

SUPPORTING EFFECTIVE MANAGEMENT OF PREECLAMPSIA/ECLAMPSIA

Mobile Application for Dosing and Dilution of Magnesium Sulfate

HEALTH NEED

Severe preeclampsia and eclampsia (PE/E) are among the leading causes of maternal death and disability worldwide. The World Health Organization (WHO) estimates that 14% of maternal deaths in developing countries result from hypertensive disorders in pregnancy, of which PE/E are the primary contributors. PE/E rank second only to obstetric hemorrhage as specific, direct causes of maternal death.¹ The risk of dying from PE/E varies greatly depending on where a woman lives; the risk that a woman in a low-resource country will die of PE/E is approximately 300 times greater than that for a woman in a high-resource country. WHO estimates that eclampsia develops in 2.3% of preeclamptic women in low-income countries compared with 0.8% of preeclampsia cases in high-income countries.²

While outcomes of PE/E can be dire, fortunately incidents of PE/E can be relatively rare in smaller health care facilities. This creates the challenge of maintaining treatment skills that may be used infrequently.

Magnesium sulfate ($MgSO_4$) remains underutilized or unavailable due in part to difficulties with administration, a general lack of experience with the therapy, and the complexity of the regimen. $MgSO_4$ requires intravenous (IV) and intramuscular (IM) administration, different dilutions for IV and IM doses, and different doses for IV, IM, loading, and maintenance regimens.

DEVELOPMENT OF A MOBILE APPLICATION

PATH, in collaboration with the University of Washington, has developed a mobile application for $MgSO_4$ administration which includes a dosing calculator and detailed checklist based on WHO protocol.

The job aid was designed specifically to address the challenges with correctly calculating $MgSO_4$ dosage given the multiple concentrations that may be available in health facilities as well as the different dosing requirements for loading and maintenance regimens. Using a smart phone or tablet, health care providers can enter into the application the dosing stage and route (e.g., loading IV or maintenance

IM) and the concentration of the $MgSO_4$ being used, and then the amount of $MgSO_4$ that should be administered is calculated. The application also provides the proper steps for dilution, and if needed, reminds providers to check vital signs and includes safe parameters for continued administration.



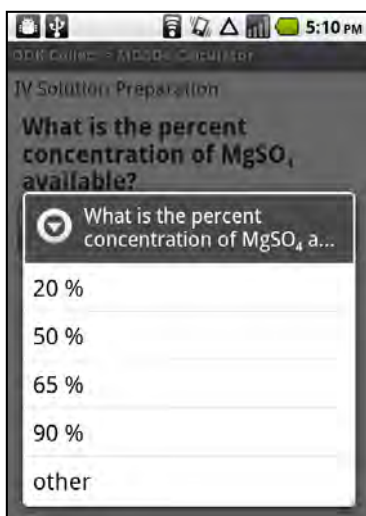
Health workers in Kenya using the mobile job aid as part of the design-stage user evaluation. Photo credit: PATH.

RESULTS FROM USER EVALUATION IN KENYA

In December 2013, PATH conducted a small-scale, design-stage user evaluation in Kenya in collaboration with the AIDS, Population, and Health Integrated Assistance plus (APHIAplus) Western Kenya Project funded by the United States Agency for International Development. The objective was to validate the content and feasibility of the approach of the mobile job aid among selected primary health care workers in Western Kenya.

Qualitative data were collected on the following design-stage evaluation criteria: content accuracy, usability, and context of use. Two data collection methods were used—focus group discussions and in-depth interviews—with 18 participants from four health facilities. The four sites were purposively selected from ten counties in Western Kenya to ensure a range of experience in treating PE/E. The participants included nurses, doctors, midwives, and clinical officers.

The mobile application was validated by health care providers in Kenya. A total of 15 of the 18 participants felt the content of the job aid was very accurate and 3 of the 18 felt it was somewhat accurate. Some participants noted that in Kenya the loading dose for the IV is given over 15 minutes and not over 5 minutes per the WHO protocol. There may be interest from countries to adapt the job aid to country-specific guidelines.



Sample screen shot from MgSO₄ job aid.

Health workers felt the mobile job aid was easy to use and a valuable tool, and overall were enthusiastic about the use of mobile devices. Both high-volume and low-volume caseloads were represented by participating facilities. In both cases, participants felt that the mobile job aid was appropriate.

Interview participants listed the three current challenges of administering MgSO₄ as: 1) staffing shortages, 2) lack of supplies, and 3) training. Staff shortages was noted as a key challenge by 6 of the 18 participants as these shortages can result in limited availability to adequately check vital signs and monitor treatment. The lack of supplies—such as patellar hammers to check patellar reflexes and infusion pumps to simplify treatment—was also mentioned. Training was a potential issue, particularly in facilities that are training sites for nurses, midwives, and doctors due to the time and effort required for overextended staff to teach students. Participants anticipated use of the job aid would result in more consistent treatment practices. They also indicated it would be a valuable tool for students and medical interns during mentoring sessions and would enable self-guided learning.³

During focus group discussions in Kenya, participants expressed a need for similar tools to support fluid balancing for severe PE/E, treatment of postpartum hemorrhage, treatment of clotting disorders, management of normal scenarios (e.g., active management of the third stage of

labor), management of essential newborn care, administration of IVs and phenobarbital for babies, maintenance of the warm chain, cord care, cervical cancer screening, administering antiretroviral drugs for mothers and babies, and use of the partograph.

AVAILABILITY

The Mobile Application for Dosing and Dilution of Magnesium Sulfate was developed using the Open Data Kit (ODK) platform <http://opendatakit.org/use/collect/>. Based on input from users in Kenya, PATH is finalizing the job aid content. In 2014, we will launch the mobile application in the Google Play store as a free download in the public domain.

NEXT STEPS

PATH is seeking funding to plan for introduction of this mobile application for dosing and dilution of magnesium sulfate.

Furthermore, with additional funding PATH would like to develop an expanded set of mobile application tools to include more job aids to support health care providers to more effectively manage women with PE/E.

CONTACT

For more information about the Mobile Application for Dosing and Dilution of Magnesium Sulfate and the development of an expanded set of mobile job aids, contact Adriane Berman at PATH (aberman@path.org).

REFERENCES

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- 3 PATH. *Final Report: Design-stage user evaluation of a job aid for magnesium sulfate dosing and dilution (mobile application)*. January 2014. [unpublished]



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