseminated intravascular coagulation [abstract]. *Obstet Gynecol* 2001;97(4 Suppl 1):S62.

360. Finan MA, Fiorica JV, Hoffman MS, et al. Massive pelvic hemorrhage during gynecologic cancer surgery: "pack and go back." *Gynecol Oncol* 1996;62(3):390-5. [PMID: 8812538]

361. Vedantham S, Goodwin SC, McLucas B, Mohr G. Uterine artery embolization: an underused method of controlling pelvic hemorrhage. *Am J Obstet Gynecol* 1997;176(4):938-48. [PMID: 9125624]

362. Prabulos AM, Chen HH, Rodis JF, et al. Angiographic embolization of a ruptured renal artery aneurysm during pregnancy. *Obstet Gynecol* 1997;90(4 Pt 2):663-5. [PMID: 11770586]

363. Finnegan MF, Tisnado J, Bezirdjian DR, Cho SR. Transcatheter embolotherapy of massive bleeding after surgery for benign gynecologic disorders. *Can Assoc Radiol J* 1988;39(3):172-7. [PMID: 2971049]

364. Baskett TF. Haemorrhagic (hypovolaemic) shock. In: *Essential Management of Obstetric Emergencies*. 3rd ed. Redland (England): Clinical Press; 1999. p. 233-41. [ISBN: 978-1-854-57042-0]

365. Klowden AJ, Salem MR, Fahmy NR, Crystal GJ. Deliberate hypotension. In: Salem MR, editor. *Blood Conservation in the Surgical Patient*. Baltimore: Williams & Wilkins; 1996. p. 189-251. [ISBN: 978-0-683-07531-1]

Nonblood Volume Expanders

366. Strauss RG, Pennell BJ, Stump DC. A randomized, blinded trial comparing the hemostatic effects of pentastarch versus hetastarch. *Transfusion* 2002;42(1):27-36. [PMID: 11896309]

367. French GW, White JB, Howell SJ, Popat M. Comparison of pentastarch and Hartmann's solution for volume preloading in spinal anaesthesia for elective caesarean section. *Br J Anaesth* 1999;83(3):475-7. [PMID: 10655924]

368. Siddik SM, Aouad MT, Kai GE, et al. Hydroxyethylstarch 10% is superior to Ringer's solution for preloading before spinal anesthesia for Cesarean section. *Can J Anaesth* 2000;47(7):616-21. [PMID: 10930199]

369. Treib J, Haass A, Schimrigk K. European hydroxyethyl starch: a safe and inexpensive alternative to albumin [letter]. *Anesth Analg* 1997;85(3):709. [PMID: 9296444]

370. Dries DJ. Hypotensive resuscitation. *Shock* 1996;6(5):311-6. [PMID: 8946643]

371. Treib J, Haass A, Pindur G, et al. All medium starches are not the same: influence of the degree of hydroxyethyl substitution of hydroxyethyl starch on plasma volume, hemorrheologic conditions, and coagulation. *Transfusion* 1996;36(5):450-5. [PMID: 8693511]

372. Anonymous. The management of postpartum haemorrhage. Collier J, editor. *Drug Ther Bull* 1992;30(23):89-92. [PMID: 1446579]

373. Scheingraber S, Rehm M, Sehmisch C, Finsterer U. Rapid saline infusion produces hyperchloremic acidosis in patients undergoing gynecologic surgery. *Anesthesiology* 1999;90(5):1265-70. [PMID: 10319771]

374. Williams EL, Hildebrand KL, McCormick SA, Bedel MJ. The effect of intravenous lactated Ringer's solution versus 0.9% sodium chloride solution on serum osmolality in human volunteers. *Anesth Analg* 1999;88(5):999-1003. [PMID: 10320158]

375. Lethagen S, Rugarn P, Åberg M, Nilsson IM. Effects of desmopressin acetate (DDAVP) and dextran on hemostatic and thromboprophylactic mechanisms. *Acta Chir Scand* 1990;156(9):597-602. [PMID:1702252]

Pharmacological Enhancement of Hemostasis

376. Morita Y, Tsutsumi O, Momoeda M, Taketani Y. Cornual pregnancy successfully treated laparoscopically with fibrin glue hemostasis. *Obstet Gynecol* 1997;90(4 Pt 2):685-7. [PMID: 11770597]

377. Mankad PS, Codispoti M. The role of fibrin sealants in hemostasis. *Am J Surg* 2001;182(2 Suppl 1):S21-8. [PMID: 11566473]

378. Malviya VK, Deppe G. Control of intraoperative hemorrhage in gynecology with the use of fibrin glue. *Obstet Gynecol* 1989;73(2):284-6. [PMID: 2463505]

379. Okin CR, Guido RS, Meyn LA, Ramanathan S. Vasopressin during abdominal hysterectomy: a randomized controlled trial. *Obstet Gynecol* 2001;97(6):867-72. [PMID: 11384687]

380. Phillips DR, Nathanson HG, Milim SJ, et al. The effect of dilute vasopressin solution on blood loss during operative hysteroscopy: a randomized controlled trial. *Obstet Gynecol* 1996;88(5):761-6. [PMID: 8885909]

