

Supplementary File 6 - Outcomes of Digital Health Interventions

Reference	Study Title	Study outcomes pertaining to digital health intervention use	Framework/model used
Maternal and fetal health outcomes (4 studies)			
Nathan et al. (2018) [28]	Early warning system hypertension thresholds to predict adverse outcomes in pre-eclampsia: A prospective cohort study	Of 1547 women with pre-eclampsia, 33.0% of women triggered a red light on admission and 78.6% at their highest BP. Severe hypertension and adverse outcomes were common across yellow and red categories. Comparing admission red to yellow lights, there was a significant increase in kidney injury (OR 1.74, CI 1.31–2.33, trend test $p=.003$), magnesium sulfate use (OR 3.40, CI 2.24–5.18, $p < .001$) and CCU admission (OR 1.50, CI 1.18–1.91, $p < .001$), but not for maternal death, eclampsia, extended perinatal death or preterm delivery.	No framework described
Bellad et al. (2020) [17]	Community level interventions for pre-eclampsia (CLIP) in India: A cluster randomised controlled trial	The primary outcome did not differ between intervention and control arms (adjusted odds ratio (aOR) 0.92 [95% confidence interval 0.74, 1.15]; $p = 0.47$; intraclass correlation coefficient 0.013). There was no intervention-related safety concerns following administration of either methyldopa or MgSO ₄ , and 401 facility referrals. Compared with intervention arm women without CLIP contacts, those with ≥ 8 contacts suffered fewer stillbirths (aOR 0.19 [0.10, 0.35]; $p < 0.001$), at the probable expense of survivable neonatal morbidity (aOR 1.39 [0.97, 1.99]; $p = 0.072$).	No framework described
Qureshi et al. (2020) [30]	Community-level interventions for pre-eclampsia (CLIP) in Pakistan: A cluster randomised controlled trial.	The primary outcome did not differ between intervention (26.6%) and control (21.9%) clusters (adjusted odds ratio, aOR, 1.20 [95% confidence interval 0.84- 1.72]; $p = 0.31$). There was reduction in stillbirths (0.89 [0.81-0.99]; $p = 0.03$), but no impact on maternal death (1.08 [0.69, 1.71]; $p = 0.74$) or morbidity (1.12 [0.57, 2.16]; $p = 0.77$); early (0.95 [0.82-1.09]; $p = 0.46$) or late neonatal deaths (1.23 [0.97-1.55]; $p = 0.09$); or neonatal morbidity (1.22 [0.77, 1.96]; $p = 0.40$). Improvements in outcome rates were observed with 4–7 ($p = 0.015$) and ≥ 8 ($p < 0.001$) (vs. 0) CLIP contacts.	No framework described
Bellad et al. (2017) [18]	Maternal and newborn health in Karnataka state, India: the community level interventions for pre-eclampsia (CLIP) Trial's baseline study results	A majority of the women reported institutional deliveries (96.0%), largely attended by skilled birth attendants. The maternal mortality ratio of 103 (per 100,000 livebirths) was observed during this study, neonatal mortality ratio was 25 per 1,000 livebirths, and perinatal mortality ratio was 50 per 1,000 livebirths. Despite a high number of institutional deliveries, rates of stillbirth were 2.86%.	No framework described
Usability and acceptability (5 studies)			

