Managing Complications in Pregnancy and Childbirth (MCPC): A Guide for Midwives and Doctors

Highlights from the World Health Organization's 2017 Second Edition

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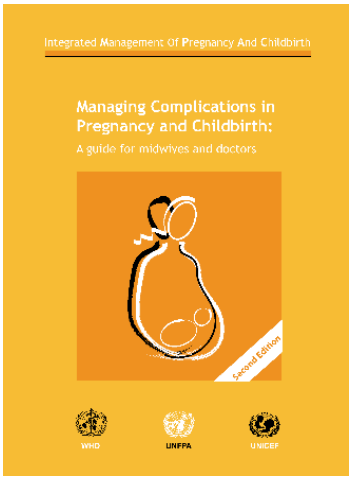
Background and Purpose

Since it was first published in 2000, the World Health Organization's (WHO's) *Managing Complications in Pregnancy and Childbirth (MCPC)* manual has been used widely around the world to guide the care of women and newborns who have complications during pregnancy, childbirth and the immediate postnatal period. The *MCPC* manual targets midwives and doctors working in district-level hospitals. Selected chapters from the first edition of the *MCPC* were revised in 2016 based on new WHO recommendations, and the second edition of the *MCPC* manual is now available. This brief reviews the revision process and summarizes updated clinical guidelines for a subset of revised chapters, including: emotional and psychological support; hypertensive disorders of pregnancy; bleeding in early pregnancy and after childbirth; and prevention and management of infection in pregnancy and childbirth.



Revision Process

The revision process was managed by WHO's Department of Maternal, Newborn, Child and Adolescent Health and Department of Reproductive Health and Research with support from the Maternal and Child Survival Program—the United States Agency for International Development's flagship maternal, newborn and child health program led by Jhpiego. A core review group (see *MCPC*'s acknowledgements section) conducted a survey of *MCPC* manual users to solicit feedback on the manual's use and suggestions to guide revisions to the manual. Based on user feedback and updated WHO recommendations, the core group prioritized a subset of *MCPC* chapters for revision (**Table 1**).

Table 1. *MCPC* chapters revised for second edition

First edition chapters revised for new edition
Clinical principles (section 1)
• Emotional and Psychological Support
• Emergencies
• General Care Principles
• Antibiotic Therapy
• Operative Care Principles
• Normal Labour and Childbirth
• Newborn Care Principles
Symptoms (section 2)
• Vaginal Bleeding in Early Pregnancy
• Vaginal Bleeding after Childbirth
• Elevated Blood Pressure, Headache, Blurred Vision, Convulsions or Loss of Consciousness
• Fever during Pregnancy and Labour
• Fever after Childbirth
• Difficulty in Breathing
• Prelabour Rupture of Membranes
• Immediate Newborn Conditions or Problems
Procedures (section 3)
• Induction and Augmentation of Labour
• Manual Removal of Placenta
• Repair of Vaginal and Perineal Tears

The core group led the first round of revisions of selected chapters based on current WHO recommendations. At least two independent external experts reviewed each revised chapter. External experts were selected based on their expertise and clinical experience in providing care for pregnancy and childbirth complications in low- and middle-income countries (see *MCPC* acknowledgements section for a list of reviewers). The core group then met in person to finalize revisions to each chapter, systematically addressing all recommended changes.

Emotional and Psychological Support and General Care Principles

Respectful maternity care (RMC) for women and newborns is increasingly recognized as a universal right of all women and newborns and is an essential component of quality care. The WHO has highlighted the importance of RMC for women and newborns in several recent documents, including Statement on the Prevention and Elimination of Disrespect and Abuse during Facility-Based Childbirth (2015); and Standards for Improving the Quality of Maternal and Newborn Care in Health Facilities (2016). Updates throughout the second edition *MCPC* reflect the importance of RMC for mothers and newborns, particularly in two chapters: Emotional and Psychological Support in Obstetric and Newborn Emergencies; and General Care Principles. Several updated chapters on symptoms refer the reader to a set of basic principles when providing care (**Box 1**), reinforcing the importance of RMC as a key element of quality care.

