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ORIGINAL ARTICLE

SUPPLY CHAIN MANAGEMENT FOR COMMUNITY-BASED NEWBORN CARE IN RURAL ETHIOPIA: CHALLENGES, STRATEGIES IMPLEMENTED AND RECOMMENDATIONS

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ABSTRACT

Introduction: *Successful implementation of Community Based Newborn Care, relies on uninterrupted availability gentamycin and amoxicillin at health posts requiring strong national supply chain System. Ethiopia is implementing a pull system through an integrated pharmaceutical and logistics system but mainly focusing on HIV, tuberculosis, and malaria commodities. Hence a semi-parallel push system was used by the ministry of health with United Nations Children's Fund support to avail newborn lifesaving commodities at health posts. Moreover, the ministry coordinated the incorporation of the lifesaving commodities in the national essential medicine list, their registration, procurement and distribution.*

Objective: *This article presents challenges, strategies in availing lifesaving commodities at health posts and recommendations.*

Methods: *We reviewed different documents and data related to newborn supply chain from March 2013 to December 2016: data from a cross-sectional survey between Quarter-4, 2015 and Quarter-1, 2016, and program monitoring from October 2015 to September 2016 were used. We describe the findings using key components of the supply chain system.*

Results: *Ethiopia took several measures to overcome supply-chain challenges; cross-sectional survey showed availability of gentamycin and amoxicillin, 72% and 82% of health posts on the day of visit respectively. during routine monitoring visits to 2,500 health posts, gentamycin and amoxicillin dispersible tablets were available in 99.8%and 77.5% on the day of visit respectively.,*

Conclusion*: the current supply chain is not strong to sustainably avail lifesaving commodities at health-posts; a semi-parallel procurement and distribution was implemented as a short-term strategy. Building a strong national supply chain system should be given due focus.*

Key words: *Ethiopia, supply chain, community based newborn care, procurement, distribution.*

INTRODUCTION

Ethiopia's ambitious Newborn and Child Health Services Strategy (NCHSS) aims to achieve reductions in neonatal mortality through an integrated program that includes Community Based Newborn Care (CBNC). CBNC relies on the uninterrupted availability of essential supplies at community health posts (HPs). As with other health system supplies, these should be provided through routine systems of the Pharmaceutical Funds and Supply Agency (PFSA).

PFSA is a separate agency under the FMOH that is mandated to forecast, procure, store and distribute all pharmaceuticals and other health related logistics. The FMOH coordinates partners' technical and financial inputs for commodities and manages day to day activities through its Pharmaceutical and Logistics Management Unit (PLMU).

Currently PFSA is developing a pull approach at all levels through integrated pharmaceutical and logistics systems (IPLS). These have been in use since 2009 but have focused on HIV, tuberculosis, and malaria commodities. PFSA uses IPLS to directly deliver all pharmaceuticals in an integrated manner to all public health facilities every two months, based on demand. Product related stock and use information flows up from health facilities to the center.

However**,** problems in record-keeping, forecast data quality, and timely requisition and consumption reporting within IPLS remain challenges. Strengthening PFSA systems is a priority in Ethiopia's Health Sector Transformation Plan, but in the interim the CBNC program has worked around it to ensure reliable supplies.

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The supply system for child health commodities including CBNC has been a push system through United Nations Children's Fund (UNICEF) and its implementing partners due to the limited capacity of PFSA and facilities (6).

MATERIALS AND METHODS

The authors reviewed different national documents related to CBNC supply chain for the period between October 2013 and December 2016. In addition, two sets of data source were used to study the stock status of the essential commodities for CBNC-gentamycin 10mg/ml and amoxicillin 125 and 250 mg dispersible tablets at health posts in Amhara, Oromia, Southern Nations Nationalities and Peoples Region (SNNPR) and Tigray regions where CBNC has been scaled up to all communities. This included 1) a cross-sectional survey which was conducted, between 4th quarter of 2015 and 1st quarter of 2016 in 367 health posts in 117 districts of Amhara, Oromia, SNNPR and Tigray regions selected through multi-stage, stratified cluster sampling technique; and (2) data from program monitoring visits in JSI Research and Training Institute Inc. The Last Ten Kilometers and UNICEF project areas.

