2009-11 MISP Technology Mapping

Name of Drug or Device	Purpose and use	Status in Development Settings (2009)	Status on Technology Introduction Continuum for Crisis Settings (2009)	Progress Specific to Crisis Settings (December 2011)
Emergency Contraception	Emergency contraception (EC) has been researched and improved over the last thirty years.[1] Currently, EC prevents pregnancy up to 120 hrs. The earliest it is taken the more efficacious. [2]	EC is available over the counter in multiple countries. The majority of the countries provide progestin-only pills. Combined pills are available in two locations; Sierra Leone and Paraguay.[3]	Emergency contraception is provided in MISP Kit 3: Rape treatment and Kit 4: Oral and injectable contraception.[4]	EC included in RH Kits, but use is limited. Need for EC use to be expanded beyond post-rape care identified as need in multi-country baseline assessment.[5] EC still often not available in public-sector programs.[6]
Non-pneumatic anti-shock garment (NASG) or LifeWrap	NASG is a secure wrap that covers women's bodies during childbirth to stabilize them from shock as a result of obstetric hemorrhage. The NASG was developed in the 1990s, by a NASA Ames scientist team. The team re-designed a military medical tool, the pneumatic anti-shock garment, which was used for war-related trauma. In 2002, Dr. Paul Hensleigh published a small case study on the use of the NASG for post-partum hemorrhage (PPH) for six women in a rural Pakistan hospital. Dr. Suellen Miller has collaborated with Dr. Hensleigh from 2003 to promote and research the use of the NASG for treatment and prevention of PPH.[7]	**Nigeria** (Katsina State): A study indicated that the NASG has a potential to reduce blood loss and maternal mortality caused by obstetric hemorrhage-related shock.[8] **Egypt**: A study done in CEmOC facilities found that NASG significantly reduced blood loss, time to recovery from shock and for those with PPH due to uterine atony who received oxytocin, the NASG had a significant effect on blood loss independent of oxytocin.[9] **Zambia & Zimbabwe:** There is a current study to evaluate if early application of the NASG at satellite clinics before patient transfer to higher level health facilities will reduce maternal mortality and morbidity caused by PPH.[10] **India, Nigeria, Bangladesh, Peru and Tanzania**: Pathfinder pilot projects to evaluate if NASG will reduce maternal morbidity and mortality caused by PHH.[11]	Pathfinder International has piloted the use of the NASG in the Nyarugusu and Mtabila refugee camps and surrounding host community health facilities in northern Tanzania. [12]	Small pilot tests have been implemented on the NASG in crisis settings; however, WHO is awaiting results of Zambia/Zimbabwe trials to make any recommendations on its use in development and humanitarian settings. Further operations research may also be necessary, specifically in acute emergency settings. In the Nyarugusu refugee camp of northern Tanzania, Pathfinder has piloted the use of the NASG among midwives, nurses and physicians.[13] A Women's Refugee Commission cross-sectional assessment has found no side-effects or problems in their use of the NASG in the refugee setting. **Additional research in development contexts** The NASG used in clinical trials, manufactured by Zoex, has been field tested in Egypt, Nigeria, and Mexico. It is currently sold for

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				USD $300 and can incur an additional USD $70 to $130 for international shipping, trucking, and import duties and taxes.[14] PATH recently established and qualified a Chinese manufacturer and distributor (Neil Pryde, Hong Kong) who will provide an identical large NASG for US$55 (not including shipping). Additional efforts are underway to develop a similarly priced, validated, and small NASG in India by August 2012. Of note, the Zoex and Neil Pryde garments have been shown to be substantially equivalent through bench-level testing that investigated elasticity, durability, Velcro strength, dimensions, and other key attributes. The NASG is not a one-size-fits-all PPH tool. Three sizes (small, medium, and large) of NASG have been developed to accommodate the significant population-dependent anthropomorphic variations around the world. Both the improvised pneumatic anti-shock garment (PASG) and a NASG were found to decrease distal aortic blood flow, but the improvised PASG device decreased it by a larger margin.[15]
New formulation, delivery pump for Magnesium	Springfusor is a spring driven syringe pump that provides continuous infusions of drugs	**India**: A study was done in 2009 to evaluate the use of the delivery pump Springfusor for magnesium sulfate for the treatment of	Future research and publication of results are needed before there is	Future research and publication of results are still needed before Springfusor can be recommended