The revised Emotional and Psychological Support chapter offers guidance for meeting women's and families' emotional and psychosocial needs in emergencies, emphasizing the importance of clear, honest communication and empathy. The second edition *MCPC* advises health care staff to understand and acknowledge the specific needs and cultural practices of individual women and their families, including the potentially differing needs of individual family members. As discussed in the section on emotional and psychological reactions, **"to achieve optimal outcomes, it is important to provide emotional and psychological support as it is to provide medical care."** Other key updates include guidance on how to care for patients in the event of an obstetric/newborn emergency or death, including the importance of providing emotional support to women and families and notifying authorities

of and reviewing every maternal death (**Box 2**). The updated manual emphasizes the need to provide supportive services for health care staff who may experience guilt, grief, confusion and other emotions after a death or an emergency.

The section on postpartum depression has been significantly expanded, with information about risk factors for postpartum depression and the importance of screening for and providing evidence-based treatment for postpartum depression (**Box 3**). According to the second edition *MCPC*, women should be screened for depression at every postpartum visit.

> *"The notion of safe motherhood must be expanded beyond the prevention of morbidity and mortality to encompass respect for women's basic human rights, including women's autonomy, dignity, feelings, and choices and preferences, including the choice of companionship, wherever possible."*
> *Source:* Emotional and Psychological Support chapter

Hypertensive Disorders of Pregnancy

The revised Elevated Blood Pressure, Headache, Blurred Vision, Convulsions or Loss of Consciousness chapter reflects the WHO 2011 Guidelines on the Prevention and Treatment of Pre-eclampsia and Eclampsia. Salient updates include new guidance on:

- Prevention of pre-eclampsia and eclampsia with calcium supplementation and with low-dose acetylsalicylic acid (aspirin 75 mg);
- Revised classification framework for hypertensive disorders in pregnancy;
- Use of systolic blood pressure in diagnosis and management of hypertensive disorders in pregnancy, including pre-eclampsia or severe pre-eclampsia;
- Updated laboratory findings often present in severe eclampsia;
- Medications for treatment of hypertension in pregnancy and for acute treatment of severe systolic hypertension;
- Anticonvulsant therapy for severe pre-eclampsia or eclampsia;
- Optimal timing for childbirth in women with severe pre-eclampsia; and
- Postpartum monitoring, family planning and counselling to reduce unwanted future pregnancies and lifetime risk of cardiovascular disease.

In the updated manual, **recommended practices to prevent pre-eclampsia and eclampsia** include:

- In areas where dietary calcium intake is low, **calcium supplementation** during pregnancy (at doses of **1.5–2.0 g elemental calcium/day**) is recommended for the prevention of pre-eclampsia in all women, but particularly those at high risk of pre-eclampsia.
- **Low-dose acetylsalicylic acid (aspirin, 75 mg)** should be initiated before 20 (and, if possible, as early as 12) weeks of gestation for women at high risk of developing pre-eclampsia, if they have one or more of the following risk factors: previous severe pre-eclampsia, diabetes, chronic hypertension, obesity, renal disease, autoimmune disease and multiple pregnancies. This list can be complemented based on local epidemiology.

The **revised classification framework** for hypertensive disorders of pregnancy replaces the term *pregnancy-induced hypertension* with the term *gestational hypertension* (**Box 4**). Updated criteria for diagnosis of hypertensive disorders of pregnancy include **elevation of systolic blood pressure** and/or elevation of diastolic blood pressure (**Box 5**). The second edition *MCPC* includes updated criteria for differential diagnosis of high blood pressure in pregnancy, including laboratory findings and clinical symptoms often present in severe pre-eclampsia. The second edition also incorporates new sections on monitoring of the pregnant woman and fetus; timing of childbirth based on gestational age and status of the woman and fetus; and antihypertensive and anticonvulsant treatment recommendations (as relevant) for chronic hypertension, gestational hypertension, mild pre-eclampsia, severe pre-eclampsia and eclampsia. These additions **reflect the dual goals of recognizing and managing the pre-eclampsia spectrum from mild to severe**,

Box 1. Basic principles when providing care (new in second edition)
- Where feasible, ensure that the woman has a companion of her choice with her.
- Provide information to the woman—and any accompanying family members the woman would like to be involved in decision-making—about diagnostic tests to be performed, supportive care to be provided (e.g. intravenous infusion), the process of care, her diagnosis, treatment options and the estimated time for inpatient care if required.
- If the woman is unconscious, explain the procedure to her family.
- Obtain informed consent for any procedures, diagnostic or therapeutic, and care.