CBNC essential commodities which included amoxicillin DT and gentamycin 10mg/ml. Data was available from 2,579 and 2,548 health posts for amoxicillin DT and gentamycin 10mg/ml respectively.

The health posts were covered in three round visits and were distributed in 112 districts in Amhara, Oromia, SNNPR and Tigray regions. Filed data was sent by supervisors to the national data base where it was organized, analyzed using an excel sheet by a dedicated monitoring and evaluation expert. We describe the results using the key components of the supply chain system.

RESULTS

Key steps followed in scale up and integration of CBNC commodities

Through the Federal Ministry of Health (FMOH) and its partners, several interventions have been carried out to strengthen national CBNC supply system. This included standardization of the required supplies and equipment (Table 1), revision of the national essential medicine list (EML) (7), registration, national forecast and quantification, pro-

Table 1: Training Kit Contents and Quantity Needed for a Health Post for One Year or an Estimated Population of 5,000

No	Item	Quantity per Health Post
1	Chart booklet for each HEW	2
2	Exercise booklet for each HEW	2
3	Sick young infant register for each HP	1
4	Amoxicillin dispersible tablets 125mg, pack of 100 tablets	2
5	Gentamycin 10mg/ml,2ml ampoule, pack of 50 ampoules	1
6	Syringe with needle (2cc), sterile box of 100	1
7	Clinical thermometer, digital (32-43°C)	2
8	Weighing scale, infant, spring type, 5kg x 25g with sling	1
9	TTC eye ointment5g tube of 50	1
10	Chlorohexidine g (4% w/w) gel	168
11	Timer, respiration for acute respiratory infection	2
12	Gloves, exam, latex, powder free, medium, box of 100	1
Additional Supplies and Equipment for Training Site		
13	Facilitator's guide	1 per facilitator
14	CBNC video in local languages	3 per training site
15	Neonatal complete simulator (mannequin, bag and mask, and suction)	4 per training site

National policy, strategy, and scale up of CBNC service: CBNC was launched in March 2013. To translate the policy into action, guidelines and standards that included an overall implementation guide, training guides, and job aids in local languages (Amharic, Oromifa, Tigrigna) were developed by the national technical working group (TWG). Production, and distribution of these guides was managed by UNICEF, and reached all implementation sites. By December 2016, the FMOH and implementing partners had scaled up CBNC service to 95% of HPs in Amhara, SNNPR, and Tigray regions.

Regulatory support and timeline: The Food, Medicine & Health Care Administration & Control Authority (FMHACA) lead the regulatory process for CBNC. This included support for standardizing and registering the commodities as well as updating the EML, to include amoxicillin dispersible tablets of 125mg and 250mg, gentamycin injections 10mg/ml, and chlorhexidine 4% gel for cord care in 2015 (7). Chlorhexidine gel was added to the list of over-the-counter (OTC) commodities in April 2016, along with zinc dispersible tablets and oral rehydration salts (10) (Table 2). The national TWG played a critical role by advocating program needs with FMHACA. Following the launch of CBNC and the revision of the EML, FMHACA supported off-shore procurement and importation of some commodities (gentamycin 10mg/ml, amoxicillin DT) by granting pre-import permits to UNICEF. They also made them fast-track commodities and conducted quality assurance activities.

