



A Systematic Review of the Interconnections between Maternal & Newborn Health



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Introduction

Poor maternal and newborn health contributes significantly to the burden of disease in developing countries: worldwide approximately 350,000 women die during pregnancy and childbirth every year, and an estimated 3.1 million babies die in the first four weeks of life.

The health of a mother and her newborn are closely linked: most maternal and newborn deaths are caused by the poor health of the mother before or during pregnancy, or by poor quality care during and immediately after childbirth. Strategies for improving maternal and newborn health and survival are therefore closely related, and can be provided most effectively and efficiently through a continuum of care approach (see below). Linking these interventions through integrated programs can lower costs, promote greater efficiencies, and reduce duplication. Perhaps most importantly, integrating interventions can maximize impact on the health and survival of women and their newborns.

Integrated services should have functional linkages between the various levels of the health system (home, community, health center, referral hospital) and between service delivery packages, so that the care provided at each time and place contributes to their overall effectiveness (1). The contents of such packages have been identified in the 2007 Lancet series on the continuum of care for maternal, newborn, and child

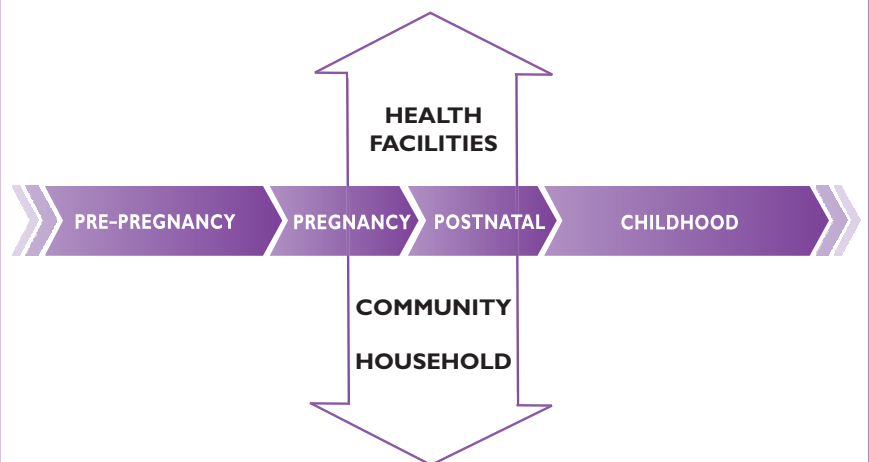
health and subsequent publications (2-6). Past reviews have evaluated the cost-effectiveness of individual interventions (7-9) and identified intervention packages such as community-based newborn care, antenatal care, skilled attendance at birth, and emergency obstetric and neonatal care which can be delivered at different levels of the health system (10). Relatively few studies have examined how interventions affect both women and newborn children, identified synergies between interventions, or assessed the impact of efforts to integrate these interventions across the continuum of care (11-12).



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The RMNCH Continuum of Care

The “Continuum of Care” for reproductive, maternal, newborn, and child health (RMNCH) includes integrated service delivery for mothers and children from pregnancy to delivery, the immediate postnatal period, and childhood. Such care is provided by families and communities, through outpatient services, clinics, and other health facilities.



Aims

A comprehensive review of published and ongoing research conducted by Zulfiqar Bhutta from Aga Khan University and others examined key maternal and newborn health interventions and the linkages between maternal and newborn health care strategies and programs, and identified those which have a positive, synergistic effect on maternal and newborn outcomes. The review also grouped these interventions into proposed “packages” of care for delivery at the community, health center, or hospital level.

The main objectives of the review were to:

- Analyze the interconnections between maternal, neonatal, and infant health outcomes. When biologically plausible, the review combined maternal and neonatal morbidities to identify additive or synergistic effects of interventions on composite maternal and neonatal/infant outcomes. Those interventions which did not have a significant impact on individual maternal or neonatal outcomes were assessed for significant impact in composite analyses.
- Describe interconnections between maternal and newborn care strategies and interventions, based on a review of actual research conducted, and group them into “packages of care.”
- Highlight gaps in knowledge and priority areas for research in integrated management of maternal and newborn health.