Source: General Care Principles chapter

Box 2. Maternal death (new in second edition)
Any maternal death in a health facility should be communicated to the appropriate authorities within 24 hours and should trigger a review of the woman's medical record to determine the cause of death.
Source: Emotional and Psychological Support chapter

Box 3. Risk factors for postpartum depression (new in second edition)
- Previous postpartum depression
- Active or previous mental illness
- Being a member of a vulnerable population
- Traumatic childbirth
- Giving birth to a preterm or stillborn infant or experiencing the death of a newborn
- Having an infant admitted to intensive care
- Having a history of being a neglected child

Source: Emotional and Psychological Support chapter

Box 4. Revised classification framework for hypertensive disorders of pregnancy
- Chronic hypertension (elevation of blood pressure noted before 20 weeks of gestation or persisting more than 12 weeks postpartum)
- Gestational hypertension
- Mild pre-eclampsia
- Severe pre-eclampsia
- Eeclampsia
- Chronic hypertension with superimposed pre-eclampsia

Source: Elevated Blood Pressure, Headache, Blurred Vision, Convulsions or Loss of Consciousness chapter

Box 5. Clinical criteria for diagnosis of hypertensive disorders in pregnancy
- Systolic blood pressure (SBP) greater than or equal to 140 mmHg and/or diastolic blood pressure (DBP) greater than or equal to 90 mmHg (two consecutive readings four hours or more apart)
- Blood pressure is in the **severe range** if SBP is greater than or equal to 160 and/or DBP is greater than or equal to 110 mmHg

Note: Only DBP included in 2000 edition
Source: Elevated Blood Pressure, Headache, Blurred Vision, Convulsions or Loss of Consciousness chapter

and striving for women to reach term before birth when possible, while avoiding major morbidity for mother and baby. **Figs. 1 and 2** summarize the second edition's updates to diagnostic criteria and recommended monitoring and timing of childbirth for mild pre-eclampsia and severe pre-eclampsia. It is important to note that timely childbirth remains the key definitive treatment for women with severe pre-eclampsia and eclampsia, as reflected in the manual's new sections on optimizing timing of childbirth for women with severe pre-eclampsia and eclampsia.

Figure 1. Diagnosis and guidance for monitoring and timing of childbirth for (mild) pre-eclampsia

Diagnosis of (mild) pre-eclampsia	**New onset hypertension and proteinuria after 20 weeks of gestation:** • Systolic blood pressure greater than or equal to 140 and/or diastolic blood pressure greater than or equal to 90 after 20 weeks of gestation Proteinuria 2+ on dipstick • Pre-eclampsia **without** any severe features present (please refer to severe features below, including neurologic, pulmonary, hepatic, renal and hematalogic in Diagnosis of Severe Pre-Eclampsia chapter).
Summary guidance for monitoring and timing of childbirth for (mild) pre-eclampsia	**Gestational age less than 37 + 0/7 weeks** • As long as mother and fetal well-being remain stable, the goal is for the woman to reach 37 + 0/7 weeks before childbirth. • However, **remain vigilant** because pre-eclampsia **may rapidly progress** to severe pre-eclampsia. • Monitor the status of the woman and fetus closely. Regularly measure the woman's blood pressure and assess for danger signs. • **Outpatient care:** If blood pressure and **signs of pre-eclampsia normalize or remain unchanged**, follow up **twice per week.** • **If outpatient follow up is not possible**, admit the woman for close monitoring, including blood pressure and danger signs. **Gestational age greater than or equal to 37 + 0/7 weeks** • Induce labor/childbirth.

