Cost-Effectiveness of Mentorship and Quality Improvement to Strengthen the Quality of Prenatal Care and Child Health in Rural Rwanda

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Partners In Health
OUTLINE

• Background
• MESH intervention
• Evaluation design
• Lessons learned
• Conclusion
BACKGROUND

- 5.6 million children under age five died in 2016, 15,000 every day (WHO 2016)

- Of 1000 live births, 73.1 die before completing 5 years of age (low-income countries)

- High maternal and child mortality rate is often associated with inadequate or late detection of pregnancy danger signs
A UNIVERSAL TRUTH:
NO HEALTH WITHOUT A WORKFORCE

SKILLED HEALTH WORKFORCE

12.9 million more skilled health professionals (midwives, nurses and physicians) are needed by 2035

(WHO, 2013)
3RD OF 5 RESOLUTIONS

“Maximizing the role of mid-level and community health workers to make frontline health services more accessible and acceptable”.

Decentralization

Task-shifting

Task-sharing
## TRADITIONAL VS FOCUSED ANTENATAL CARE

<table>
<thead>
<tr>
<th>Approach</th>
<th>Traditional: only pregnancy issues are addressed by health providers</th>
<th>Integrated with other services e.g. PMTCT of HIV, counselling on danger symptoms, malaria prevention, nutrition, vaccination, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assumption</td>
<td>More frequent visits for all and categorizing into high/low risk helps to detect problems.</td>
<td>Targeted and individualized visits help to detect problems</td>
</tr>
<tr>
<td>Use of risk indicators</td>
<td>Relies on routine risk indicators.</td>
<td>Assumes that risks to the mother and fetus will be identified in due course</td>
</tr>
<tr>
<td>Prepares the family</td>
<td>To be solely dependent on health service providers</td>
<td>Shared responsibility for complication readiness and birth preparedness</td>
</tr>
<tr>
<td>Cost and time</td>
<td>Incurs much cost and time to the pregnant women</td>
<td>Less costly and more time efficient. Since majority of pregnancies progress smoothly, very few need frequent visits and referral</td>
</tr>
<tr>
<td>Implication</td>
<td>No attention to those not labelled ‘at risk’, and makes the family unaware and reluctant when complications occur</td>
<td>Alerts health service providers and family in all pregnancies for potential complications which may occur at any time</td>
</tr>
</tbody>
</table>
BUT POOR TRAINING AND SUPERVISION SYSTEM...

Didactic classroom-based training in Focused Antenatal Care (FANC)

Limited and poor post-training follow up

Clinical supervisors perceived as police NOT as change agents
10 COUNTRIES | ABOUT 18,000 STAFF

WHERE WE WORK

Navajo Nation
- 56 facilities supported
- 800 community health workers
- 256,000 catchment area
- Measles vaccination campaign

Mexico
- 16 facilities supported
- 79 community health workers
- 25,000 catchment area
- Launches maternal health program

Peru
- 15 facilities supported
- 406 community health workers
- 339,955 catchment area
- Celebrates 50th anniversary

Sierra Leone
- 2 facilities supported
- 104 community health workers
- 1,065,229 catchment area
- 2.6m children screened for eye problems

Haiti
- 11 facilities supported
- 3,050 community health workers
- 2,704,480 catchment area
- Helps vaccinate 2.7m people against cholera

Liberia
- 15 facilities supported
- 1,006 community health workers
- 248,183 catchment area
- Delivers triplets in December

Lesotho
- 8 facilities supported
- 2,917 community health workers
- 1,015,948 catchment area
- Runs solo MDR-TB hosp in country

Rwanda
- 43 facilities supported
- 4,865 community health workers
- 939,903 catchment area
- Begins building global health university

Malawi
- 14 facilities supported
- 989 community health workers
- 154,122 catchment area
- Opens new clinic in Chichewa