Table 2: Timeline of Supply Chain Events for CBNC from 2013-2016

2013	2014	2015	2016
• Gentamycin 10mg/ml, amoxicillin DT, CHX gel 4% were introduced per protocol • National guidelines for medicines, supplies, equipment, job aids for HPs developed • Projections of annual quantity needed per health post developed	• Local manufacturing of chlorhexidine gel 4% 20g (Misrach) initiated • First batch of 150,000 tubes distributed to 4early CBNC zones in Tigray, Amhara, Oromia, and SNNP	• Amoxicillin DT 125mg, 250mg; gentamycin 10mg/ml; chlorhexidine gel 4%; zinc sulfate DT added to national EML	• Chlorhexidine gel 4%; zinc sulfate DT included in OTC drug list; • Amoxicillin DT registered locally

Coordination and management:
Overall coordination of CBNC supply forecasting, quantification, procurement, and distribution was provided by FMOH through the PLMU and PFSA. The national TWG, which included FMOH/PLMU, UNICEF, WHO, CHAI, Results for Development (R4D), Save the Children, JSI Research and Training Institute/L10K, Emory University, and the Integrated Family Health Program (IFHP), gave technical guidance through regular and ad hoc meetings.

Forecasting, quantification, and procurement:
To guide the standardization and procurement of life-saving commodities, the FMOH/PLMU and PFSA led national quantification and forecasting exercises for two-time periods. The first, forecast 2014 to 2015 and the second forecast 2016 to 2018 (8,9). Based on a decision by FMOH and its partners, procurement of CBNC commodities took place through UNICEF from2013 to 2016. UNICEF also supported the procurement with distribution through implementing partners or directly using its own mechanisms.

Distribution:
CBNC supply distribution used three mechanisms built on lessons from Integrated Community Case Management (iCCM) supply systems.

1. Training kits containing enough supplies for 12 months to woredas were distributed to implementing partners before each training session occurred. Then, the kits were provided by the partners to HEWs at the end of the trainings. This short-term approach helped HEWs start service delivery immediately after finishing training and returning to their HPs.
2. Later, replenishment supplies to cover 12 months were distributed to HPs either directly through implementing partners or by UNICEF to woreda health offices (WrHO). and health centers (HCs) made the final distribution to HPs. In this case, supplies were distributed based on monitoring reports of stock-outs.

These two approaches used a semi-parallel and push system that ensured continuous availability of the supplies during the period 2014 to 2016.

3. Distribution through the IPLS based on demand was initiated in December 2016 after planning, preparation of training guides, amended or new forms and job aids, and after HC pharmacy personnel and HEWs were trained.

Stock Monitoring and information: In the absence of well-established and strong LMIS and IPLS, the FMOH/PLMU and UNICEF integrated supply stock monitoring into implementing partners' quarterly supportive supervision checklists. Using the national quantification exercises and microplanning by the TWG, enough supplies were made available at national level to respond to replenishment requests (Tables 3 and 4). Overstock and understock problems in HPs were corrected through redistribution among HPs by district staff.

Table 3: Supplies Procured and Distributed, 2014-2016

Supply	Quantity
Gentamicin injection 10mg/ml, 2ml ampoule/BOX-50	70,245
Amoxicillin 125mg dispersible tablet/PAC-100	68,417
Amoxicillin 250mg dispersible tablet/PAC-(10x10)	345,822
Syringe, disposable,2ml, w/needle,21g/BOX-100	21,000
Tetracycline eye ointment 1%/TBE-5g	65,000
Scale, infant, springtype,5kg x 25g with sling	23,800
Thermometer, clinical,digital,32-43ºC	34,563
Timer for ARI	26,800
Gloves, exam, latex, powder free, medium/BOX-100	16,500
Training guides and job aids	220,685
Neonatal resuscitator (bag and mask and suction device)	7,800
Neonatal complete simulator (mannequin, bag and mask, and suction)	3,900