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sulfate	through flow control tubing (FCT). There is no risk of drugs being accidentally downloaded as with electronic pumps. They require no electricity or batteries.[16] The Springfusor is produced by Go Medical Industries Pty Ltd in Australia. It was introduced as a new delivery pump in the 1990s.[17]	preeclampsia in low resources settings. The study was completed but no formal publication has been released.[18] Presently there is an undergoing study to evaluate the efficacy and acceptability of administrating magnesium sulfate with the Springfusor where treatment for preeclampsia with magnesium sulfate is limited or not available. The study is still underway and results will be forthcoming.[19]	adoption of the Springfusor in humanitarian settings.	for use in humanitarian settings. **Research in development contexts** **India:** Results from study conducted at two research hospitals found that fewer women stopped treatment due to side effects, toxicity, oliguria or renal failure, or women's request in the Springfusor arm (4% or 6 of 147 women) compared to the Standard of Care arm (6.5% or 10 of 153 women). Women in the Springfusor arm reported significantly less nausea, headache, and pain than women in the Standard of Care arm. Almost all women in the Springfusor arm reported their pain level as 'acceptable' or 'very acceptable' compared to women given the Standard of Care. The Springfusor pump may offer an alternative to intramuscular administration of magnesium sulfate where electronic pumps are not available.[20]
Gentamicin (drug to treat bacterial infections) in Uniject, an injection device. Two doses for the treatment of neonatal sepsis	Uniject with gentamicin is a one time pre-filled injection device to be used for the treatment of neonatal sepsis.[21] Uniject has been in existence since the early 90's where it was used in Latin America for immunization purposes.[22] It was developed by PATH and Horizon Medical Inc. to prevent	**Bangladesh**: A prospective observational study in the Special Care Nursery at Dhaka Shishu Hospital was done to evaluate the pharmacokinetics of gentamicin for the treatment of neonatal sepsis in predetermined dose at 24 or 48-hour intervals. The study reported gentamicin to be a safe treatment within the study's treatment protocol.[25] **India and Bangladesh**: A 2007 two-site study found intervals of gentamicin to be a safe	Uniject-gentamicin use in humanitarian settings could be effective in reducing neonatal sepsis, especially in areas that are difficult to access by medical personnel. However, proper medical training and guidance materials need to be developed.	More information is needed to determine use in humanitarian settings. **Research in development contexts** **Nepal:** Study of community-based management of sick newborns with Gentamicin-

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	syringe reuse and improve administration of correct dosages. The manufacture Becton Dickinson (BD) owns the license for Uniject and is marketing Uniject for vaccines, injectable contraceptives, uterotonics, and analgesics.[23] An Argentinean manufacture, Instituto Biologico Argentino (BIOL) is also collaborating with PATH to make gentamicin-Uniject commercially available.[24]	treatment for neonatal sepsis and recommend the use of Uniject for simplification of the administration of the dosage.[26] **India**: A 2004 study evaluating Uniject for use in treating Hepatitis B found it to be a safe and effective tool.[27] **Int'l Organizations**: As of 2008, PATH is waiting to field test gentamicin-Uniject in Nepal and India. They are also creating guidance materials for appropriate scenarios/settings where gentamicin-Uniject should be used. BIOL of Argentina is waiting for FDA approval to complete their production of genatmicin-Uniject.[28]		uniject found community level treatment feasible and an option for areas with poor access to health facilities.[29] PATH began surveying stakeholders to determine interest in gent-Uniject for community-based programming at the country level, and also began exploring additional opportunities to evaluate use in the field, though work is currently on hold due to funding constraints.[30]
Oxytocin (drug to manage labor) in Uniject	Uniject with oxytocin is a one time pre-filled injection device to be used during active management of third-stage labor (AMTSL) for PPH.[31] Uniject has been in existence since the early 90's where it was used in Latin America for immunization purposes.[32] It was developed by PATH and Horizon Medical Inc to prevent syringe reuse and improve administration of correct dosages. The manufacture Becton Dickinson (BD) owns the license for Uniject. BD is marketing Uniject for vaccines, injectable contraceptives, uterotonics, and analgesics.[33] PATH is collaborating with a small pharmaceutical company	**Indonesia**: A 2003 study to evaluate the use of oxytocin in Uniject for midwives during home births found that it was an appropriate and safe method to use during AMTSL. It also substantively decreased the practice of reusing nonsterile syringes among study participants.[35] **Vietnam**: A descriptive study revealed that the majority of midwives reported preferring Uniject for the administration of oxytocin then the original ampoules or syringes. They stated convenience, ease and speed as reason for their preference.[36] **Angola** : A study in hospitals found the use of oxytocin in Uniject during AMTSL significantly reduced blood loss and the duration of the third stage of labor.[37]	Uniject-oxytocin use in humanitarian settings could be effective in managing AMTSL for PPH. However, there are still questions of its use by non-trained medical providers and its limitations due to its reliance on a cold chain system[38]. There is a need for proper medical training and guidance materials to be developed.	Although some guidance materials have been developed on the use of Oxytocin in Uniject, questions about its use by non-trained medical providers still need to be studied before beginning its use in humanitarian settings. **Research in development contexts** Recent regulatory approval received in Argentina. Efforts for approval in other Latin American and African countries currently in progress.[39] PATH published several training materials and job aids providing written and pictorial instruction for health workers, available in several languages. Pilot introductions and/or studies were