Figure 2. Diagnosis and guidance for timing of childbirth for severe pre-eclampsia

Diagnosis of severe pre-eclampsia	**New onset hypertension and proteinuria after 20 weeks of gestation** • Systolic blood pressure greater than or equal to 160 and/or diastolic blood pressure greater than or equal to 110 after 20 weeks of gestation • Proteinuria 2+ on dipstick Pre-eclampsia **with any of the following present**, diagnose as severe pre-eclampsia: • **Neurologic:** headache, vision changes, hyperreflexia or clonus • **Pulmonary:** difficulty breathing (rales on auscultation due to fluid in lungs) • **Hepatic:** upper abdominal pain, nausea/vomiting or liver enzymes elevated (greater than two times the baseline) • **Renal:** serum creatinine greater than 1.1 mg/dL or doubling of baseline, oliguria (less than 400 cc urine in 24 hrs) • **Hematalogic:** Platelets less than 100,000 cells/mcL
Summary guidance for optimal timing of childbirth for severe pre-eclampsia	**Gestational age of less than 24 weeks (previable fetus)** • Magnesium sulfate ($MgSO_4$), antihypertensive medications • Induce labour **Gestational age of 24–34 weeks** • $MgSO_4$, antihypertensive medications, antenatal corticosteroids if safety conditions met • Close maternal and fetal monitoring; expedite birth if maternal and fetus status not stable **Gestational age of 34–36 6/7 weeks** • Same management as for 24–34 weeks **except NO *antenatal corticosteroids*** **Gestational age of 37 0/7 weeks** • $MgSO_4$, antihypertensive medications; expedite delivery

Anticonvulsant treatment for severe pre-eclampsia and eclampsia

In the second edition MCPC, magnesium sulfate continues to be the anticonvulsant of choice for treatment of severe pre-eclampsia and eclampsia; diazepam has been removed as an anticonvulsant treatment option for women with pre-eclampsia and eclampsia. Specific guidance is provided on different magnesium sulfate regimens, including intravenous and intramuscular regimens, and an intravenous-only regimen has been added.

Antihypertensive treatment

The second edition *MCPC* includes updated guidance on: use of **antihypertensive medications to treat high blood pressure associated with pre-eclampsia and eclampsia;** and **chronic and gestational hypertension** in pregnancy, including treatment recommendations for non-severe hypertension and acute, severe systolic hypertension **to prevent strokes** (**Table 2**).

Table 2. Antihypertensive medications and dosing options for acute treatment of severe hypertension (new in second edition)

Antihypertensive options	Dosing
Hydralazine	**Intravenous treatment:** • Administer 5 mg IV, *slowly* (risk of maternal hypotension; closely monitor blood pressure). • Repeat every five minutes until the blood pressure goal has been achieved. • Repeat hourly as needed or give 12.5 mg IM every two hours as needed. • The maximum dose is 20 mg per 24 hours.
Labetalol	**Oral treatment:** • Administer 200 mg. • Repeat dose after one hour until the treatment goal is achieved. • The maximum dose is 1200 mg in 24 hours. **Intravenous treatment:** • Administer 10 mg IV. • If response is inadequate after 10 minutes, administer 20 mg IV. • The dose can be doubled to 40 mg and then 80 mg with 10-minute intervals between each increased dose until blood pressure goal is lowered below threshold. • The maximum total dose is 300 mg; then switch to oral treatment.
Nifedipine (immediate-release capsule)	**Oral treatment**: • Administer 5–10 mg orally. • Repeat dose after 30 minutes if response is inadequate, until optimal blood pressure is reached. • The maximum total dose is 30 mg in the acute treatment setting.[a]
Alpha methyldopa	**Oral treatment:** • Administer 750 mg orally. • Repeat dose after three hours until blood pressure goal is achieved. • The maximum dose is 3 grams in a 24-hour period.

Source: Elevated Blood Pressure, Headache, Blurred Vision, Convulsions or Loss of Consciousness chapter

[a] Other treatment options should be considered if blood pressure is not lowered within the acute treatment phase of 90 minutes with 30 mg immediate-release nifedipine.