Musyoka et al. (2019) [25]	A 24-hour ambulatory blood pressure monitoring system for preeclampsia management in antenatal care. Informatics in Medicine Unlocked.	Content richness has a slightly positive linear effect on Perceived Ease of Use, while there is a slightly negative relationship between Content Richness and Perceived usefulness. Overall, the 24-hour ambulatory blood pressure monitoring system has shown great potential for actual adoption in healthcare systems in developing countries, given its simplicity and affordability.	Technology Acceptance Model
Lim et al. (2015) [24]	Usability and Feasibility of PIERS on the Move: An mHealth App for Pre-Eclampsia Triage.	Overall, users felt the app was usable using the Computer Systems Usability Questionnaire; median (range) values for Study 1 = 2 (1-6) and Study 2 = 1 (1-7). Usability problems were often related to mobile phone features (eg, scroll wheels, touch screen use).	LambdaNative framework for app development
Nathan et al. (2018) [26]	The CRADLE vital signs alert: qualitative evaluation of a novel device designed for use in pregnancy by healthcare workers in low-resource settings.	Most HCWs perceived the CRADLE device to be easy to use and accurate. The traffic lights early warning system was unanimously reported positively, giving HCWs, Pregnant women and families understanding of vital signs and confidence with decision-making. Some described manual inflation as tiring, particularly when measuring vital signs in obese and hypertensive women (n=4) and a few South African HCWs distrusted the device's accuracy (n =7).	Diffusion of innovation model Three delay model
Thakor et al. (2010) [32]	Hypertension Detector for Developing Countries.	The study developed a prototype of a low-cost device engineered specifically for semi-literate volunteers in developing countries. Preliminary testing has shown reliable hypertension detection and plans have been made for field testing in rural communities this August 2010 in Nepal.	No framework described
Dunsmuir et al (2014) [19]	Development of mHealth applications for pre-eclampsia triage. IEEE J Biomed Health Inform.	The paper outlines the POTM application development process. The paper concludes that the successful development of an mHealth tool, must consider the user and the setting in which it is deployed. CLIP POTM began with a single specification document, but study discovered differing requests from the different countries with their cultural differences, leading to modified application versions for each country.	LambdaNative Framework for developing application
Intervention Feasibility and Fidelity (7 studies)			
Vousden et al (2018) [34]	Evaluation of a novel vital sign device to reduce maternal mortality and morbidity in low-resource settings: a mixed method feasibility study for the CRADLE-3 trial	Intervention was implemented with high fidelity (85% of HCP trained, n=204). Results indicated a good understanding of device use with 75% of participants scoring >75% (n=97; 90% of those distributed). Interviews with HCPs reported that the intervention improved capacity to make clinical decisions, escalate care and make appropriate referrals.	Medical Research Council framework and logic model
Khowaja et al (2016) [23]	The feasibility of community level interventions for pre-eclampsia in South Asia and	The study highlight enabling factors including need for community mobilization, awareness raising programs, institutional support, community safety nets for	Normalization process theory

	Sub-Saharan Africa: a mixed-methods design.	emergency funds, and system integration. Whereas, impeding factors included delays in care seeking, knowledge gaps, lack of trained human resource, cultural myths and misconceptions, high cost of care, and poor health service quality.	
Abejirinde et al (2018) [16]	Pregnant women's experiences with an integrated diagnostic and decision support device for antenatal care in Ghana.	Pregnant women generally valued the availability of diagnostic services at the point-of-care. The intervention made women feel listened to and cared for. Process outcomes of the B4M encounter also showed that it was perceived as improving the skills and knowledge of the health worker, which facilitated trust in diagnostic recommendations and was therefore believed to motivate referral compliance.	No framework described
Sharma et al (2017) [31]	A process evaluation plan for assessing a complex community-based maternal health intervention in Ogun State, Nigeria.	This paper offers robust measures of the process indicators, external validity of conclusions about effectiveness can best be complemented by efficacy studies using a RCT. The methodology allows to examine the internal validity of the efficacy of the intervention by assessing the implementation (quantity and quality) of what is delivered.	Logic model, Diffusions of innovations and realist evaluation theories
Nathan et al (2015) [27]	An accurate semiautomated oscillometric blood pressure device for use in pregnancy (including pre-eclampsia) in a low-income and middle-income country population: the Microlife 3AS1-2	The Microlife 3AS1-2 device achieved an overall B/A grade in pregnancy (including pre-eclampsia), passing the British Hypertension Society protocol requirements and achieving the International Organization for Standardization standard with a mean difference and SD of -3.8 ± 7.3 and -1.5 ± 6.2 mmHg for systolic and diastolic pressures, respectively. The device can be recommended for use in pregnancy, including preeclampsia. Also, it fulfils the requirements of WHO for an automated blood pressure device suitable for use in a low-resource setting.	No framework described
Payne et al (2014) [29]	A risk prediction model for the assessment and triage of women with hypertensive disorders of pregnancy in low-resourced settings: the miniPIERS (Pre-eclampsia Integrated Estimate of RiSk) multi-country prospective cohort study.	The miniPIERS model was well-calibrated and had an area under the receiver operating characteristic curve (AUC ROC) of 0.768 (95% CI 0.735–0.801) with an average optimism of 0.037. External validation AUC ROC was 0.713 (95% CI 0.658–0.768). A predicted probability $\geq 25\%$ to define a positive test classified woman with 85.5% accuracy. The miniPIERS model shows reasonable ability to identify women at increased risk of adverse maternal outcomes associated with the hypertensive disorders of pregnancy	Three delay model
Jonas et al. (2016) [21]	Smartphone-based diagnostic for preeclampsia: an mHealth solution for administering the Congo Red Dot (CRD) test in settings with limited resources.	The results suggests that combining smartphone-based image analysis with molecular-specific disease features represents a cost-effective application of mHealth that has the potential to fill gaps in access to health care solutions that are critical to reducing adverse events related to PE in resource-poor settings	No framework described