This review focused mainly on evidence supporting an integrated approach to the management of maternal, neonatal, and infant health. The review explored potential synergies with new and poorly researched areas such as linking maternal health, nutrition, and family planning interventions with perinatal and newborn outcomes.

Methodology

SEARCH STRATEGY

Using the WHO recommended interventions for reducing maternal and newborn deaths and disability (13),

a total of 154 maternal and newborn health interventions were assessed in the review. Relevant reviews and studies for each intervention were identified from the Cochrane library and the Lancet series (on neonatal survival, 2005; on maternal survival, 2006; on maternal and child under-nutrition, 2008; and on Alma Alta, 2008). If no Cochrane review was identified, a search of PubMed was conducted using targeted search terms. Data were also extracted from agency reports, including those from WHO, UNFPA, UNICEF, and the World Bank. A further search was conducted of references from identified studies. The principal focus was on collecting randomized controlled trials and quasi-randomized trials; where such studies were missing, observational or pre-post studies were also included.

CLASSIFICATION OF INTERVENTIONS

Each of the interventions was assessed using the WHO’s Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) criteria. Following the grading, the interventions were analyzed to assess their synergistic effects on maternal and newborn health outcomes. The interventions were categorized into Interconnections Groups A, B, C, D, or E, depending on whether statistically significant outcomes for mother and/or newborn were found. See table below for criteria used for classification of the interventions.

Group A interventions were further analyzed for composite outcomes on maternal, fetal, and neonatal mortality and morbidity. This analysis identified additive or synergistic effects of the intervention on composite outcomes of maternal, fetal, and neonatal health.



Table 1: Interconnections Groups

A	B	C	D	E
<p>High level of evidence (from randomized controlled trials) of benefit of the intervention to both the mother and fetus/newborn</p>	<p>B-I: Moderate/low level of evidence (<i>from low-quality randomized controlled trials</i>) of benefit of the intervention to both mother and fetus/newborn</p> <p>B-II: Moderate/low level of evidence (<i>from high-quality observational studies</i>) of benefit of the intervention to both mother and fetus/newborn</p>	<p>High/moderate/low level of evidence of benefit of the intervention on a single category (i.e., either maternal outcome or fetal/newborn outcome)</p>	<p>No immediate benefits of the intervention; however, the impact is later in infancy/childhood/adulthood</p>	<p>No existing evidence of benefit of the intervention on maternal or fetal/newborn outcomes</p>

Findings & Recommendations

Below are Group A interventions found to have a positive, synergistic effect on the health and survival of both women and their newborns during the reproductive, pregnancy, childbirth, and postnatal periods.

REPRODUCTIVE PERIOD*

Two interventions provided during the reproductive period have a synergistic effect on maternal and newborn health:

- **Folic acid supplementation** (through folic acid tablets or food fortification) for women prior to and during pregnancy prevents neural tube defects in infants and the risk of preterm births. Folic acid supplementation also has a long-term beneficial impact on the health of the woman, specifically in reducing total plasma homocysteine levels.
- **Family planning**, including counseling on and provision of contraceptive methods, prevents unwanted pregnancies and unsafe abortion, and increases spacing between births. Available data indicate that short intervals between pregnancies (less than 6 months) are associated with negative maternal and perinatal outcomes, such as maternal anemia, preterm birth, small-for-gestational age infants, and an increased risk of perinatal and maternal mortality. Adequate birth spacing (18-23 months) reduces the risk of perinatal and maternal mortality.