Table 4: Cost of Items in Training Kits

No	Item	Quantity per Health Post	Unit cost per item (USD)	Cost per Health Post (USD)	Total cost for 13,870 Health Posts (USD)
1	Chart booklet for each HEW	2	3.00	6.00	83,220.00
2	Exercise booklet for each HEW	2	1.01	2.01	27,901.09
3	Sick young infant register for each HP	1	5.68	5.68	78,718.65
4	Amoxicillin dispersible tablets 125mg, pack of 100 tablets	2	1.14	2.27	31,484.90
5	Gentamycin 10mg/ml, 2ml ampoule, pack of 50 ampoules	1	12.80	12.80	177,558.31
6	Syringe with needle (2cc), sterile box of 100	1	4.25	4.25	58,947.50
7	Clinical thermometer, digital (32-43°C)	2	3.96	7.92	109,916.98
8	Weighing scale, infant, spring type, 5kg x 25g with sling	1	5.50	5.50	76,285.00
9	TTC eye ointment 5g tube of 50	1	14.72	14.72	204,097.05
10	Chlorohexidine g (4% w/w) gel	168		-	-
11	Timer, respiration for acute respiratory infection	2	3.47	6.93	96,152.39
12	Gloves, exam, latex, powder free, medium, box of 100	1	4.25	4.25	58,947.50
Sub total			59.76	72.33	1,003,229.36
	15% freight for offshore air transport				122,008
	Total cost				1,125,237.81

Stock availability at health posts:
Gentamycin 10mg/ml was available in 99.8% of the 2548 health posts, while amoxicillin DT was available in 77.5% of the 2579 HPs visited by CBNC supervisors over a period of one year, from October 2015 to September 2016 (Table 5). In the cross-sectional survey conducted by the FMOH, CHAI, and PFSA, gentamycin was available in 72% while amoxicillin DT was available in 82% of the 376 HPs on the day of visit.

In this same survey, the stock-out rate of 125mg amoxicillin DT in the health posts in the previous 30 days was 2% (6). The survey and the supervision haven't captured the stock status of amoxicillin DT and gentamycin injection together as both should be available to treat the sick newborn which is the limitation of the data presented.

Table 5: Availability of Supplies, Equipment, and Job Aids in HPs on the Day of Visit as Observed During the 1st,2nd, and 3rd Quarterly Supervision Visits in the Period from October 2015 to September 2016

	Round1			**Round2**			**Round3**			**All Rounds**		
Medicines, Equipment, and Job Aids	HP Visited	Supply Available	%	HP Visited	Supply Available	%	HP Visited	Supply Available	%	HP Visited	Supply Available	%
Chart booklet	1,907	1,891	99	523	523	100	220	219	100	2,650	2,633	99
Sick young infant register	1,906	1,746	92	521	462	89	220	220	100	2,647	2,428	92
Family health guide	1,907	1,881	99	523	517	99	220	220	100	2,650	2,618	99
ARI timer	1,907	1,796	94	522	558	107	220	182	83	2,649	2,536	96
Newborn weighing scale with sling	1,884	1,732	92	520	455	88	220	219	100	2,624	2,406	92
Thermometer digital	1,903	1,780	94	521	519	100	220	212	96	2,644	2,511	95
Amoxicillin DT	1,906	1,418	74	523	436	83	150	144	96	2,579	1,998	77
Gentamycin injection	1,907	1,864	98	521	459	88	120	100	83	2,548	2,543	95
2cc syringe	1,903	1,190	63	523	378	72	201	114	57	2,627	1,682	64

Resource mobilization and financing: The FMOH and UNICEF mobilized external resources for procurement and distribution of commodities from different sources. These included the UN Commission for Lifesaving Commodities/RMNCH Trust Fund, the European Union, the ELMA Foundation, the Canadian Development Agency, the UK Department for International Development (DFID), USAID, the Bill and Melinda Gates Foundation, Margaret A. Cargill Philanthropy, and the Korean International Cooperation Agency (KOICA).

DISCUSSION

Ethiopia successfully introduced essential commodities to support the national scale up of CBNC. Key program elements for the success included a functional national TWG that addressed challenges, FMOH leadership that managed regulatory approvals, incorporation of essential commodities into the national Essential Medicines List (EML), mobilization of adequate resources and strong partnerships that supported procurement and distribution of essential CBNC commodities.