Partners In Health
CASE OF RWANDA

*2013 and **2012 World Bank figures and World Development indicators

**2013 and **2012 World Bank figures and World Development indicators
MENTORSHIP ENHANCED SUPERVISION FOR HEALTHCARE AND QUALITY IMPROVEMENT (MESH-QI) MODEL

- Formal IMCI & FANC training
- Additional Ministry of Health Supervisors
- Ongoing, on-site clinical mentoring at health centers
- Quality improvement facilitation to address systems gaps that affect ANC & IMCI implementation

MESH-QI Intervention Components

Strengthened IMCI & ANC practices

Improved quality of care: Diagnosis and Treatment
MENTORSHIP AND QUALITY IMPROVEMENT COACHING: PHASED IMPLEMENTATION
MESH-QI MENTORS IN ACTION

MESH-QI mentor teaching PMTCT nurse on the use of pregnancy wheel to calculate gestational age

MCH mentor conducting a neonatal resuscitation teaching session at health center
QUALITY IMPROVEMENT TEACHING & COACHING SESSION
STUDY AIM

- To measure the effect of the addition of MESH-QI to standard training on IMCI and ANC quality of care.

- To estimate the cost-effectiveness of MESH-QI compared to standard district supervision practices in Rwanda by comparing the costs and quality of ANC and IMCI resulting from each approach.
PRIMARY OUTCOME: INTEGRATED CHILD ASSESSMENT SCORE

• For all children:
  – check for ability to drink or breastfeed
  – check whether the child vomits everything
  – check whether the child has had convulsion
  – check for cough or difficulty breathing
  – check for diarrhea
  – check for fever
  – child weighed the same day of visit
  – weight checked against recommended growth chart
  – checked for palmar pallor
  – checked for visible severe wasting*
  – checked for edema of feet
  – vaccination status checked
  – temperature checked
  – checked for other problems

• If <2yo:
  – All of the same plus:
    – ask about breastfeeding
    – ask if the child takes any other foods or fluids
    – ask whether feeding has changed during the illness

PRIMARY OUTCOME: ANC DANGER SIGNS ASSESSMENT

Danger Signs Assessment

- Headache
- Blurry vision
- Facial swelling
- Convulsions
- Bleeding
- Loss of fluid
- Painful contractions
METHODS

- Cross-sectional pre-post study covering 21 health centers across two rural districts

- Interaction terms were used to assess potential modifiers of the MESH-QI’s effect by other covariates

- A multivariate mixed-effects logistic regression was performed to assess the impact of MESH-QI on study outcomes, controlling for other covariates.
COST EFFECTIVENESS ANALYSIS

- Costing analysis measured MESH-QI program expenses
- The Incremental Cost Effectiveness Ratios (ICER) were estimated
- **Equation 1:** \[
\text{ICER} = \frac{(C_b - C_f)}{(E_b - E_e)}
\]
  Where:
  - \(C_b\): Cost at the baseline (before MESH-QI);
  - \(C_f\): Cost at follow up period (12-15 months of MESH-QI implementation);
  - \(E_b\): Percentage of ANC assessments
  - \(E_e\): Percentage of ANC assessments during MESH-QI implementation
EFFECT OF MENTORSHIP ON IMCI

Mentoring and quality improvement strengthen integrated management of childhood illness implementation in rural Rwanda

Hema Magge,1–5 Manzi Anatole,4–6 Felix Rwabukwisi Cyamatare,4,5 Catherine Mezzacappa,1,4,5 Fulgence Nkikabahizi,7 Saleh Niyonzima,7 Peter C Drobac,1,3,4,5 Fidele Ngabo,7 Lisa R Hirschhorn1,3,5

ABSTRACT

Objective Integrated Management of Childhood Illness (IMCI) is the leading clinical protocol designed to decrease under-five mortality globally. However, impact is threatened by gaps in IMCI quality of care (QOC). In 2010, Partners In Health and the Rwanda Ministry of Health implemented a nurse mentorship intervention Mentoring and Enhanced Supervision at Health Centres (MESH) in two rural districts. This study measures change in QOC following the addition of MESH to didactic training.