PREGNANCY AND INTRAPARTUM

The antenatal period provides unique opportunities to safeguard and protect the health of a woman and her fetus/newborn. Antenatal care provides a critical window to address a range of health care needs, such as treating HIV and sexually transmitted infections (STIs), and providing counseling and educational support. The greatest number of interventions with synergistic effects for mother and newborn was found during this period:

- **Smoking cessation programs** during pregnancy have positive health benefits for the mother and her newborn. Smoking increases the risk of premature mortality among women (smoking is responsible for 1 in 20 deaths in women), and preterm birth and low birth weight among newborns. Techniques such as counseling, cognitive behavioral therapy, social support and encouragement, and use of pharmacological agents such as nicotine replacement therapy have been shown to be effective in helping women to stop smoking.
- **Antenatal care during pregnancy (ANC)** and the 4-visit focused antenatal model: Well-designed, good-quality ANC reduces the risk of preterm birth, perinatal mortality, and low-birth-weight infants. An effective ANC package includes counseling for birth preparedness/ complication readiness, disease detection, and general health promotion; it consists of recording of medical history, advice and guidance on pregnancy and delivery, screening tests, and education on self-care, as well as identification of health conditions, first-line management, and referral, if necessary. WHO recommends a four-visit

* For women or adolescents of childbearing age (15-49), the period of the lifecycle either before pregnancy or in-between pregnancies.

antenatal care model for women who have no evidence of pregnancy-related complications, medical conditions, or major health-related risk factors.

- **Iron and iron-folic acid supplementation** was found to reduce anemia in pregnant women, and the risk of preterm and low-birth-weight babies. During pregnancy, women who have iron-deficiency anemia have inadequate weight gain, weakened immune systems, heavy placentas (weighing more than 700 grams), and are more likely to have newborns born prematurely or with low birth weight.

- **Detection and management of maternal diabetes:** Pre-gestational diabetes is a risk factor for maternal hypertension and pre-eclampsia, and for congenital malformations, macrosomia (excessive birth weight), and intrauterine fetal death. Treating maternal diabetes (through dietary advice, glucose monitoring, and insulin) reduces maternal and perinatal morbidity, specifically the occurrence of antenatal pre-eclampsia and neonatal convulsions.

- **Prevention and management of STIs** (syphilis, gonorrhea, bacterial vaginosis, and chlamydia) before and during pregnancy reduces poor health outcomes in women, the fetus, and the newborn. Treating women early in the pregnancy effectively prevents infection in the fetus, and helps reduce the occurrence of disease in the woman.

- **Prevention and management of HIV in pregnancy (antiretroviral therapy or ART):** WHO guidelines published in 2010 recommend the following:

- Providing ART for HIV-infected women for their own health, which is also safe and effective in reducing prevention of maternal to child transmission (PMTCT).
- Antiretroviral (ARV) prophylaxis for HIV+ pregnant women not in need of treatment to reduce risk of transmission from mother to child.
- Provision of ARVs to the mother or child to reduce the risk of transmission during the breastfeeding period (14).

Available data show that maternal ART during pregnancy and through breastfeeding is most effective for maternal health and in reducing HIV transmission and infant death. Extending the course of ARVs through the breastfeeding period, especially in areas where breastfeeding is important to the survival of the infant, also

decreases the risk of transmission via breast milk.

- **A range of community support strategies** (e.g., emergency transport funds, cash transfers and insurance funds, supportive care during childbirth) can improve maternal health care-seeking behavior, and facilitate early recognition of complications. The review assessed the impact of community-based interventions as a whole on maternal and newborn health outcomes, and not as single interventions.

- **Preventing malaria** during pregnancy leads to reduction of maternal anemia and low-birth-weight infants. Two recommended strategies for preventing malaria in endemic areas include:

- Use of routine **anti-malarial drugs** during pregnancy to reduce placental parasitemia and low-birth-weight babies during first and second pregnancy.
- Use of **insecticide-treated nets** reduces perinatal mortality and morbidity, placental parasitemia, and the occurrence of maternal clinical illness.