Notes: Selection and choice of the administration route of an antihypertensive medication for treatment of severe hypertension should be based on a clinician's experience with the drug and the availability and cost of the drug (WHO 2011 Guidelines on Prevention and Treatment of Pre-Eclampsia and Eclampsia). The goal is to lower the blood pressure to less than 160/110 mmHg. If the target blood pressure is not achieved with the maximum dosage of one medication, other medications should be considered.

Postpartum care for women with hypertensive disorders

Women who experience hypertensive disorders during pregnancy face a high risk of complications in future pregnancies and a significantly elevated lifetime risk of cardiovascular disease (e.g. chronic hypertension, stroke, heart disease). An expanded section on **postpartum care** in the second edition *MCPC* includes guidance on postpartum monitoring, family planning, counselling and follow-up for continuing care. The new guidance stresses the importance of family planning counselling, application of medical eligibility criteria and provision of effective **postpartum contraception** to prevent unwanted pregnancy, including timely access to long-acting reversible (e.g. implants and intrauterine devices) and permanent (tubal ligation and vasectomy) contraceptive methods. Counselling should promote early initiation of antenatal care in future pregnancies for close monitoring and timely initiation of **calcium supplementation** and **low-dose acetylsalicylic acid (aspirin, 75 mg).**

Due to the elevated lifetime risk of cardiovascular complications in pregnant women with hypertensive disorders, recommendations for postpartum cardiovascular disease risk assessment,counselling and follow-up care include:

- Counsel women treated for hypertensive disorders in pregnancy, including pre-eclampsia, about their increased risk of future cardiovascular disease (i.e. hypertension, stroke).
- Assess and address the woman's risk factors for cardiovascular disease (e.g. smoking, obesity, lack of physical activity, hyperlipidaemia) before she is discharged from the facility.
- Emphasize the importance of regular medical follow-up, and link women to follow-up primary care services before discharge.

Box 6.Surveillance of uterine tone for early identification of PPH

1. Regularly assess uterine tone in the first hours after birth. If the uterus is soft, massage the fundus of the uterus through the woman's abdomen until the uterus is contracted.
2. Teach the woman how to assess her uterine tone and massage her own uterus should it become soft (new in second edition).

Source: Normal Labour and Childbirth chapter

Bleeding in Early Pregnancy

The second edition *MCPC* includes updated chapters on management of bleeding in early and late pregnancy, including differential diagnosis and management of **threatened abortion, ectopic pregnancy, complete abortion, inevitable abortion, incomplete abortion** and **molar pregnancy**. Updated guidance on management of inevitable and incomplete abortion outlines options for surgical evacuation, medical or expectant management, including a new table summarizing **medical management** protocols using misoprostol or uterotonic medication.

The second edition reviews symptoms and management of post-abortion complications, an important cause of maternal mortality, including an updated regimen for antibiotic treatment of infection/sepsis as a complication of abortion (clindamycin and ampicillin as first-line drugs and gentamycin and ampicillin as second-line drugs—both regimens *without* metronidazole). The new edition retains guidance on the importance of post-abortion counselling and immediate initiation of contraception after an abortion.

Prevention and Management of Postpartum Haemorrhage

In the second edition *MCPC*, updated guidance on the prevention and management of postpartum haemorrhage (PPH) is based on WHO's 2012 Recommendations on Prevention and Treatment of PPH. Highlights of the Vaginal Bleeding after Childbirth chapter include: addition of new medications for prophylaxis and treatment of atonic PPH (**Table 3**); and updated text and new illustrations related to emergency interventions for women with uncontrolled PPH, including the uterine balloon tamponade, uterine compression sutures and use of a nonpneumatic anti-shock garment.