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	in India; Dolphin Laboratories Limited for pilot-scale manufacturing of the Uniject-filled oxytocin.[34]			planned in Ghana, India, Honduras, Nicaragua, and South Africa in 2010 (pending in-country approvals).[40] **Nepal:** A verbal autopsy study of causes of stillbirths and neonatal deaths found a need to reduce the uncontrolled use of oxytocics for augmentation of labor.[41] **Guatemala:** A pilot introduction of Oxytocin in Uniject during the AMTSL at the institutional level found that 10 international units with a time-temperature indicator (TTI) could be successfully used by birth attendants for AMTSL as part of an effective PPH prevention program at the facility level. The TTI offers the advantage of storing the product under more flexible conditions, which can be a potential solution to large hospitals that report challenges with cold chain capacity.[42]
Bed nets for malaria prevention	Bed nets: Insecticide treated bed nets **(ITN)** are bed nets treated with pyrethroid insecticide solution. The insecticide on the net repels or kills mosquitoes for several feet around the net. The ITN works up to 12 months before needing to be retreated. Long-lasting insecticide-treated nets **(LLITNs)** have the insecticide woven into the net material. The net is replenished	**ITN/LLITN**: Studies have shown that child mortality can be reduced by 20 percent with the use of bed nets. It has also been noted that the repellant from bed nets can reduce the number of mosquitoes in areas of bed net use. If a community has 80 percent of their households using ITN/LLTNs, the mortality from malaria is reduced within 300 sq meters of the bed net area.[44] **Kenya**: Pregnant women who used bed nets had approximately 25 percent fewer babies who were either small for gestational age or born prematurely. Additionally, the use of ITN	The Sphere Project recommends the use of ITN/LLITN as a measure to protect persons from malaria during crisis/disaster settings.[46] The WHO used ITN/LLITN as prevention materials for malaria and other diseases after the Tsunami disaster in 2004.[47]	While not a part of the RH Kits, ITN/LLITN can safely and feasibly be used in humanitarian settings; diffusion and use are encouraged. **Research in development contexts** Several companies developed long-lasting insecticide treated nets (LLINs), for which 12 were been given approval by WHO in 2011.[48]

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	with each wash because washing brings the insecticide out from the cloth material. The LLITN lasts up to four years.[43]	has been documented to improve pregnancy-related outcomes and reduce morbidity or mortality due to malaria related illness for pregnant women.[45]		
Misoprostol (drug) for postpartum hemorrhage (PPH) and post-abortion care (PAC)	Misoprostol is used to treat women who have incomplete abortions.[49] Misoprostol is also being promoted by Gynuity Health Projects and Venture Strategies for Health and Development for use in the management of PPH in settings where it is difficult to store and maintain oxytocin.[50]	There is a division in opinion on whether misoprostol is an appropriate substitute for oxytocin for the management of PPH in low resource settings. The advocates of misoprostol state that it is a needed resource in areas with little access to health care providers or facilities due to its stability in tropical climates and ease of correct administration. Those against the use of misoprostol state that the drug has more side effects and blood loss for women than oxytocin.[51] A 2004 Cochrane meta-analysis of misoprostol and oxytocin found that one in 100 women who receive misoprostol rather than oxytocin lost more than 1000 mL of blood. However, there were no clinically relevant outcomes, such as the need for a blood transfusion.[52] <u>Treatment of PPH</u> There are further studies being undertaken and an EML application for misoprostol as a PPH treatment will be reviewed by the WHO in coming years.[53] There have been multiple small-scale studies done to show that misoprostol has positive effects in the management of PPH in low resource settings. Studies in **Zimbabwe, Mozambique, Hong Kong**, and **Turkey** have shown that misoprostol, while prone to more side affects then oxytocin, does not produce adverse medical effects.[54] A larger randomized study done in rural Pakistan in 2008 evaluating the use of misoprostol for rural women	WHO has put misoprostol on the essential medicines list (EML) for PAC but not for the management of PPH.[59] However, WHO does recommend the use of misoprostol as a last resort for PPH treatment in settings where the use of oxytocin or another injectable uterotonic such as ergometrine or an oxytocin and ergometrine fixed-dose combination are not available. WHO stipulates that misoprostol should only be handled by trained health providers and should not be provided to community based health workers, women or their families for use.[60]	In 2010, IAWG reviewed whether to include misoprostol to manage PPH in kit 6, and decided against it; it is not yet in the EML for PPH indications since strong evidence of negative side effects was shown in studies last year. However, sixty 600mcg dose equivalents (180 tablets of 200 mcg) with instructions for use from the Gynuity Health Project were added to kit 8 for PAC.[61] [62] [63] 2010 Application to WHO EML proposed inclusion for treatment of PPH based on evidence that misoprostol is safe and effective, and easy to use by providers at all levels.[64] **Research in development contexts** In May 2011, misoprostol was added to the WHO List of Essential Medicines for prevention of PPH in situations where oxytocin is not available, but use for treatment of PPH was not approved.[65] More evidence and inclusion of misoprostol in national protocols is needed.[66] Although misoprostol has been included in the WHO EML, the lowest effective dose and the