- **Recognition and management of hypertensive disorders** in pregnancy can lead to reductions in maternal mortality and neonatal morbidities (such as preterm birth, low birth weight, and birth asphyxia). The interventions are both preventive (calcium supplementation during pregnancy and anti-platelet agents in high-risk pregnancies) and therapeutic (anti-hypertensive agents to treat mild to moderate hypertension in pregnancy). For eclampsia, magnesium sulphate is the recommended treatment.

Key Pregnancy & Intrapartum Interventions

- Smoking cessation programs
- Antenatal care during pregnancy (ANC)
- Iron and iron-folic acid supplementation
- Detection and management of maternal diabetes
- Prevention and management of STIs
- Prevention and management of HIV in pregnancy (antiretroviral therapy)
- A range of community support strategies
- Preventing malaria
- Recognition and management of hypertensive disorders
- Vaccination in pregnancy
- Basic emergency obstetric care
- Comprehensive emergency obstetric care

• **Vaccination in pregnancy:** Providing women with influenza and pneumococcal vaccinations during pregnancy has beneficial health impacts: influenza vaccination reduces febrile respiratory illness in both mother and infant, and pneumococcal vaccination improves the immune response and protects them against potential infection.

• **Basic obstetric care:**¹ For the purposes of this review, two Group A interventions were found to have beneficial impact on maternal and newborn health:

• **Skilled birth attendance:** Maternal deaths due to obstetric complications such as sepsis and postpartum hemorrhage can be prevented or managed if a woman has access to a skilled birth attendant during childbirth. The evidence regarding provision of skilled birth attendance is of low quality, consisting of primarily before-and-after and quasi-experimental studies and observational studies. There is great potential for future research in order to generate impact estimates that would make composite analysis feasible.

• **Provision of clean delivery kits:** Available studies show that provision of clean delivery kits has a statistically significant impact on perinatal/neonatal mortality, and a positive effect was also seen on maternal puerperal sepsis, neonatal sepsis, and infection of the umbilical cord.

• **Emergency obstetric care:** The following interventions were shown to have positive outcomes for both women and their newborns:

• **Provision of lower segment caesarean section (LSCS):** C-section results in a decrease in maternal mortality and reduces the risk of intrapartum stillbirths.

• **Routine labor induction from 41 weeks gestation:** Labor induction from 41 completed weeks is recommended for prevention of maternal and neonatal morbidity; it is also associated with fewer perinatal deaths.²

POSTNATAL/NEONATAL

Postnatal care, provided either at home or at the health center, is a critical but often neglected component of maternal and newborn health. Two interventions were

found to have a synergistic effect on maternal and newborn health outcomes:

• **Exclusive breastfeeding during the first six months of life:** The benefits of breastfeeding for the mother are both short- and long-term. In the short-term, she is likely to recover more rapidly from the stress of parturition—the uterus contracts, stimulated by the oxytocin released during lactation, thereby reducing blood flow, which prevents anemia as iron stores are less depleted. It also has a significant impact on breast cancer risk for the mother. For the newborn, exclusive breastfeeding for the first six months of life is recommended for optimal growth, development, and health. Specifically, it decreases the risk for infections and many acute and chronic diseases during infancy, such as diarrhea and respiratory tract infections.

• **Recognition and treatment of postnatal depression** has benefits for both mother and child. Pharmacological methods led to a significant decrease in maternal depression following treatment; non-pharmacological interventions, such as cognitive behavior therapy, led to improved contraceptive use in mothers (at 12 months), reduced incidence of infant diarrhea, and an increased rate of completed immunization at 12 months.

PACKAGING THE INTERVENTIONS

Once synergies between maternal and neonatal health were identified, the review grouped these interventions into proposed “packages” of care for delivery at the community, health center, or hospital level. These interventions cut across the continuum of care, and include interventions classified as Group A, as well as Group B.

Some of these interventions can be provided at the level of the community (e.g., counseling for immediate and exclusive breastfeeding); others require more technical expertise (e.g., prevention and management of diabetes during pregnancy). A framework demonstrating how the different interventions can be delivered as packages of care, along with the level of care, is given in Table 2.