381. Kammerer-Doak DN, Rogers RG, Johnson Maybach J, Traynor Mickelson M. Vasopressin as an etiologic factor for infection in gynecologic surgery: a randomized double-blind placebo-controlled trial. *Am J Obstet Gynecol* 2001;185(6):1344-8. [PMID: 11744907]

382. Townsend DE. Vasopressin pack for treatment of bleeding after myoma resection. *Am J Obstet Gynecol* 1991;165(5 Pt 1):1405-7. [PMID: 1957869]

383. Townsend DE, Barbis SD, Mathews RD. Vasopressin and operative hysteroscopy in the management of delayed postabortion and postpartum bleeding. *Am J Obstet Gynecol* 1991;165(3):616-8. [PMID: 1892187]

384. Bobrowski RA, Jones TB. A thrombogenic uterine pack for postpartum hemorrhage. *Obstet Gynecol* 1995;85(5 Pt 2):836-7. [PMID: 7724130]

385. Alperin JB. Coagulopathy caused by vitamin K deficiency in critically ill, hospitalized patients. *JAMA* 1987;258(14):1916-9. [PMID: 3656602]

386. Alperin JB. Transfusion medicine issues in the practice of anesthesiology [letter]. *Transfus Med Rev* 1995;9(4):339. [PMID: 8541716]

387. Dunn CJ, Goa KL. Tranexamic acid: a review of its use in surgery and other indications. *Drugs* 1999;57(6):1005-32. [PMID: 10400410]

388. As AK, Hagen P, Webb JB. Tranexamic acid in the management of postpartum haemorrhage. *Br J Obstet Gynaecol* 1996;103(12):1250-1. [PMID: 8968245]

389. Lindoff C, Rybo G, Åstedt B. Treatment with tranexamic acid during pregnancy, and the risk of thrombo-embolic complications. *Thromb Haemost* 1993;70(2):238-40. [PMID: 8236125]

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390. Verstraete M. Haemostatic drugs. In: Bloom AL, Forbes CD, Thomas DP, Tuddenham EGD, editors. *Haemostasis and Thrombosis*. Volume 2. 3rd ed. Edinburgh: Churchill Livingstone; 1994. p. 1057-73. [ISBN: 978-0-443-04521-9]

391. Ray JG. DDAVP use during pregnancy: an analysis of its safety for mother and child. *Obstet Gynecol Surv* 1998;53(7):450-5. [PMID: 9662731]

392. Lethagen S. Desmopressin in the treatment of women's bleeding disorders. *Haemophilia* 1999;5(4):233-7. [PMID: 10469175]

393. Mannucci PM. Desmopressin (DDAVP) in the treatment of bleeding disorders: the first 20 years. *Blood* 1997;90(7):2515-21. [PMID: 9326215]

394. Flordal PA. Use of desmopressin to prevent bleeding in surgery. *Eur J Surg* 1998;164(1):5-11. [PMID: 9537702]

395. Valentine S, Williamson P, Sutton D. Reduction of acute haemorrhage with aprotinin. *Anaesthesia* 1993;48(5):405-6. [PMID: 7686350]

396. Oney T, Schander K, Muller N, et al. Amniotic fluid embolism with coagulation disorder—a case report [German]. *Geburtshilfe Frauenheilkd* 1982;42(1):25-8. [PMID: 6174392]

397. Peter FW, Benkovic C, Muehlberger T, et al. Effects of desmopressin on thrombogenesis in aspirin-induced platelet dysfunction. *Br J Haematol* 2002;117(3):658-63. [PMID: 12028039]

398. Flordal PA. Pharmacological prophylaxis of bleeding in surgical patients treated with aspirin. *Eur J Anaesthesiol* 1997;14 Suppl:38-41. [PMID: 9088834]

399. Sher G. Trasylol in the management of abruptio placentae with consumption coagulopathy and uterine inertia. *J Reprod Med* 1980;25(3):113-8. [PMID: 6159472]

400. Suzuki S, Kanagawa Y. Treatment of obstetric disseminated intravascular coagulation [Japanese]. *Rinsho Ketsueki* 1982;23(6):827-35. [PMID: 6184494]

401. Caine YG, Bauer KA, Barzegar S, et al. Coagulation activation following estrogen administration to postmenopausal women. *Thromb Haemost* 1992;68(4):392-5. [PMID: 1333098]

402. Alperin JB. Estrogens and surgery in women with von Willebrand's disease. *Am J Med* 1982;73(3):367-71. [PMID: 6981997]

403. Eskandari N, Feldman N, Greenspoon JS. Factor VII deficiency in pregnancy treated with recombinant factor VIIa. *Obstet Gynecol* 2002;99(5 Pt 2):935-7. [PMID: 11975965]

404. Kenet G, Walden R, Eldad A, Martinowitz U. Treatment of traumatic bleeding with recombinant factor VIIa [letter]. *Lancet* 1999;354(9193):1879. [PMID: 10584732]