Given the larger functional evolution of the PFSA and the IPLS, a short-term strategy through UNICEF and its partners was used in order to enable the FMOH to launch and scale up CBNC more rapidly. Despite the limitation of pushing the same quantity of commodities to all HPs without consideration of variations in need, it kick-started the program and allowed the delivery of life saving interventions for several years. It also serves as a bridge to the time when the national IPLS becomes fully functional.

The development of logistics for a new initiative required time and active technical support. The logistics subgroup of the national TWG was instrumental in preparing standard treatment guidelines and ensuring translation into local languages. The initial procurement, packaging of CBNC commodities into kits, and distribution took 12 months but completing these preparations before implementation enabled the coordinated use of training venues as distribution points for HEWs.

Despite the success of making CBNC commodities available in country for the short term, critical challenges still need to be addressed. Data from the cross-sectional survey indicated that gentamicin 10mg/ml was available in only 72% of HPs on the day the visit. Similarly, the proportion of health posts with amoxicillin DT was 82%. This implies that about 28% of newborns with possible serious bacterial infection could not be treated or receive adequate pre-referral treatment before being referred to the next level facility.

The national forecasting and quantification exercises were challenged by a lack of consumption data for proper quantification and planning due to the lack of an IPLS and an LMIS that integrate child health commodities. The lack of consumption data could result in over or under quantification which means wastage of resources or stock outs of lifesaving commodities.

The funding for most of these commodities came from external development partners channeled through UNICEF and distribution took place through non-PFSA channels. This made stock tracking and refill decisions difficult. Moreover, funding from development partners may decline, requiring more from scarce domestic resources.

Conclusion and recommendations:

Transitioning the short-term supply approach to PFSA and IPLS:

The FMOH and PFSA directed that all MNCH commodities including those for CBNC be integrated into the IPLS system in 2017. A national plan was developed and a MNCH supply security working group was established to oversee integration. Procurement financing plans, revisions of supply chain formats, IPLS Standard Operating Procedures, and training of facility supply chain personnel have been initiated.

As of the end of 2017, amoxicillin DT and gentamycin started to be processed through the national system. Careful monitoring and learning from this process should provide the foundation for successful incorporation of all CBNC supplies. The effective transition to the national system is essential to sustained supplies at all levels.

Leadership and policy support:

Strong leadership and commitment by the FMOH and PFSA to ensuring sustained supplies has been critical to the successful launch of a new, national initiative. It will be especially important to CBNC national scale up and sustainability for leaders to prioritize the reliability of child health supplies more broadly. This may benefit from robust monitoring and reporting by the MNCH commodity security working group to assure accountability.

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REFERENCES

1. UN Inter-Agency Group for Child Mortality. Levels &trends in child mortality: 2013 report. New York: UNICEF; 2013.
2. UN Inter-Agency Group for Child Mortality. Levels &trends in child mortality:2015 report. New York: UNICEF; 2015
3. Federal Ministry of Health of Ethiopia. Community-based newborn care plan. Addis Ababa: FMOH; 2013.
4. Federal Ministry of Health of Ethiopia. National newborn and child survival strategy for 2016-2020. Addis Ababa: FMOH/MCH Directorate; 2015.
5. United Nations Population Fund. UN commission on life-saving commodities implementation plan. New York: United Nations; 2012.
6. Clinton Health Access Initiative. Accelerating policy change, translation and implementation for pneumonia and diarrhea commodities in Ethiopia: baseline survey report submitted to the Bill and Melinda Gates Foundation. Addis Ababa: Clinton Health Access Initiative; 2016.
7. Food, Medicine and Healthcare Administration and Control Authority of Ethiopia. National essential medicine list,5th edition. Addis Ababa: FMHACA; 2015.
8. Federal Ministry of Health. National quantification exercise report for iCCM and CBNC in Ethiopia: products requirements for 2016 to 2018. Addis Ababa: FMOH; 2013.
9. Federal Ministry of Health. National quantification exercise report for iCCM and CBNC in Ethiopia: products requirements for 2016 to 2018. Addis Ababa: FMOH; 2015.