Prevention of PPH

The second edition *MCPC* includes updated recommendations for active management of the third stage of labour in line with WHO 2012 PPH guidelines, emphasizing the administration of a prophylactic uteronic immediately after childbirth as the main intervention to reduce the incidence of PPH. Also in line with the WHO 2012 guidelines, the second edition *MCPC* includes controlled cord traction as an optional intervention in the context of active management of the third stage of labour if provided by a skilled attendant (this intervention is contraindicated in the absence of a skilled attendant). In addition, the second edition *MCPC* specifies that continuous uterine massage is not recommended as an intervention to prevent PPH. However, surveillance of uterine tonus through abdominal palpation is recommended for early identification of postpartum uterine atony (**Box 6**).

Management of PPH

The second edition *MCPC* stresses the importance of close postpartum monitoring for loss of uterine tone, elevated pulse, decreased blood pressure and/or vaginal bleeding, with prompt treatment of PPH based on the underlying cause. Key causes of PPH include uterine atony, cervical and vaginal tears, retained placenta, inverted and ruptured uterus and clotting disorders.

Management of PPH Due to Uterine Atony

The second edition *MCPC* reaffirms the initial use of uterine massage and uteronic medicines for treatment of PPH due to uterine atony, followed by temporizing measures including bimanual uterine compression or external aortic compression. The second edition also recommends the use of uterine balloon tamponade for PPH due to atony and provides new graphics to illustrate assembly and use of uterine balloon tamponade using local materials that are available in most district hospitals. Uterine balloon tamponade can also be used for women who do not respond to uterotonics. This procedure can potentially eliminate the need for surgery and is an important temporizing intervention for uncontrolled PPH while the woman is awaiting transfer to a higher-level facility. Interventions for management of PPH due to uterine atony include:

- uterine massage and medicines;
- bimanual uterine compression;
- external aortic compression; and
- uterine balloon tamponade (new in second edition).

Table 3. Use of medicines in the management of PPH

	Dose and route*	Continuing dose*	Maximum dose	Precautions and contraindications
Oxytocin	IV: infuse 20 units in 1 L at fastest flow rate possible IM: 10 units	IV: infuse 20 units in 1 L fluids at 40 drops per minute	Not more than 3 L of intravenous fluids containing oxytocin	Do not give as an IV bolus
Ergometrine/ methylergometrine	IM or IV (slowly): 0.2 mg	Repeat 0.2 mg IM; after 15 minutes If required, give 0.2mg IM or IV (slowly) every four hours	Five doses (total 1.0 mg)	High blood pressure, pre-eclampsia, heart disease, retained placenta
15-methyl prostaglandin F2 alpha	IM: 0.25 mg	0.25 mg every 15 minutes	Eight doses (total 2 mg)	Asthma Do not give IV
Misoprostol (new in second edition)	Sublingual: 800 mcg	Repeat 200–800 mcg	Not more than 1600mcg	
Tranexamic acid (new in second edition)	IV (slowly): 1 g	Repeat after 30 minutes if bleeding continues	Not more than 10 mg per kg of body weight; three to four times daily	History of coagulopathy or active intravascular clotting, convulsions

Source: Vaginal Bleeding after Childbirth chapter

*Notes: Drip rate calculated using a giving set of 20 drops/mL; intravenous (IV); intramuscular (IM)

Prostaglandins should not be given intravenously. They can be fatal.

Management of PPH Due to Cervical, Vaginal and Perineal Tears

Tears of the birth canal are the second most frequent cause of PPH. Tears may coexist with atonic uterus. The second edition *MCPC* includes an updated procedure chapter on classification and repair of cervical, vaginal and perineal tears, including new illustrations of first, second, third and fourth degree tears. The second edition specifies that a single oral dose of prophylactic antibiotic (ampicillin 500 mg) should be administered before beginning repair of third and fourth degree tears (but not first and second degree tears).

Management of PPH Due to Retained Placenta

If the placenta has not been expelled and the woman is bleeding, manual removal of the placenta should be attempted after administration of a prophylactic antibiotic (single dose, ampicillin 2 g intravenously or cefazolin 1 g intravenously). The second edition *MCPC* includes an updated procedure section on manual removal of the placenta.