405. White B, McHale J, Ravi N, et al. Successful use of recombinant FVIIa (Novoseven®) in the management of intractable post-surgical intra-abdominal haemorrhage [letter]. *Br J Haematol* 1999;107(3):677-8. [PMID: 10583276]

406. Spence RK. Management of surgical patients with special problems. In: Petz LD, Swisher SN, Kleinman S, et al, editors. *Clinical Practice of Transfusion Medicine*. 3rd ed. New York: Churchill Livingstone; 1996. p. 595-606. [ISBN: 978-0-443-08981-7]

407. Roddie PH, Ludlam CA. Recombinant coagulation factors. *Blood Rev* 1997;11(4):169-77. [PMID:9481447]

408. Hedner U. NovoSeven® [recombinant activated factor VII] as a universal haemostatic agent. *Blood Coagul Fibrinolysis* 2000;11(Suppl 1):S107-11. [PMID: 10850574]

409. Staudinger T, Frass M, Rintelen C, et al. Influence of prothrombin complex concentrates on plasma coagulation in critically ill patients. *Intensive Care Med* 1999;25(10):1105-10. [PMID: 10551966]

410. Watson HG, Baglin T, Laidlaw S, et al. A comparison of the efficacy and rate of response to oral and intravenous Vitamin K in reversal of over-anticoagulation with warfarin. *Br J Haematol* 2001;115(1):145-9. [PMID: 11722425]

411. Evans G, Luddington R, Baglin T. Beriplex P/N reverses severe warfarin-induced overanticoagulation immediately and completely in patients presenting with major bleeding. *Br J Haematol* 2001;115(4):998-1001. [PMID: 11843839]

Management of Profound Anemia

412. Brimacombe J, Skippen P, Talbutt P. Acute anaemia to a haemoglobin of 14 $g \cdot l^{-1}$ with survival. *Anaesth Intensive Care* 1991;19(4):581-3. [PMID: 1750645]

413. Howell PJ, Bamber PA. Severe acute anaemia in a Jehovah's Witness. Survival without blood transfusion. *Anaesthesia* 1987;42(1):44-8. [PMID:3548474]

414. Mann MC, Votto J, Kambe J, McNamee MJ. Management of the severely anemic patient who refuses transfusion: lessons learned during the care of a Jehovah's Witness. *Ann Intern Med* 1992;117(12):1042-8. [PMID: 1307705]

415. Rasanayagam SR, Cooper GM. Two cases of severe postpartum anaemia in Jehovah's Witnesses. *Int J Obstet Anesth* 1996;5(3):202-5. [EMBASE: 1996207801] [PMID: 15321351]

416. Thomas JM, Wong CJ, Scheuermann KW, et al. Clinical Strategies for Managing Hemorrhage and Anemia Without Blood Transfusion in the ICU [poster presentation]. The 7th World Congress of Intensive and Critical Care Medicine; 1997 Jun 29-Jul 3; Ottawa, Canada.

417. Smoller BR, Kruskall MS, Horowitz GL. Reducing adult phlebotomy blood loss with the use of pediatric-sized blood collection tubes. *Am J Clin Pathol* 1989;91(6):701-3. [PMID: 2729182]

418. Tibbles PM, Edelsberg JS. Hyperbaric-oxygen therapy. *N Engl J Med* 1996;334(25):1642-8. [PMID: 8628361]

419. Grim PS, Gottlieb LJ, Boddie A, Batson E. Hyperbaric oxygen therapy. *JAMA* 1990;263(16):2216-20. [PMID: 2181162]

420. Makrydimas G, Lolis D, Lialios G, et al. Recombinant human erythropoietin treatment of postpartum anemia. Preliminary results. *Eur J Obstet Gynecol Reprod Biol* 1998;81(1):27-31. [PMID: 9846709]

421. Breymann C, Zimmermann R, Huch R, Huch A. Use of recombinant human erythropoietin in combination with parenteral iron in the treatment of postpartum anaemia. *Eur J Clin Invest* 1996;26(2):123-30. [PMID: 8904521]

422. Kunz J, Mähr R. Management of severe blood loss after tumor resection in a Jehovah's Witness [German]. *Gynakol Geburtshilfliche Rundsch* 1995;35(1):34-7. [PMID: 7727972]

423. Atabek U, Alvarez R, Pello MJ, et al. Erythropoietin accelerates hematocrit recovery in post-surgical anemia. *Am Surgeon* 1995;61(1):74-7. [PMID:7832387]

424. Koenig HM, Levine EA, Resnick DJ, Meyer WJ. Use of recombinant human erythropoietin in a Jehovah's Witness. *J Clin Anesth* 1993;5(3):244-7. [PMID: 8318245]

425. Dudrick SJ, O'Donnell JJ, Raleigh DP, et al. Rapid restoration of red blood cell mass in severely anemic surgical patients who refuse transfusion. *Arch Surg* 1985;120(6):721-7. [PMID: 3924007]

426. Corwin HL, Gettinger A, Rodriguez RM, et al. Efficacy of recombinant human erythropoietin in the critically ill patient: a randomized, double-blind, placebo-controlled trial. *Crit Care Med* 1999;27(11):2346-50. [PMID: 10579246]

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