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		concluded that the drug showed promise for treatment of PPH and further exploration should be done.[55] <u>Prevention of PPH</u> Due to the results of the small scale studies, the use of misoprostol for the prevention of PPH has been approved or included in several country health guidelines. <u>Post Abortion Care</u> **Burkina Faso**: A 2004 study found that misoprostol is as safe and acceptable as manual vacuum aspirations (MVA) for PAC.[56] **Mozambique**: A study comparing MVA to misoprostol reported that misoprostol was preferred by women and recommended its use in low resource settings.[57] **Review**: A 2004 meta-analysis on the management of early pregnancy loss was done and found that misoprostol reduced the need for curettage.[58]		optimal route of administration for maximum benefit has not yet been established.[9] Consensus on dose and route of administration of misoprostol is critical to inform scale-up of the medication into community programs. In addition, efforts to improve the quality of misoprostol in developing countries are required. In a study that evaluated misoprostol products in multiple countries and regions, the researchers found problems of content and purity with certain misoprostol finished pharmaceutical products (FPPs). The key issues affecting product quality were: impact of moisture at all stages, from the active pharmaceutical ingredient (API) to the storage of FPPs; manufacture and quality of APIs; manufacture and quality of FPPs; and packaging of tablets.[67]
Neonatal kits with cloth/blankets	Newborns in the first few hours after delivery need to be kept warm. After delivery, a newborn should be dried and placed in contact with their mother's skin (kangaroo care) and covered with material to help them regulate their body temperature. The material can be the mother's clothing, cloth, towel, blanket, etc. The purpose of the cover is to serve as an aid in temperature regulation in	The use of blankets or cloth is cited as standard practice of care of newborns for medical providers in the Philippines.[70] The provision of a blanket or cloth to cover the baby's head and body is listed in the USAID Newborn Indicator Profiles for basic care after birth.[71] A 2005 article on effective interventions for newborn care noted that extra warmth for low-birth weight babies was an indicator for survival.[72]	Blankets are listed in the WHO's *Key Steps for Maternal and Newborn Health Care in Humanitarian Crisis* as an item to be included for use in immediate newborn care.[73] UNICEF supplies towels in their emergency midwifery kit.[74]	In 2010, IAWG reviewed whether to include blankets in MISP Kit 6, and decided against it. However, a footnote was inserted in the RH kits manual to encourage local purchase of towels and blankets to dry babies and keep them warm.[75] [76]