¹ Basic emergency obstetric and newborn care includes: administration of antibiotics, oxytocics, and anticonvulsants; and manual removal of the placenta; removal of retained products following miscarriage or abortion; assisted vaginal delivery, preferably with vacuum extractor; newborn care. Comprehensive emergency obstetric and newborn care includes all basic functions above, plus Cesarean section, safe blood transfusion, and care to sick and low-birth-weight newborns, including resuscitation.

² In settings where gestational age is not routinely determined by early ultrasound, the practice of routine labor induction from 41 weeks gestation can result in iatrogenic prematurity and/or failed induction leading to unnecessary C-section.

Table 2: Packages of Care

General supportive care	<ol style="list-style-type: none"> 1. Smoking cessation in pregnancy [Group A] 2. Prevention of intimate partner violence [Group B] 3. Prevention of maternal drug abuse during pregnancy [Group B] 4. Recognition and treatment of postnatal depression [Group A] 5. Perinatal audit [Group B] 6. Family planning [Group A]
Maternal nutrition package	<ol style="list-style-type: none"> 1. Multiple micronutrient supplementation during pregnancy [Group B] 2. Balanced protein energy supplementation during pregnancy [Group B] 3. Periconceptual folic acid supplementation [Group A] 4. Iron-folic acid supplementation during pregnancy [Group A] 5. Calcium supplementation in pregnant women with low/inadequate calcium intake [Group A]
Improving quality of basic antenatal care	<ol style="list-style-type: none"> 1. Four-visit focused antenatal package [Group A] 2. Screening and management of STIs in pregnancy [Group A] 3. Prevention and management of malaria in pregnancy [Group A]
Expanded antenatal care package	<ol style="list-style-type: none"> 1. Treatment and management of maternal diabetes [Group A] 2. Management of HIV in pregnancy and infancy [Group A] 3. Anti-platelet agents in high-risk pregnancies [Group A] 4. Anti-hypertensives for mild to moderate hypertension during pregnancy [Group A] 5. Magnesium sulphate for treatment of pregnancy-induced hypertension/eclampsia [Group A] 6. Influenza immunization in pregnancy [Group B] 7. Pneumococcal vaccination in pregnancy [Group B]
Community-based intervention packages	<ol style="list-style-type: none"> 1. Community-based intervention packages, including emergency transport funds, cash transfers, supportive care during childbirth [Group A]
Childbirth care package	<ol style="list-style-type: none"> 1. Basic obstetric care [Group A] 2. Emergency obstetric care (LSCS, active induction of post-term pregnancy) [Group A] 3. Treatment of pre-term prelabor rupture of membranes (pPROM) [Group B] 4. Training TBAs in clean delivery and referral [Group B]
Postnatal care	<ol style="list-style-type: none"> 1. Birth spacing/family planning [Group A] 2. Promotion of immediate and exclusive breastfeeding [Group A] 3. Kangaroo mother care [Group B] 4. Postnatal visits [Group B]

1. General Supportive care

Advice and counseling for smoking cessation can be administered at the community level. Detection and treatment of postnatal depression should be performed at the level of outpatient clinics or within a tertiary-level setting. Prevention of intimate partner violence involves not only the health sector but requires support from the community as well.

2. Maternal nutrition support package

This package consists of key nutrition interventions which can be promoted and delivered at the community level. Vitamin supplementation programs can also be administered at the outpatient level.

3. Improving quality of basic antenatal care

This review illustrates that quality antenatal care can reduce the risk of preterm birth, low birth weight, and perinatal mortality. For mothers, it can reduce the risk of postpartum hemorrhage and need for blood transfusion. Problems with accessing adequate antenatal care are frequently encountered in developing countries. Antenatal care can be delivered at the outpatient level.