Nonpneumatic Anti-Shock Garment

New guidance in the second edition *MCPC* states that if available, a nonpneumatic anti-shock garment should be applied as a temporizing measure in uncontrolled PPH until appropriate care is available. A nonpneumatic anti-shock garment applies pressure to the lower body and abdomen, thereby shunting blood from the periphery of the body to core organs and the brain, helping to prevent and/or mitigate hypovolaemic shock.

Surgical Interventions in the Treatment of Uncontrolled Postpartum Haemorrhage

The second edition *MCPC* has a new section on surgical interventions in the treatment of uncontrolled PPH, including detailed descriptions of how to perform compression sutures along with accompanying illustrations. If **bleeding does not stop despite treatment** with uterotonics and other available conservative interventions (e.g. uterine massage, uterine balloon tamponade) and external or internal pressure on the uterus, surgical interventions should be initiated as follows:

1. Conservative approaches should be tried first; if these are not successful, they should be followed by more invasive procedures. For example, compression sutures may be attempted.
2. If the use of compression sutures fails, uterine or utero-ovarian ligation can be tried.
3. If life-threatening bleeding continues even after ligation, subtotal hysterectomy (also called supracervical) or total hysterectomy should be performed.

Care after Postpartum Haemorrhage

The second edition *MCPC* provides updated guidance on postpartum care for women who have suffered from PPH, including providing close follow-up and counselling on self-care, risk of infection, and the importance of immediate care seeking for any change in status.

Prevention and Management of Infection in Pregnancy and Childbirth

Key elements of the WHO's 2015 Global Recommendations for Prevention and Treatment of Maternal Peripartum Infections are incorporated throughout the second edition *MCPC*. Key revisions include guidance on:

- using prophylactic antibiotics for specific obstetric procedures and newborns with infection risk factors;
- rapidly assessing and developing a differential diagnosis of fever and other signs of infectious illness in pregnant and postpartum women, including updated summary tables of clinical presentations (signs and symptoms) of common infections in pregnancy and childbirth;
- using antibiotics judiciously in line with evidence-based recommendations for the prevention and treatment of peripartum infections,
- administering antibiotics only for recommended indications; reducing non-justified use of antibiotics in order to reduce antimicrobial resistance;
- using a clinically appropriate narrow-spectrum antibiotic with correct dosing and duration of treatment;
- verifying a woman's history of antibiotic allergy; and
- monitoring local bacteria and antibiotic susceptibility and resistance patterns to inform antibiotic selection, where feasible.

Prophylactic Antibiotics

Whenever possible, **prophylactic intravenous antibiotics should be given 15–60 minutes before the start of indicated procedures** to achieve adequate blood levels of the antibiotic at the time of the procedure. Updated obstetric indications with timing, type, and dose of prophylactic antibiotics are summarized in **Table 4**.

Table 4. Administration of prophylactic antibiotics

Obstetrical procedure or condition	Recommended antibiotic(s) and dosage
• Caesarean birth (elective and emergency)—administer prophylactic antibiotics before the procedure, not *after* clamping and cutting the cord; also, now recommend cleansing the vagina with povidone-iodine before the procedure • Manual removal of the placenta • Placement of uterine balloon tamponade	Single dose of antibiotics (ampicillin or first-generation cephalosporin): • Ampicillin 2 g intravenously OR • Cefazolin 1 g intravenously
• Repair of third and fourth degree lacerations	Single dose of antibiotics: • Ampicillin 500 mg
• Preterm prelabour rupture of membranes	• Oral erythromycin 250 mg every six hours for 10 days (or until birth) OR • Ampicillin 2 g intravenously every six hours

Administration of prophylactic antibiotics **is not recommended** for the following conditions: uncomplicated vaginal birth; operative vaginal birth; episiotomy; and first or second degree lacerations.

The second edition *MCPC* specifies that **newborns delivered under the following circumstances are at increased risk of infection and should be treated** with prophylactic antibiotics—ampicillin (intravenously or intramuscularly) and gentamycin—for at least two days, until the infection is ruled out:

- Preterm prelabour rupture of membranes occurred.
- The membranes ruptured more than 18 hours before birth.
- The mother is being treated with antibiotics for chorioamnionitis.
- The mother had a fever greater than 38 ºC before childbirth or during labour.
- The amniotic fluid was foul smelling or purulent.
- The mother has confirmed maternal colonization with Group B streptococcus without adequate antibiotic therapy during labour.

Differential Diagnosis of Fever and Therapeutic Antibiotics in Pregnant and Postpartum Women

The second edition *MCPC* reviews symptoms of common causes of fever linked to infections in pregnant and postpartum women, which include **pyelonephritis** (kidney infection), **pneumonia, malaria, amnionitis** and **postpartum endometritis**. The second edition *MCPC* updates antibiotic treatment regimens for common infections in pregnancy and after childbirth (**Table 5**). In general, the choice of an antibiotic regimen should be informed by the narrowest clinically appropriate antibacterial spectrum and lowest effective dose and duration of treatment. The second edition also includes important updated recommendations to prevent and treat uncomplicated and severe **malaria** in pregnant and postpartum women, which are based on WHO's 2012 Guidelines for the Treatment of Malaria.

Table 5. Therapeutic antibiotics for selected infections in pregnant and postpartum women

Diagnosis	New in second edition	Comments
Cystitis	Antibiotic options and dosing of either **amoxicillin or nitrofurantoin** remain the same, **except:** • Avoid nitrofurantoin at term as it can cause neonatal haemolysis. • Remove trimetoprim/sulfamethoxazole due to interference with folic acid metabolism and increased risk of congenital malformations.	Amoxicillin 500 mg by mouth every eight hours for three days; or nitrofurantoin 100 mg by mouth every eight hours for three days
Acute pyelonephritis	Antibiotic regimen **IV ampicillin PLUS gentamicin followed by oral amoxicillin** remains the same, but there is added emphasis on: the importance of identifying and treating pyelonephritis in pregnancy to prevent significant illness; and reevaluating diagnosis and choice of antibiotic if there is **no clinical response in 48 hours**.	Ampicillin 2 g IV every six hours PLUS gentamicin 5 mg IV per kg of body weight every 24 hours; amoxicillin 1 g orally every eight hours to complete 14 days of treatment
Amnionitis	Antibiotic regimen **IV ampicillin PLUS gentamicin** remains the same, **but** if the **woman gives birth vaginally**, **continue treatment for at least 48 hours** after the symptoms and signs of infection have subsided.	Ampicillin 2 g IV every six hours PLUS gentamicin 5 mg IV per kg of body weight every 24 hours
Postpartum endometritis	Antibiotic regimen changed from ampicillin, gentamicin and metronidazole to **clindamycin and gentamicin** for **24–48 hours** after complete resolution of clinical signs and symptoms (fever, uterine tenderness, purulent lochia, leukocytosis). Oral antibiotics are not necessary following IV antibiotics.	Clindamycin 600 mg IV every eight hours PLUS gentamicin 5 mg IV per kg of body weight every 24 hours If clindamycin is not available: Ampicillin 2 g IV every 6 hours PLUS gentamicin 5 mg/kg body weight IV every 24 hours When available, clindamycin (in combination with gentamycin) is more effective than ampicillin or a penicillin antibiotic for the treatment of postpartum endometritis.
Serious infections of pelvic organs	Antibiotic regimen narrowed to **IV ampicillin PLUS gentamicin, deleting metronidazole.** Discontinue antibiotics 48 hours after complete resolution of clinical signs and symptoms.	Ampicillin 2 g IV every six hours PLUS gentamicin 5 mg IV per kg of body weight every 24 hours
Pelvic abscess, peritonitis	Antibiotic regimen remains the same: **IV ampicillin PLUS gentamicin, PLUS metronidazole.**	Ampicillin 2 g IV every six hours PLUS gentamicin 5 mg IV per kg body weight every 24 hours PLUS metronidazole 500 mg IV every eight hours
Mastitis or breast abscess	Antibiotic regimen remains the same: oral cloxacillin or erythromycin for 10 days.	Cloxacillin 500 mg by mouth every six hours OR erythromycin 250 mg every eight hours For abscess, surgical drainage is an option as well.

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