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	conjunction with another's body heat.[68] Kangaroo care has shown to have similar or better outcomes in infant temperature regulation then incubators.[69]			
Rapid diagnostic tests for gonorrhea, syphilis, HIV	Rapid diagnostic test refers to Point of care (POC) tests. These types of tests use immunochromatography to detect antigens or antibodies in a dipstick or lateral-flow format within 10 to 30 minutes. The syphilis POC is slightly different than other POCs because it is based on the visualization of antigen–antibody lattice formations. The use of the tests helps diagnose people who are asymptomatic and thereby reduce the morbidity and mortality associated with the indicated diseases by earlier treatment. [77] [78] **Syphilis**: There are 20 commercial POCs and 6 POCs that have been evaluated by the WHO Sexually Transmitted Diseases Diagnostics Initiative (SDI). The SDI found that all six Fujirebio (Espline), Abbott (Determine), Standard (BIOLINE), Diesse (Syphilis Fast), Omega (VISITECT), Qualpro (Syphicheck)) performed better then the	<u>Syphilis</u> **Mozambique** and **Bolivia:** A 2006 cost-effective analysis study was done to evaluate the rapid plasma reagin (RPR) test and the immunochromatographic strip (ICS) test in low-resource settings. Overall, the study found that the ICS tests were a cost effective option for both Bolivia and Mozambique. The rapid tests were found to be on average more expensive than the standard protocol due to the expense of training staff on a new diagnostic tool.[85] <u>Gonorrhea</u> A 2004 study using male patients to evaluate a rapid gonorrhea test found it to be as sensitive and specific as compared to a urethral culture. Additionally, the test gave results in 25 minutes and could be stored for 45 hours at room temperature without affecting results.[86] **Benin**: In a 2005 study that evaluated the validity of the PATH GC-Check rapid test for Gonorrhea, it was found that the PATH test was as efficient as a culture test in areas where people tend to not return for their results. The PATH test may also lower over-treatment of gonorrhea for clinics that serve populations with moderate prevalence of gonorrhea.[87] **Review**: A 2002 review done on laboratory-based results versus syndromic diagnosis found that rapid tests, even when insensitive, could lead to more timely treatment, compared to	HIV POC tests are marketed by the WHO in their HIV Test Kit Bulk procurement scheme.[91] HIV rapid test-kits are listed as an essential item in the UNICEF Emergency Field Handbook.[92] UNICEF used HIV and Syphilis rapid test kits in the Solomon Islands in their response to the 2007 earthquake and tsunami.[93]	Given their existing recommendations and use in humanitarian settings, the focus is on diffusion and use. **Research in development contexts** **Gonorrhea**: The immunochromatographic strip (ICS) test for gonorrhea is being developed by PATH, using relatively inexpensive, off-the-shelf components. The test can be completed in 15-20 minutes and can be performed by technicians with minimal training. The strips are stable for months at ambient temperatures if packaged appropriately. Performed satisfactorily in Benin trial; hoping to license critical antibody agent to a commercial manufacturer in the developing world."[94] **HIV**: UNICEF bought and distributed 10.4 million HIV Rapid-test Kits.[95] **Syphilis:** Study findings from an Elizabeth Glaser Pediatric AIDS

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	reference standard tests Treponema pallidum Haemagglutination Assays (TPHA) or Treponema pallidum Particle Agglutination Assays (TPPA). The WHO does not recommend a specific POC but provides evaluations of their performance. The POC tests are strongly felt to be an acceptable alternative to the conventional syphilis test, particularly for low resource settings because they do not require electricity or further equipment.[79] **Gonorrhea**: The Inverness medical group provides a BioStar OIA GC test for the detection of the L7L12 ribosomal protein gonococcal antigen in female endocervical swabs and male urine samples. Biostar is commercially available and has performed well in clinical trials.[80] PATH has developed a POC test that is under clinical trials.[81] **HIV**: Rapid test for HIV were introduced in 2007.[82] There are multiple providers of rapid HIV tests that have been evaluated by WHO.[83] Six tests have been approved by the FDA. Four of the tests can diagnose both	highly sensitive but not rapid tests. Additionally, if a high percentage of the population being served does not return for the highly sensitive laboratory test results, the rapid tests would increase the percentage of persons treated for gonorrhea.[88] A 2005 review on the pros and cons of rapid test for gonorrhea re-affirmed the need for rapid test in settings where there are no laboratory facilities or in high-risk populations where persons do not return for lab results. The difficulty in using the rapid tests for gonorrhea is in the high cost to purchase. The article recommends the development of cheaper and simpler tests.[89] <u>HIV</u> In 2008, 64 low- and middle income countries reported providing rapid HIV testing in at least 25 percent of health facilities with antenatal care services. Thirty-eight countries had started HIV rapid tests in at least 75 percent of their facilities with antenatal care. Among those countries, 25 were in sub-Saharan Africa. Ten of the twenty countries with the highest HIV burden among pregnant women improved their provider initiated testing, counseling, and HIV rapid testing to at least 75 percent of their antenatal care facilities.[90]		Foundation study in Zambia and Uganda found that rapid syphilis testing introduction into ANC is feasible and cost-effective in urban and remote rural clinics and resulted in high levels of same-day testing and treatment. The high rate of HIV-syphilis co-infections and the increased risk of MTCT further justify the importance of syphilis testing as part of the PMTCT package.[96]