This package includes interventions which can detect and manage infections and conditions such as malaria, STIs, and HIV. Case management of malaria and HIV/STIs can be performed in the outpatient setting. Other conditions affecting pregnancy such as anemia, pre-eclampsia, and malnutrition can be screened at outpatient visits. Pregnant women can also be counseled on the benefits of breastfeeding by both community health workers and health providers through outreach/outpatient programs.

4. Expanded antenatal care package

Routine pregnancy care can be enhanced by expanding the components of the antenatal care package. New components focus on prevention and management of diabetes during pregnancy, aggressive treatment of pregnancy-induced hypertension during pregnancy with anti-hypertensives, use of antiplatelet agents for prevention of pre-eclampsia in high-risk pregnancies, and use of magnesium sulphate for management of pregnancy-induced hypertension and eclampsia. These interventions are more likely to be applicable at the tertiary care level. Other emerging interventions linked to improved maternal outcomes are pneumococcal and influenza vaccinations during pregnancy; these interventions can be administered at the level of the community or in outpatient/outreach programs.

5. Community-based intervention packages and support groups

Available data suggest that introduction of community-based intervention packages can decrease maternal and

neonatal mortality. It can also improve breastfeeding practices, increase referrals to health facilities for pregnancy-related complications, and improve other health care practices in pregnancy, such as iron-folic acid supplementation. Community-based packages include emergency transport funds, cash transfers, insurance funds, supportive care during childbirth, among others.

6. Childbirth care package

The interventions that comprise a childbirth care package include C-section and instrumental delivery, both of which can be delivered at the tertiary level.

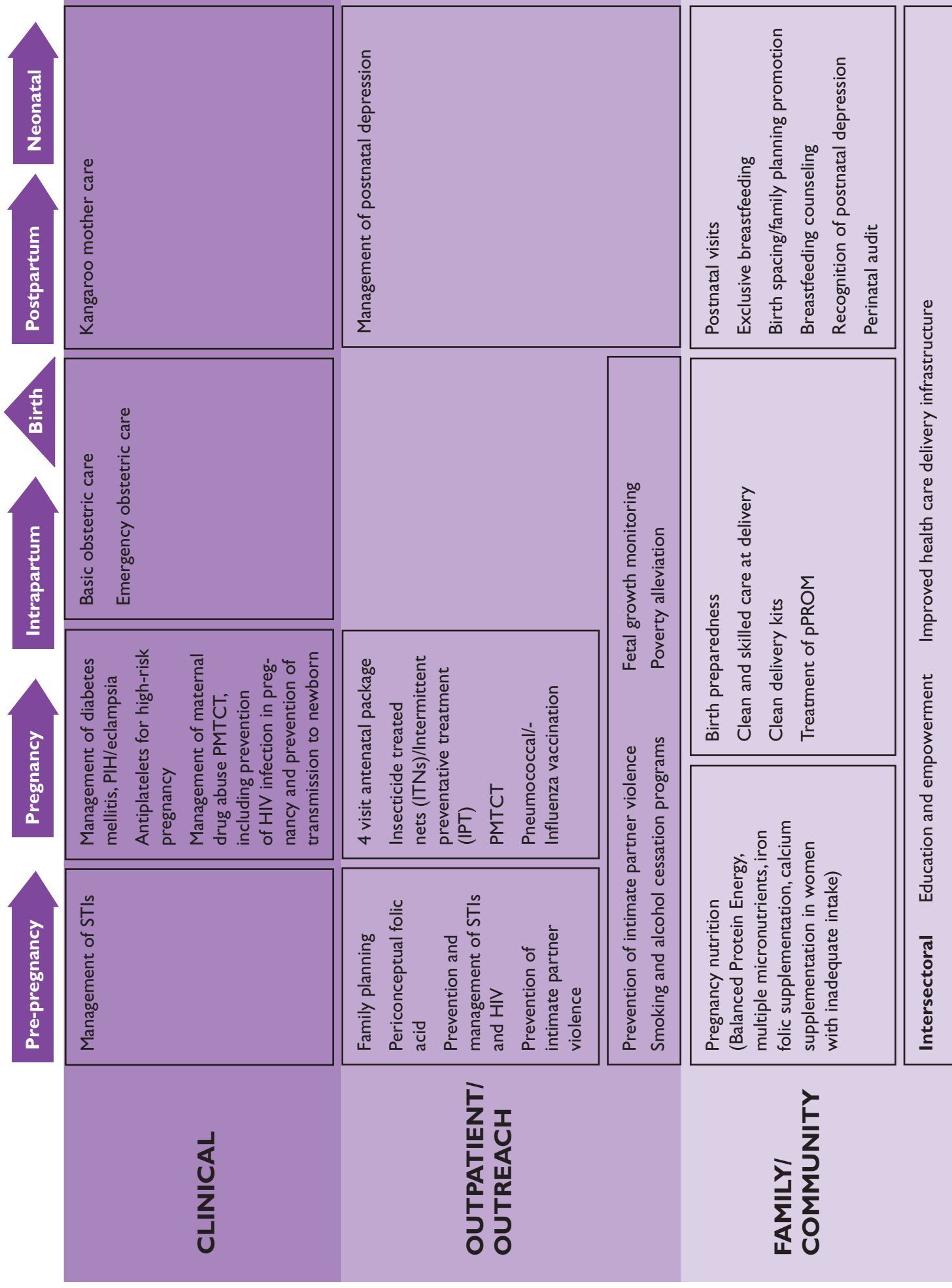
Other interventions, such as emergency transport systems, need to be established at a grassroots level within the community. Although not included in this review since they only affect the health of the newborn or mother, other interventions which should be included in childbirth packages are: vaginal chlorhexidine to prevent neonatal infections, continuous cardiotocography monitoring for fetal assessment, amniotomy to shorten labor, management strategies for breech presentation, and management of postpartum hemorrhage and retained placenta.