However, many countries have encountered significant barriers to widespread implementation, including poor training of health workers, inadequate equipment and infrastructure, and financial constraints. Even in areas where IMCI has been implemented, optimal clinical outcomes were not observed.6–10 One of the main challenges in achieving and maintaining the benefits of IMCI is the quality of the IMCI-related services provided.

Table 2 Integrated Management of Childhood Illness (IMCI) quality of care and coverage

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Endpoint*</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of child visits observed</td>
<td>292</td>
<td>413</td>
<td></td>
</tr>
<tr>
<td>Number (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checked for three danger signs</td>
<td>136 (47.2)</td>
<td>410 (99.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Weighted</td>
<td>278 (95.9)</td>
<td>412/412 (100)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Temperature taken</td>
<td>248 (86.7)</td>
<td>410 (99.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Checked for presence of cough, diarrhea and fever</td>
<td>217 (75.6)</td>
<td>404 (99.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Vaccination status checked</td>
<td>140 (48.6)</td>
<td>395 (96.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Checked for anaemia</td>
<td>154 (53.1)</td>
<td>409 (99.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Weight checked against growth chart</td>
<td>151 (52.4)</td>
<td>188 (45.9)</td>
<td>0.09</td>
</tr>
<tr>
<td>Feeding practices assessed</td>
<td>5/100 (5.0)</td>
<td>255/408 (62.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Checked for other problems</td>
<td>239 (82.4)</td>
<td>403 (99.5)</td>
<td></td>
</tr>
<tr>
<td>Classification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child correctly classified</td>
<td>117 (56.0)</td>
<td>377 (91.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Child correctly classified for serious cough, fever and diarrhoea†</td>
<td>61/104 (58.7)</td>
<td>73/74 (98.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Treatment†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child correctly treated</td>
<td>47/60 (78.3)</td>
<td>108/110 (98.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pneumonia correctly treated</td>
<td>25/35 (71.4)</td>
<td>68/69 (98.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Malaria correctly treated</td>
<td>22/23 (95.7)</td>
<td>29/29 (100)</td>
<td>0.26</td>
</tr>
<tr>
<td>Counselling and communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregiver advised on fluids and feeding</td>
<td>19 (8.4)</td>
<td>388 (96.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Caregiver advised on when to return</td>
<td>82 (34.2)</td>
<td>388 (99.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Coverage</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Beyond coverage: improving the quality of antenatal care delivery through integrated mentorship and quality improvement at health centers in rural Rwanda

Abstract

Background: Inadequate antenatal care (ANC) can lead to missed diagnosis of danger signs or delayed referral to emergency obstetrical care, contributing to maternal mortality. In developing countries, ANC quality is often limited by skill and knowledge gaps of the health workforce. In 2011, the Mentorship, Enhanced Supervision for Healthcare and Quality Improvement (MESH-QI) program was implemented to strengthen providers’ ANC performance at 21 rural health centers in Rwanda. We evaluated the effect of MESH-QI on the completeness of danger sign assessments.

Methods: Completeness of danger sign assessments observation checklists. Checklists completed from Oc measurement and checklists completed between Fel MESH-QI implementation were used for follow-up. Effect of the MESH-QI intervention on the danger sign clustering of effect at the health center level.