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	types of HIV; HIV-1 and HIV-2. Three of the tests are: • MultiSpot HIV-1/HIV-2 Rapid Test by BioRad Laboratories in 2004. • Clearview HIV1/2 STAT-PAK and Clearview Complete HIV 1/2 by Inverness Medical Professional Diagnostics in 2006, • OraQuick Advance Rapid HIV- 1/2 Antibody test by OraSure Technologies in 2002.[84]			
Hand-carried portable ultra-sound for hospitals and health centers	The portable ultrasound is used during pregnancy in the first trimester to confirm a viable pregnancy, heartbeat, molar or ectopic pregnancies, estimate the gestational age, and assess abnormal gestation. In the second trimester it is used to diagnose fetal malformation, fetal abnormalities, confirm multiple pregnancies, verify dates and growth, confirm intrauterine death, identify hydramnios or oligohydramnios – excessive or reduced levels of amniotic fluid and evaluate fetal well-being. In the third trimester, ultrasound is used to identify placental location, confirm intrauterine death, observe fetal presentation, observe fetal movements and identify uterine and pelvic	**Review**: A 2009 review done on the use of portable ultrasounds in low resource settings found that few studies have been carried out to evaluate its effectiveness. However, the author using his own experience and limited data concluded that portable ultrasounds have the ability to improve maternal and neonatal health outcomes in low resource settings, but further investigation is needed. The author cites three key issues that hinder evidence-based analysis of portable ultrasounds in low resource settings: (1) the maternal and perinatal mortality and morbidity in low resource settings, (2) the lack of evaluations of compact ultrasound systems as reliable alternatives to full-sized systems, and (3) the dearth of outcomes data based on actual deployments of compact ultrasound. The use of field trials are encouraged to appropriately review the portable ultrasounds impacted in the developing world.[99]	In 2005-2007, a feasibility study to evaluate the impact of a portable ultrasound was conducted in the Lugufu refugee camp in Tanzania. The study found that the portable ultrasound was a tool that was enthusiastically received and was used primarily for pregnancy related exams. However, the accuracy of identifying the effect of the ultrasound machine could not be confirmed and was a strong limitation in the study. The study concluded that for the ultrasound to be effective, training for the operators must be strict. The rigidness of the training is important because a patient's	In 2010, IAWG reviewed whether to include a doppler in MISP Kit 6, and decided against it for three reasons: 1) the difficulty of battery maintenance; 2) a high false positive rate of abnormal readings may lead to unnecessary interventions with cesarean sections or assisted deliveries; and 3) cost of around 200 USD for a portable doppler versus 1.8 USD for a foetal stethoscope.[101] [102] **Research in development contexts** Ultrasound platform was designed and tested by University of Washington researchers for midwives working in rural developing regions and was developed at a reduced cost with both socio-technical and socio-

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	abnormalities of the mother.[97] The development of the portable ultrasound has a strong institutional foundation in the field of obstetrics. The portable ultrasound is now, small, with good pictures and can rely on battery power alone.[98]		diagnosis is based off the operator's interpretation of the ultrasound.[100]	cultural environments in mind. Platform is low-cost, has a simplified user interface, allows for easy modifications, supports a solitary work environment, and has an integrated teaching help system. Further research is needed to identify cultural barriers to use, expanding the help system, and further lower the cost.[103] There are many other examples of efforts to develop portable ultrasound designed and marketed for low-resource populations. However, the cost of the technology does not currently warrant its use.[104]
Contraceptive Implants	Contraceptive implants are a reversible and effective contraceptive method that delays pregnancy from one to five years.[105] Implants are inserted just under the skin of a woman's upper arm by a trained medical provider. They do not contain estrogen and women are protected within 24 hours of insertion. Once the implants are removed, women return to their normal fertility. [106] Indications for use are women who want a long-term contraception method without becoming sterile and/or have difficulty remembering to take other methods of contraception on regular basis.[107]	Contraceptive implants are available in developing countries and are considered a safe and effective means of birth control with the appropriate counseling and provider training.[113] [114]	The WHO has put two-rod levonorgestrel-releasing implant on the EML.[115] **Uganda**: Through RAISE I, Marie Stopes Uganda provided implants through mobile outreach from health center IIs, along with tubal ligations and IUDs.[116]	While not a part of the RH Kits, implants have been introduced in humanitarian settings, particularly in protracted or stable settings. **Research in development contexts** Although use of implants relative to other methods remains low worldwide, demand often exceeds supply. Significant increases in procurement have been reported worldwide over the past 4 years - data gathered by the RH Interchange show that by 2010, donations to sub-Saharan Africa had risen 19-fold from 2005 levels to more than

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	There are two types of contraceptive implants; multi and single rod.[108] The implants most commonly known are multi rod implant; Norplant and Jadelle. Norplant has been on the markets since 1983 and has been approved for use in over 60 countries.[109] Jadelle was approved for commercial use by the FDA in 1996. It differs from Norplant in application because it is comprised of two rods instead of the Norplant's six capsules.[110] Norplant and Jadelle were both developed by the Population Council and are licensed to Bayer Schering Pharma Oy outside of the United States.[111] A single rod implant, Implanon, lasts up to three years and is marketed by the Schering Corporation.[112]			1.8 million.[117] [118]
Bag and Mask for neonatal resuscitation	Bag/mask ventilation for neonates is used to resuscitate newborns that have signs of apnea or a heart rate less than 100 bpm.[119] The first manual bag was developed in 1956 by a German company, Ambu A/S.[120] There are now multiple manufactures of manual ventilation bags.	The bag and mask for neonatal resuscitation is listed on the WHO essential emergency drugs and supplies for transport and home delivery list.[121]	The bag and mask are provided in the MISP Kit 11: Referral level kit for RH.[122]	Progress in the development of neonatal resuscitation technologies for low-resource settings and guidance materials makes implementation of the bag and mask in humanitarian settings feasible. Neonatal resuscitator (bag and mask) was added to MISP Kit 6 in 2010.[123] **DRC:** A study was carried out to assess the knowledge and expertise gained by physicians and midwives who participated in

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				a Neonatal Resuscitation Course and workshop on the use of on the use of Laryngeal Mask Airway (LMA). Results showed that LMA can be easily taught to health workers.[124] **Additional research in development contexts** Laerdal Medical developed a low-cost, high-quality suite of neonatal resuscitation technologies for low-resource settings, and collaborated with the American Academy of Pediatrics to develop a comprehensive set of training materials to teach evidence-based resuscitation skills in low-resource settings—the Helping Babies Breathe (HBB) program; the materials and equipment will be brought to low-resource settings through a global development alliance. HBB is now focusing on a suite of resuscitation equipment, NeoNatalie, including a penguin suction bulb, bag and mask and training mannequin.[125] A study of low-cost, reusable resuscitators were evaluated and results were published in a guide for program managers and other decision-makers.[126] In 2011, PATH conducted an evaluation of manual bulb selection devices.[127]

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Magnesium Sulfate for Eclampsia	Magnesium sulfate is a chemical compound used in drugs for the prevention and treatment of eclampsia and severe pre-eclampsia.[128] Multiple businesses supply and produce magnesium sulfate.	WHO has stated that magnesium sulfate is the drug of choice for prevention and treatment of eclampsia.[129]	Magnesium sulphate is provided in MISP Kit 6: Clinical delivery assistance.[130] It is listed in the 2009 WHO EML.[131]	Given its inclusion in Kit 6, the focus is on diffusion and use in humanitarian settings. **Research in development contexts** Job aid for administration of magnesium sulfate developed by JHPIEGO/USAID/ MCHIP.[132] PATH is developing a cell-phone based job aid for dilution and dosing of magnesium sulfate; the prototype has been designed and will be field-tested in the next few months.[133]
Male condoms, female condoms	Female Condoms were developed in the 1980s as a contraceptive barrier method. They are used to prevent pregnancy and protect against HIV/STIs.[134] Male condoms are a contraceptive barrier method that has been around for centuries to prevent pregnancy and to protect against disease.[135]	**Female Condoms**: A 1997 review of the female condom in Africa has indicated that it is more acceptable among women than men. The dislike of the condom by men creates problems in negotiating its use by women.[136] Currently, the female condom has been seen as a tool for women's empowerment and has been encouraged to be actively promoted as a socially acceptable contraceptive barrier method.[137] **Male condoms**: Condoms are well-known around the world as a method to prevent pregnancy and protect against disease. Problems that occur with condoms are inconsistent or incorrect use and negative perceptions based on religious or cultural views.[138]	Male and female condoms are provided in MISP Kit 1: Condoms.[139] Condoms are listed in the WHO's EML.[140]	Male and female condoms have both been used in humanitarian settings, though continued advocacy is still needed for diffusion and use. **Research in development contexts** Advocacy for the female condom is assessed to be problematic mainly at the international policy level.[141] Woman's Condom, designed to be more acceptable than the Female Condom for both partners and is now in production in China and under review by WHO/UNFPA Technical Review Committee.[142] Other female condom products are also under review, including the Cupid Condom and FC2.[143]
Reusable Kiwi	The OmniCup is based on the	The Vacca OmniCup has been reported to be a	The Bird vacuum extractor	VE device in MISP Kit 10 not

Name of Drug or Device	Purpose and use	Status in Development Settings (2009)	Status on Technology Introduction Continuum for Crisis Settings (2009)	Progress Specific to Crisis Settings (December 2011)
OmniCup and Vacca Reusable OmniCup for vacuum extraction	original Malmstrom-design which is a cup with a thin, flexible suction tube through which passes a traction wire that is attached to the centre of the dome of the cup. The wire creates suction on the top of a newborn's head, which allows a medical provider to help guide out the newborn. The Omni-cup differs from the original Malmstrom cup in that it does not use metal parts and includes T. Birds modifications that allows for all fetal position extractions.[144] [145] Indications for vacuum extraction: • Mother has cardiac or cerebrovascular disease • Inadequate maternal expulsive efforts • Maternal exhaustion • Prolonged second stage of labor[146] The Kiwi Omni-cup was developed by Clinical Innovations Inc.[147] The Vacca OmniCup has one manufacturer and limited suppliers.	safe and effective means for vacuum extractions during childbirth.[148] However, more research is needed on the Omni-cups performance in developing countries.	is provided in MISP Kit 10: Vacuum extraction delivery.[149] IAWG is waiting on further field data before transitioning to the Vacca or Kiwi OmniCup.	replaced.[150] Data are needed on field durability to strengthen operational research.[151] **Research in development contexts** A randomized controlled trial of two instruments for vacuum-assisted delivery (Vacca Re-Usable OmniCup and the Bird anterior and posterior cups) found failure rates, maternal trauma, and fetal scalp trauma not statistically different.[152] The Odon device is another innovation in assisted vaginal delivery, currently finishing Phase I testing in Argentina and beginning Phase II testing in South Africa and Argentina.[153] WHO approved testing in 2009.
Manual Vacuum Aspiration (MVA) equipment for post-abortion care and safe abortion care	The first published paper documenting the use of MVA was in 1958 by Dr. Wu and Dr. Wu of China. In 1967, Dorothea Kerslake introduced MVA to the UK. The 1970s saw the MVA refined in the U.S. by a	**Review**: A 2009 review of the use of MVA in developing countries by mid-level providers (midwives, nurse practitioners, clinical officers, physician assistants) found that abortion and post-abortion care delivered by mid-level providers was equivalent in safety and satisfaction as to the same services	MVAs are provided in MISP Kit 8: Management of miscarriage and complications of abortion.[161]	MVA included in RH kits; focus on diffusion and use.

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	psychiatrist, Harvey Karnen. He developed a soft flexible tubing that could be used without needing to dilate the cervix.[154] The MVA equipment is made up of a plastic or metal cannula that is attached to a vacuum source (syringe) that evacuates the contents of the uterus. There are cannulae and aspirators that are re-usable, once cleaned and high-level disinfected or sterilized.[155] Indications: • Early pregnancy loss, • Elective termination of early pregnancy (up to 12 weeks), and • Completion of a failed abortion.[156]	provided by doctors.[157] **WHO**: The WHO lists MVA as the preferred surgical procedure for abortions up to 12 weeks.[158] The use of MVA by mid-level providers was stated to be a safe alternative to doctors in a 2008 WHO policy brief.[159] MVA use by mid-level providers was also documented as appropriate in the WHO 2003 technical and policy guidance manual for health systems.[160]		
Post-Exposure Prophylaxis for HIV prevention	Post-Exposure Prophylaxis (PEP) has been used since 1988[162] and consists of the short term use of antiretroviral drugs to prevent HIV infection to individuals who may have been exposed. [163] PEP is administered within 72 hours of exposure. Once PEP is administered, it should be taken for 28 consecutive days.[164]	WHO recommends that HIV PEP be used for the management of sexual assault.[165] Additionally, the WHO recommends that PEP be part of a comprehensive prevention package for occupational exposure risks and as a secondary prevention measures for patients and health care workers.[166]	PEP is provided in MISP Kit 3: Rape treatment.[167]	WHO recommendations for PEP are included in the 2010 update of IASC Guidelines for Addressing HIV in Humanitarian Settings.[168] Research gap includes CHW initiation of PEP, especially if community-based care for survivors of sexual assault is to be realized.
Calibrated blood drape	The blood drape is a plastic sheet with calibration lines marked on it to help in the estimation of a women's blood loss during childbirth and PPH. The drape was developed by Stacie Geller of the University	**U.S.:** A randomized simulation study that evaluated the effect of a calibrated blood drape on a medical provider's estimation of patient blood loss during a vaginal delivery found that the use of a calibrated blood drape significantly increased accurate estimates of blood loss.[170]	The use of the blood drape in humanitarian settings would increase visual cues of severe blood loss for women during childbirth. Blood drapes in a MISP kit may need to include	Further operations research is necessary to demonstrate safety and appropriate use of the blood drape in humanitarian contexts. Pathfinder International's model for addressing PPH identifies several different technologies for

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	of Illinois at Chicago in 2001.[169]	**India**: A 2006 study reported providers who did not use the drape were more likely to underestimate the amount of blood loss. [171] Currently, the blood drape is used in eight countries.[172]	guidance material on its use and purpose because it is not widely known.	estimating blood loss: in Bangladesh, a Blood Mat is used; in India, the Kelly Pad; in Tanzania, the Kanga; in Nigeria, the Blood Drape. [173] A training guide with instructions on use of the Blood Drape was also published.[174]

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