7. Postnatal care

During the postnatal period, community health workers making home visits can promote newborn care (including cord care, eye care, etc.), exclusive breastfeeding, and birth spacing/family planning. It is recommended that home visits should be initiated as soon as possible after birth or after returning home from a health facility. A visit within the first 24 hours after birth is likely to be most effective in reducing newborn mortality, especially in low-birth-weight babies. Visits on day three and day seven are also recommended, as appropriate.

At the level of the tertiary care center, postnatal care will include kangaroo mother care, especially for low-birth-weight infants; it also includes treatment for newborns at risk for HIV and malaria.

Figure 1: Delivery of Interventions



Research Limitations

This review included systematic and thorough analyses for maternal and newborn health interventions; however, there were a number of limitations. These include:

1. Ethical concerns do not permit the feasibility of performing randomized controlled trials (RCTs) for certain interventions, e.g., screening and treatment of syphilis in pregnancy, emergency obstetric care, and family planning. This limited the data available for composite analyses for these interventions.
2. For interventions where conducting RCTs was ethically feasible, there was a lack of research reporting the evidence of impact on both maternal and neonatal outcomes simultaneously, such as breastfeeding promotion, smoking cessation in pregnancy, peri-conceptual folic acid, and kangaroo mother care. This restricted the pool of studies for the composite analysis.
3. Certain outcome measures, such as maternal satisfaction regarding an intervention, cannot be quantitatively estimated.
4. Certain interventions may have negative impacts on maternal and neonatal outcomes. These were not covered in the review.

Evidence Gaps

The review identified a number of gaps and unanswered questions. Future studies need to ensure standardized methods for data collection across the continuum of care and should include the pre-pregnancy period in intervention strategies (in circumstances where this is feasible).

There is also an urgent need to 1) evaluate the effects of family planning/birth spacing on maternal and newborn health outcomes as part of integrated packages; 2) investigate the feasibility of implementing enhanced antenatal care strategies (including detection and treatment of diabetes, hypertension, and STIs) in health systems; and 3) evaluate the long-term impact of maternal nutrition packages.

The utilization of community-based platforms for promoting skilled maternal and newborn care is another key area requiring further research. Finally, given rapid increases in healthcare costs, and the need to reach remote and underserved communities, it has become crucial to build the evidence base on cost-effectiveness of integrated MNCH delivery strategies (intervention packages and platforms such as community-based strategies, conditional cash transfers, voucher schemes, etc.).

Conclusion

The continuum of care for maternal, newborn, and child health is based on the premise that the health and well-being of women and their children are closely linked and can be managed in an integrated way, and that interventions in one stage of the life-cycle profoundly affect the rest. This review of the evidence has confirmed the synergistic effects of such well-recognized interventions as basic and emergency obstetric care; the findings also highlight a range of new and lesser known interventions (specifically those focusing on addressing maternal illness and nutrition) which have beneficial impacts on the health of women and their newborn children.

Key Messages from Research

- Mother and newborn form a critical dyad, whose health is strongly interconnected.
- Health care for women and newborns is an interconnected continuum – many clinical interventions benefit both the mother and newborn.
- Research studies tend to examine the impact of interventions on either the woman or the newborn. As a result, there are lost opportunities to interlink care for women and their children.
- It is vital to interconnect care for women and their newborn children – to promote greater efficiency, lower costs, reduce duplication of resources, and to achieve greater impact.

References

1. WHO. WHO Annual Report 2007. Making pregnancy safer. Available from: http://www.who.int/making_pregnancy_safer/-documents/report_2007/en/index.html. 2007.
2. Campbell OM, Graham WJ. Strategies for reducing maternal mortality: getting on with what works. *Lancet*. 2006 Oct 7; 368(9543):1284-99.
3. Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, et al. What works? Interventions for maternal and child under-nutrition and survival. *Lancet*. 2008 Feb 2; 371(9610):417-40.
4. Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L. Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet*. 2005 Mar 12-18; 365(9463):977-88.
5. Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS. How many child deaths can we prevent this year? *Lancet*. 2003 Jul 5; 362(9377):65-71.
6. Engle PL, Black MM, Behrman JR, Cabral de Mello M, Gertler PJ, Kapiriri L, et al. Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. *Lancet*. 2007 Jan 20; 369(9557):229-42.
7. Bhutta ZA, Darmstadt GL, Haws RA, Yakoob MY, Lawn JE. Delivering interventions to reduce the global burden of stillbirths: improving service supply and community demand. *BMC Pregnancy Childbirth*. 2009; 9 Suppl 1:S7.
8. Adam T, Lim SS, Mehta S, Bhutta ZA, Fogstad H, Mathai M, et al. Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries. *BMJ*. 2005 Nov 12; 331(7525):1107.
9. Graham WJ, Cairns J, Bhattacharya S, Bullough CHW, Quayyum Z, R. K. Maternal and Perinatal Conditions. Disease Control Priorities in Developing Countries. New York: Oxford University Press; 2006. p. 499-530.
10. WHO. The World Health Report 2005 - make every mother and child count. <http://www.who.int/whr/2005/en/index.html>; 2005 Contract No.: Document Number.
11. Kerber KJ, de Graft-Johnson JE, Bhutta ZA, Okong P, Starrs A, Lawn JE. Continuum of care for maternal, newborn, and child health: from slogan to service delivery. *Lancet*. 2007 Oct 13; 370(9595):1358-69.
12. Bhutta ZA, Ali S, Cousens S, Ali TM, Haider BA, Rizvi A, et al. Alma-Ata: Rebirth and Revision 6 Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make? *Lancet*. 2008 Sep 13; 372(9642):972-89.
13. WHO. Packages of Interventions for Family Planning, Safe Abortion care, Maternal, Newborn and Child Health. 2010 http://whqlibdoc.who.int/hq/2010/WHO_FCH_10.06_eng.pdf
14. WHO. Antiretroviral drugs for treating pregnant women and preventing HIV infection in infants Recommendations for a public health approach (2010 version).