Results: Complete assessment of all danger signs im Similar improvements were found for 20 of 23 other confounders, the improvement in danger sign assessment was different by intervention district and type of obs danger sign assessment score was 6.28 (95% CI: 5.59, ANC visits. In Kirehe District, the increase in danger sign visits and 3.30 (95% CI: 2.80, 3.81) for first ANC visits.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th></th>
<th>Follow-up</th>
<th></th>
<th></th>
<th></th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>79</td>
<td>24.0</td>
<td>278</td>
<td>95.2</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Blurry vision</td>
<td>77</td>
<td>23.3</td>
<td>278</td>
<td>95.2</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Facial swelling</td>
<td>184</td>
<td>56.0</td>
<td>290</td>
<td>99.3</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Convulsions</td>
<td>57</td>
<td>17.3</td>
<td>275</td>
<td>94.1</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Bleeding</td>
<td>134</td>
<td>41.0</td>
<td>285</td>
<td>98.0</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Loss of fluid</td>
<td>76</td>
<td>23.0</td>
<td>267</td>
<td>91.4</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Painful contractions</td>
<td>91</td>
<td>28.0</td>
<td>264</td>
<td>90.4</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Composite</td>
<td>7</td>
<td>2.1</td>
<td>246</td>
<td>84.2</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
## ANNUAL MESH-QI PROGRAM EXPENSES

<table>
<thead>
<tr>
<th>Category</th>
<th>ANC</th>
<th>IMCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary and benefits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial trainings (onboarding, refresher) and recurrent meetings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debrief and data sharing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment, materials and supplies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overhead</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total Expenses**

- **ANC**: $19,699
- **IMCI**: $27,955
**MESH-ANC: INCREMENTAL COST-EFFECTIVENESS RATIO (ICER)**

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Follow-up</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median cost per patient visit</td>
<td>$6.99</td>
<td>$7.90</td>
<td>$0.9</td>
</tr>
<tr>
<td>N (total ANC visits during the costing period)</td>
<td>11,760</td>
<td>11,760</td>
<td>0</td>
</tr>
<tr>
<td>Cost per ANC visit for cohort</td>
<td>$82,226.17</td>
<td>$92,953.51</td>
<td>$10,727</td>
</tr>
</tbody>
</table>

**Danger signs:**
- Complete ANC assessment (%)
  - Baseline: 2%
  - Follow-up: 84%
- Modeled-completely assessed
  - Baseline: 247
  - Follow-up: 9902
  - Difference: 9655

**Additional cost per additional patient correctly assessed (ICER)†**
- $1.1

**Vital signs:**
- Complete assessment (%)
  - Baseline: 1%
  - Follow-up: 55%
- Modeled-completely assessed
  - Baseline: 117.6
  - Follow-up: 6468
  - Difference: 6350.4

**Additional cost per additional patient correctly assessed (ICER)†**
- $1.7

† Incremental cost per percentage increase quality of care (defined as completeness of seven danger signs including headache, blurry vision, facial swelling, convulsions, bleeding, and loss of fluid and painful contractions during ANC visit, and vital signs assessed; completeness of at least four signs including temperature, blood pressure, pulse, and respirations), before MESH-QI and 12-15 post MESH-QI intervention.
### MESH-IMCI: INCREMENTAL COST-EFFECTIVENESS RATIO (ICER)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Mentorship (12 months)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median cost per visit</strong></td>
<td>$0.18</td>
<td>$1.24</td>
<td>$1.06</td>
</tr>
<tr>
<td><strong>Modeled N</strong></td>
<td>1000</td>
<td>1000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total cost per visit for cohort</strong></td>
<td>$176.63</td>
<td>$1,237.17</td>
<td>$1,060.54</td>
</tr>
</tbody>
</table>

**Classification**

| Correctly diagnosed (%)     | 56%      | 92%                    |            |
| Modeled correctly diagnosed | 560      | 920                    | 360        |
| **C/E ratio (Difference in cost/difference in modeled correctly diagnosed)** | [2.95](#) |

**Treatment**

| Correctly treated (%)       | 78%      | 98%                    |            |
| Modeled correctly treated   | 780      | 980                    | 200        |
| **C/E ratio (Difference in cost/difference in modeled correctly treated)** | [5.30](#) |
CONCLUSION

• MESH-QI improves the quality of care: Essential clinical assessments/diagnosis and treatment

• Onsite and ongoing nurse mentorship supplements didactic training

• MESH-QI constitutes an effective and affordable alternative training model in resource-limited settings
ACKNOWLEDGEMENTS: