



SIAPS Supply Chain Management Training: Report

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SIAPS Supply Chain Management Training: Report

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About SIAPS

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to assure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes. Toward this end, the SIAPS result areas include improving governance, building capacity for pharmaceutical management and services, addressing information needed for decision-making in the pharmaceutical sector, strengthening financing strategies and mechanisms to improve access to medicines, and increasing quality pharmaceutical services.

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Key Words

supply chain management, collaboration, forecasting, quantification, Kanban, Lean

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CONTENTS

| | |
|--|-----|
| Acronyms | iv |
| Acknowledgments..... | v |
| Executive Summary | vi |
| Background | vi |
| Purpose..... | vi |
| Methodology | vii |
| Outcomes | vii |
| Recommendations..... | vii |
| Introduction..... | 1 |
| Background | 1 |
| Purpose and Objectives..... | 1 |
| Methodology..... | 3 |
| Approach..... | 3 |
| Workshop Itinerary | 4 |
| Day 1 | 4 |
| Day 2..... | 7 |
| Day 3..... | 12 |
| Key Instructor Observations | 15 |
| Workshop Evaluation..... | 18 |
| Conclusion, Recommendations, and Proposed Next Steps | 19 |
| Recommendations..... | 19 |
| Annex A. Sessions | 20 |
| Annex B. Workshop Participants..... | 23 |

ACRONYMS

| | |
|------------|--|
| DMAIC | define, measure, analyze, improve and control |
| JIC | just-in-case |
| JIT | just-in-time |
| KPI | key performance indicators |
| LMIS | logistics management information system |
| MOH | Ministry of Health |
| MSH | Management Sciences for Health |
| PMI | United States President's Malaria Initiative Program |
| RH | reproductive health |
| SCM | Supply Chain Management |
| SIAPS | Systems for Improving Access to Pharmaceuticals and Services [Program] |
| SKU | stock keeping unit |
| SOP | standard operating procedure |
| SPS | Strengthening Pharmaceutical Systems [Program] |
| SRM | Supply relationship management |
| SSSSS (5S) | straighten up, sequencing, spic and span, standardized clean |
| TA | technical assistance |
| TCO | total cost of ownership |
| USAID | US Agency for International Development |
| WMS | warehouse management systems |

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- Alison Corbacio, Arthur Ostrega, and Stephanie Rotolo for assisting with logistics and admin support during preparations and implementation of the workshop
- Workshop participants, for actively participating to make this interactive workshop a success, and for providing useful feedback. The feedback was used to customize the training approach and materials as needed, as well as incorporated in this report
- SIAPS management and USAID for providing leadership, technical support, and funding for the training.

EXECUTIVE SUMMARY

Background

The goal of the Systems for Improving Access to Pharmaceuticals and Services (SIAPS) Program is to assure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes through improving governance, building capacity for pharmaceutical management and services, promoting evidence-based decision-making in supply chain operations, strengthening financing strategies and mechanisms to improve access to medicines, and increasing the quality of pharmaceutical services. SIAPS provides TA support to countries to develop and implement appropriate country or regional strategies and interventions to close gaps and bottlenecks in key supply chain functional areas.. Through this effort, SIAPS has contributed to improvements in supply chain operations and effectiveness, thus ensuring availability to patients of essential health technologies. In bid to improve supply chain staff capability in areas such as framing supply chain strategies, identifying technical approaches for addressing barriers in various supply chain functional areas, and conducting technical assistance (TA), SIAPS conducted a three-day supply chain management capacity development workshop for its technical staff. The workshop took place at Management Sciences for Health's Center for Pharmaceutical Management /CPM) in Arlington, VA, October 21–23, 2014. Participants were drawn from the SIAPS home office, as well as from two SIAPS' field offices. All participants play an important technical advisory role in delivering system-strengthening TA in different supply chain functional areas across all disease portfolios.

Purpose

The purpose of the workshop was to–

- Enhance the supply chain management knowledge and capability in five key supply chain functional areas–selection and quantification; procurement; warehousing/storage and distribution; resource management including logistics management information systems (LMIS); and professional and personal talent development
- Demonstrate the value in the application of appropriate commercial best practices in public health care supply chains. Foremost is utilization of supply chain terminology, understanding differences and similarities in the lexicon of private and public sectors.
- Foster the execution of knowledge and learning among SIAPS supply chain technical staff and private sector professionals.
- Identify effective, evidence-based approaches that may be customized and applied for resolving supply chain challenges in settings where SIAPS provides technical assistance.

Methodology

The training consisted of 12 sessions held over three days:

An experienced private sector supply chain practitioner facilitated learning and skills-building sessions of the workshop.

Workshop facilitation and learning techniques included group discussions, case studies, videos, break-out group work/exercises, simulations, and short presentations of group work, followed by plenary discussions.

Outcomes

There were 21 participants, including 12 pharmacists and 4 doctors. All participants were from the home office, except two from field offices. All participants play an important technical advisory role in delivering system-strengthening TA in different supply chain functional areas across all disease portfolios, or in the execution of SIAPS FY15 work plan supply chain activities in SIAPS-supported countries. The training strengthens participants' capability in key supply chain functional areas including by learning from colleagues and private sector professionals. It also equipped participants with skills to identify effective, evidence-based approaches that may be customized and applied for resolving supply chain challenges in settings where SIAPS provides technical assistance. Workshop outputs included—

- Utilized a professional development structure to provide participants with better tools to apply knowledge they have obtained from formal learning, such as universities, or through on the job training.
- Leveraged diverse skills of the participants—pharmacists, medical personal, experienced business staff, public health logisticians—to enhance knowledge of all participants, demonstrating the collaborative approach to learning, a key tool of the workshop
- Participants were challenged to improve their current capabilities through adult learning nurtured by the instructor.

Recommendations

- Conduct a work survey analysis of key SIAPS technical staff including those with direct, as well as those with indirect, supply chain responsibility to determine current capabilities
- Consider development of different course levels which will address staff capabilities. This workshop could be considered the beginning of the workshop series.
- Consider extending the length of the workshop to 4 to 5 days.

- Consider adding the tour of a medical warehouse, where applicable, if the workshop is held in a country setting.
- Consider developing videos of commercial pharmaceutical stakeholders' experiences that demonstrate supply chain lessons learned; these could be used for future workshops covering key SIAPS' SC functional areas
- Consider certification credentials in supply chain including APICS Certified Supply Chain Professional, to develop a top level group of credentialed supply chain professionals
- Explore conducting similar regional workshops with SIAPS field-based staff in Africa or Asia in future

INTRODUCTION

Background

The United States Agency for International Development (USAID)'s Systems for Improved Access to Pharmaceuticals and Services (SIAPS) program, implemented by Management Sciences for Health, and its predecessor programs have provided technical assistance (TA) support to strengthen public health pharmaceutical management systems in countries around the world for about a decade and a half.

A significant proportion of SIAPS TA support to countries is for strengthening health supply chains for HIV and AIDS, tuberculosis (TB), malaria, and maternal, newborn and child health (MNCH) programs. The TA support involves developing and implementing appropriate country or regional strategies and interventions to close gaps and bottlenecks in key supply chain functional areas—quantification, procurement, warehouse (storage) and distribution management, inventory management, logistics management information systems (LMIS), transportation, and waste management. Through this effort, SIAPS has contributed to improvements in supply chain operations, responsiveness, and effectiveness, thus ensuring availability to patients of essential health commodities.

SIAPS and its predecessors Strengthening Pharmaceutical Systems (SPS) and Rational Pharmaceutical Management Plus have provided technical assistance (TA) to countries aimed at strengthening supply chains for HIV, TB, malaria and maternal, newborn and child health programs, through its country- and headquarter-based technical resource staff. Through this effort, SIAPS has contributed to improvements in supply chain operations and effectiveness, thus ensuring availability to patients of essential health technologies.

Human resource capacity development is critical to SIAPS mission. SIAPS would like to enhance supply chain staff capability in areas such as framing supply chain strategies, developing, implementing and applying appropriate key performance indicators to monitor effectiveness of tailored TA approaches and interventions for addressing gaps in various supply chain functional areas.

To this end, SIAPS conducted a three-day supply chain management capacity development workshop for its technical staff involved in supply chain efforts.

Purpose and Objectives

The goal of the workshop was to enhance the participants' supply chain management knowledge within a public health infrastructure, recognizing the participants' differences in capabilities, knowledge, and experience, together with evolving changes in supply chain management best practices.

The workshop's purpose is to accelerate achieving program results by–

- Helping emerging countries build reliable public health pharmaceutical systems
- Helping guide the transformation of USAID-supported pharmaceutical supply chains into locally appropriate, adapted supply chains
- Developing local human resources into competent supply chain professionals and capable leaders in SIAPS-supported countries

Key workshop objectives included–

- Strengthen capability in five key supply chain functional areas –selection and quantification; procurement; warehousing/storage and distribution; resource management including logistics management information systems (LMIS); and professional and personal talent development
- Demonstrate the value in the application of appropriate commercial best practices in public health care supply chains.
- Use terminology to understand similarities and differences in the lexicon of private and public sectors.
- Foster knowledge exchange and learning among SIAPS supply chain technical staff and private sector professionals.

Identify effective, evidence-based approaches that may be customized and applied for resolving supply chain challenges in settings where SIAPS provides TA.

METHODOLOGY

Approach

Workshop facilitation and learning techniques included group discussions, case studies, videos, break-out group work and short presentations of group work, followed by plenary discussions; exercises, simulations. The facilitator conducted a survey of participants before the workshop. The survey results provided the instructor with an understanding of the participants' knowledge, experience, previous training, and their expectations for the workshop.

The workshop outputs included--

1. Utilized a professional development structure to provide participants with better tools to apply knowledge they have obtained from formal learning, such as universities, or through field experience (on the job training).
2. Leveraged diverse skills of the participants— pharmacists, medical personal, experienced business staff, SC logisticians—to enhance knowledge of all participants, demonstrating the collaborative approach to learning, a key tool of the workshop
3. Challenged participants to improve their current capabilities. Motivation for adult learners must be personally motivated, which the instructor can then build on. The instructor's goal was to gain “buy-in” of the workshop's objectives by participants. Buy-in cannot be imposed.

The training was conducted over three days as follows—

- Day 1—Customer focused supply chain management, supply chain elements, quantification; procurement, videos; case studies, workshop participants' experiences, success stories
- Day 2—Continue procurement, warehousing/storage and distribution, risk management, resource management, videos, case studies, supply chain performance, and measuring key performance indicators (KPIs)
- Day 3—Continue resource management; supply chain performance; measuring KPIs, supply chain professional/talent management, and final case study simulation

WORKSHOP ITINERARY

Prior to the workshop, the consultant first reviewed relevant SIAPS documents such as work plans, supply chain-related reports and intermediate result areas. The consultant then worked with Wonder Goredema (SIAPS technical lead for the activity) and Emmanuel Nfor (SIAPS supply chain cluster lead) to set appropriate training goals and session learning objectives and to develop training materials, including a facilitator's guide,¹ participants' guide,² and session activity worksheets and related materials. The materials were included in the training hand-outs package.

The workshop was held at the SIAPS Home Office in Arlington, VA, October 21-23, 2014. All participants were drawn from the home office, except two from field offices. There were 21 participants (annex B), including 12 pharmacists and 4 doctors. Only one participant had professional training in supply chain. However, all participants play an important technical advisory role in delivering system-strengthening TA in different supply chain functional areas across all disease portfolios, or in the execution of SIAPS FY15 work plan supply chain activities in SIAPS-supported countries.

Day 1

- SIAPS consultants are diverse with varied backgrounds and professions. As supply chain training and experiences of participants vary, the participant pre-workshop survey indicated a focus on establishing common foundations of understanding, engagement, and outcomes in supply chain management.
- The workshop focused on multiple aspects of inventory including push vs. pull inventory. When pushing inventory, we rely on extended forecasts. When pulling inventory, we decrease reliance on forecasts and seek to increase responsiveness of our extended supply chain. Push inventory is less reliant on collaboration. Pull inventory calls for supply chain collaboration.
- Supply chain professionals work in different cultures, regulatory environments, economies, and political systems.. Supply chain knowledge provides common standards that can be further customized to meet national requirements while minimizing national constraints.
- Constraints vary in appearance and impact. They are found in online technology, transportation infrastructure, pharmaceutical procurement, regulations, and more. We can utilize the Theory of Constraints (TOC) to smooth the flow of product from the design stage through distribution to the end user. The TOC is a management paradigm that is based on the

¹ Varkonyi, Irvin. 2014. *SIAPS Supply Chain Management Workshop-October 21–23, 2014: Facilitator's Guide*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

² Varkonyi, Irvin. 2014. *SIAPS Supply Chain Management Workshop-October 21–23, 2014: Participants' Guide*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

principle that at any given time, only a very small number of variables or constraints limits the ability of a manageable system to achieve more of its goals.³ The supply chain is only as strong as its weakest link, as fast as its slowest moving piece.

- Supply chain strategy can be developed by using the seven Vs
 - Visibility—The ability to track orders through the supply chain
 - Velocity—The ability to control the speed at which movement of goods is optimized
 - Variability—Improvement in visibility and velocity reduces the variability of goods movement, offering more certainty to the end user
 - Volatility—A cyclical aspect of supply chains that needs to be managed by stakeholders, influenced by non-controllable factors such as economic, environmental, political and malicious/disruptive actions
 - Variety—The various types stock keeping units (SKUs) of products offered by suppliers in response to the increasing complexity of medical diagnoses
 - Volume—Determine shipment/order size that can be accommodated by logistics systems or strain infrastructure.
 - Verdency—The sustainability of supply chain systems that minimizes negative impacts on our environment (including product recycling)
- Forecasting, a separate component of supply chains, is related to the acquisition process and quantification incorporates the two. Forecasting is intended to guide push inventories and guide the acquisition processes. A variety of forecasting tools is available, including utilization of historical demand in combination with past forecast errors.
- The bullwhip effect is a trend of larger and larger swings in inventory in response to changes in customer demand, as one looks from the final customer to firms further back in the supply chain for a given product.⁴ It is the consequence of poor communication, long lead times, and poor visibility of the movement of goods in the supply chain. It is common in forecast-driven supply chains. Minimizing the bullwhip effect can improve supply chain efficiency.
- KPIs must be set to measure achievement against standards to determine how well standards have been met. KPIs can be sourced from many standard setting organizations including the Supply Chain Council (Supply Chain Operations Reference [SCOR]) Model KPIs are selected by an organization and may be adjustable based on local factors. KPIs and local factors can measure presence of constraints.

During the first day, there was uncertainty among participants on the focus of the workshop based on the application of commercial supply chain knowledge in the nonprofit public sector. Is

³ Adapted from Varkonyi, Irvin. 2014. *SIAPS Supply Chain Management Workshop-October 21–23, 2014: Participants' Guide*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health

⁴ Adapted from Varkonyi, Irvin. 2014. *SIAPS Supply Chain Management Workshop-October 21–23, 2014: Participants' Guide*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health

there a realistic convergence of public and private sector supply chain processes? There was ample discussion on this question and it was also raised in the instructor evaluation survey.

Session 1

A generic definition of supply chain management shows the public health care supply chain functions within national medical health systems. As supply chains become integrated, bringing together previously separately functioning units, cost decisions must then be made on future actions based on the best overall value of a combination of factors rather than on the price of any single component.

- **Consistency of Terminology**—The lack of standards in supply chain terms among stakeholders and between the public and private sectors may cause confusion in implementation of supply chain goals. SIAPS can select a standard for its supply chain terms against currently recognized standard.
- **Mapping out Stakeholders**— SIAPS works with many stakeholders. There needs to be greater understanding of the relationships among these stakeholders, throughout the national medical infrastructure and public health systems in SIAPS’ areas of responsibility. By better understanding all stakeholders’ perspectives, and their official responsibilities, SIAPS can enhance collaboration among them.
- **Supply Chain Options**—Supply chain management incorporates a significant number of processes, integrating internal units of an organization with external units of suppliers and partners to help achieve optimum results. Supply chain management has evolved and there are now better integrated functions and processes. The tradeoff among processes, such as inventory vs. transportation, requires using cost benefit analyses and other tools which enable decision makers to make the most informed decision.

Session 2

This session covered quantification and understanding the role of demand management. There are multiple perspectives of demand management as offered by government, health professionals, manufacturers and clients. Quantification involves data collection, forecasting, and supply planning. The tool of customer-focused supply chain management was highlighted as a way to improve supply planning and decrease excessive reliance on forecasting.

- **Setting standards**—Common standards can help accommodate varied perspectives that exist within public health care systems. The inconsistency of global standards in public health care logistics makes this very challenging as does the uncertainty of data accuracy. Participants learned that SIAPS can take a role in selecting standards.
- **Focus on constraints**—Supply chain processes must deal with bottlenecks, a slowdown of one or more process caused by other processes. SIAPS staff can identify, measure, and propose solutions to reduce bottlenecks in the delivery of public health care at national, regional, and local levels.

- **Reduce Constraints**—The TOC is a significant tool to reduce and/or eliminate bottlenecks by focusing on the factors that cause them. Visual signals such as the Kanban tool, a visual process management solution tool, help manage the speed at which dependent processes can collectively improve. SIAPS can apply the Theory of Constraints to achieve evenness in health care delivery process.

Session 3

The focus on quantification continued in this session. Demand and supply variability are major obstacles to supply planning. A major weakness of forecasting was demonstrated by the bullwhip effect along with processes that can minimize the variability in supply planning resulting from insufficient communication, supply visibility, long lead times, and excessive forecasting.

- **Utilization of KPIs**—KPIs should be applied to measure achievement. Such measurement should be set against standards established for those processes.
- **Improve communication**—Poor communication among stakeholders will insert risk into achieving efficient quantification. SIAPS staff members can seek to incorporate collaborative practices and greater visibility in health care supply chains' ability to perform at consistently high levels.
- **Focus on Visibility**—Improving visibility, one of the seven Vs. helps supply chain performance. SIAPS can direct efforts to utilize better processes, technology, and communication to improve visibility.

Exercise—We saw how visibility, communication, and lead time bring about the potential bullwhip effect, the phenomenon in forecast-driven distribution channels that refers to a trend of larger and larger swings in inventory in response to changes in customer demand, as one looks at firms further back in the SC for a product. Measures to reduce the bullwhip effect:

- Promote increased collaboration among stakeholders (consider utilizing the Theory of Constraints)
- Develop more efficient communication

Day 2

- Supplier relationship management (SRM) is a critical collaborative aspect between suppliers and the organization that purchase from these suppliers. While SIAPS is not directly involved in this process, understanding SRM enables SIAPS to support its customers.
- Application of SRM faces challenges in the public sector due to regulatory constraints. While regulations seek to maintain fair competition, the lack of SRM within public health care can

lead to higher costs. SIAPS should focus on aspects of SRM to reduce bottlenecks among suppliers.

- Vendor managed inventory transfers the responsibility of inventory management to vendors, allowing the primary organization to focus on their core competence of the delivery of health care products to end users.
- Focus on taking waste and fat out of inventory using the inventory strategies Just in Time (JIT) and Just in Case (JIC). Consider initiating a survey of current product variety in SIAPS countries. Is there too much variety, too many SKUs? Can SIAPS oversee medical and supply chain staff to trade off variety for consistency of availability?
- Customs delays are recognized as a reality which we need to manage, recognizing government-imposed challenges.
- Root cause analysis is a best practice to investigate why standards are not being met. This tool can be used to re-assess standards as appropriate.
- Total cost of ownership (TCO) incorporates costs throughout the supply chain associated with procurement, manufacturing, transportation, and distribution. TCO is most valuable when there is data upon which to make decisions. The lack of hard, accurate data can undermine TCO.
- SIAPS can take advantage of new, inexpensive technology to better track inventory, including mobile apps on smartphones.
- SIAPS can advise better warehouse management through warehouse management systems (WMS) software based on explicit policies and standards instead of ad hoc procedures. There is recognition of the need for consistent internet access as WMS systems have migrated to the cloud. WMS improves warehouse operational efficiency by reducing wasted time and motion of warehouse workers.
- Changing warehouse and inventory policies requires openness to change and application of change management processes:
 - Open the current processes that require change
 - Change current processes to new processes
 - Freeze new processes
- There are multiple tools to manage inventory. Inventory turnover is a calculation of how often an item enters and exits from inventory. The high turnover of an item indicates the item is not sitting in inventory for a long time. The lower the turnover of an item, the longer it is sitting in inventory. The longer an item sits in inventory, the more susceptible it becomes to expiration, obsolescence, theft, or damage.

- Inventory counting should be based on item usage. The more frequent the usage and the higher cost, the more frequent the count. This is the best practice of cycle counting. The 80/20 rule is one tool to help determine cycle counts.
- Usage of items in real time (in SKUs) requires bar code scanning, or use of other technology such as radio frequency identification, in place of manual systems. Health care environments need to monitor item usage by providers and patients. Modern technology such as mobile applications (apps) on smartphones could be used to monitor product usage.
- End to end tracking of items is feasible where accurate data is collected and smart technology available. Tracking can protect supply chains from potential disruptions from workers involved in movement of items.
- Government procurement and regulations can create supply chain bottlenecks that may need to be managed. Sharing logistics data can help overcome barriers which create bottlenecks. SIAPS should seek supply network integration of partner organizations (or expand on existing networks). It helps to enlist the support of local champions who can initiate change.
- Keep in mind the seven deadly sins of waste and seek incremental improvement. Consider the follow steps in this process:
 - Remember MUDA (waste in its many forms)
 - Attack hoarders through Kaizen Blitzes (a workplace improvement project)
 - Recognize and diminish bureaucracy where possible
 - Overcome negative practices such as “It’s always been done this way.”
 - Avoid excessive holding of documents which cause bottlenecks
 - Manage cleanliness of warehouses (5S process)
 - Overcome rigid policies such as designating distribution centers in regional/districts which may increase waste of motion retrieving items in a faraway warehouse in the same district rather than a different region which has a much closer warehouse.

Participants requested definitions in the participant guide to be consolidated into one section. Participants felt that three days is not enough time to go into depth to support inventory theory with real on the ground challenges.

Session 4

Session four began by focusing on procurement as a process which goes beyond selecting products based only on low price. The relationships that exist between suppliers and the buying organization play a critical role in effective procurement. The total cost of ownership through the entire supply chain includes the cost of raw materials, lead times in manufacturing, efficient or responsive supply chains, and distribution trade-offs. Inventory policy needs to align with procurement policies and cannot be isolated from procurement processes.

- **Collaboration**—Relationships with stakeholders in the supply chain have become more collaborative than adversarial. Creating a seamless, synchronized supply chain among

stakeholders is a best practice and requires information sharing. SIAPS can promote tools for collaboration such as the theory of constraints, collaborative planning and forecasting, and vendor managed inventory.

- **Communication**—SIAPS can review and develop approaches and tools for effective communication with public health SC.

Session 5

Session five looked at understanding the total cost of ownership in procurement. Procurement is connected to the customer through SCM. Technology enables greater visibility within the supply chain which then enables procurement to better align itself to customer demand through pull inventory. This improves upon push inventory which is production driven, and while efficient, it lacks responsiveness to customer demand. Procurement processes can be improved by being more responsive to the customer.

- **Utilize inventory tools**—There are a variety of inventory tools to measure inventory trends, such as average inventory (inventory at beginning of a period and at the end of a period.) The reduction of average inventory indicates a trend toward lower inventory costs. SIAPS can offer inventory tools which enable decision makers to find the best trade off of priorities, i.e.. high levels of safety stock vs cost of expired products.
- **Total Cost of Ownership**—Responsive supply chains consider the TCO. Customers can be provided with products, at an affordable cost to the organization and an acceptable price to the customer when we understand all actual and opportunity costs. SIAPS can review and develop TCO criteria to improve decision making in a resource constrained environment.

Session 6

Session six covered warehousing, storage and distribution. These functions are challenged by insufficient infrastructure to support public health care supply chains, especially cold chain supply chains. Inventory tools can reduce waste which results from poor management as well as poor warehouse infrastructure and local distribution challenges. Warehousing capabilities can be improved by implementing tools such as ABC inventory management, cycle counting, and mobile technology.

- **Inventory counting**—There are a variety of tools to improve inventory counting. SIAPS can develop inventory policies that focus on saving time and motion to maintain desired inventory. SIAPS can offer training how to efficiently count inventory.
- **Standard operating procedures (SOPs)**—Inefficient warehousing can result from decentralized inventory policies within public health sector supply chains. SIAPS can develop and assess SOPs on a regular basis to determine the best combination of centralized policies with decentralized execution. Consider a survey of best practices in private sector health care delivery systems. Incorporate lean policies to reduce waste.

Lean is a philosophy of operations and a set of techniques oriented toward active elimination of all waste and toward continuous improvement of productivity⁵

Session 7

A look at warehousing, storage and distribution continued in session seven. Tools such as ABC inventory analysis help identify the most important inventory items but they need to be managed. This can save time and money by not managing all inventory items with the same priority. Mobile technology is available and continues to improve to provide tools to convert from manual inventory management to web-based inventory management. The costs to develop technology solutions will be paid for by improved productivity of the inventory workforce. We applied holistic solutions to utilizing warehouse space with the goal to reduce waste of motion, loss of inventory and accommodate resource constrained warehouses. Public sector health care supply chain performance can be improved despite variability in national transportation infrastructure.

- **Collaboration**—Collaboration involves processes that encourage win/win solutions among stakeholders. The value of inventory is not limited to arbitrary levels but is to insure customer satisfaction. SIAPS can encourage greater engagement among all stakeholders including information technology professionals, financial managers, procurement managers, distribution managers, and health professionals by considering options to align inventory with customer requirements.
- **Inventory policies**—Inventory policies differ between national medical systems and decentralized public health care supply chains. SIAPS can determine applicable inventory policies such as ABC analysis to improve efficiency of warehouses while accommodating individual organizational goals.
- **Sustainable tools**—There was a discussion about sustainable tools in inventory management, recognizing the risks to manage cold chains and delivery in difficult environments. SIAPS can conduct surveys of appropriate inventory tools to advise stakeholders the best use of such tools. (Note this can also play a role in managing public health care supply chains for the Ebola pandemic.)

Session 8

The first session on resource management focused on an organization's ability of to utilize its human and physical assets to achieve best possible overall outcomes. Collaboration, integration and performance tools are all processes to lay the foundation for resource management. SCM is interdisciplinary and requires understanding of change management. Resources are increased through information sharing, logistics synchronization, collective learning and incentive alignment. Improved supply chains require the use of human and physical assets within a network instead of operating separately. During session eight, there was a demonstration on reducing waste by incorporating lean processes to make better use of resources.

⁵ Varkonyi, Irvin. 2014. *SIAPS Supply Chain Management Workshop-October 21–23, 2014: Participants' Guide*. Submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health

- **Implement 5S simulation**—Waste in the workshop can be eliminated through Lean tools such as 5 Ss (straighten up, sequencing, spic and span, standardized cleanup and self-discipline). SIAPS can conduct 5 S simulations to engage stakeholders.
- **Implement 5 S business processes**—After demonstrating the value of 5 S, SIAPS can guide organizations to implement 5S business processes, to reduce waste. Among other tools available improve processes are customer relationship management, Lean (reduce waste), Kaizen (continuous improvement process), Kaizen blitz (workplace improvement project), and Kanban's (reduce wasted bottlenecks).
- **Recognition**—There is value in focusing human resources on overall resource management. SIAPS can guide processes which recognize individual and organizational success. This is a strong motivator for future success

Day 3

- Approach supply chain challenges with problem-solving tools such as Define, Measure, Analyze, Improve and Control (DMAIC) data-driven improvement cycle. The following is an example in public health care:
 - Define— here's a specified need for medicines and a system to deliver them
 - Measure—Develop a process to be measured by KPIs
 - Analyze— Determine available options and select an optimum solution
 - Improve—Anticipate issues that will come up
 - Control—Collect data to determine outcomes of the measures
 - The DMAIC process is very similar to the options analysis or situational analysis processes that SIAPS already conducts. However, that process itself has not been documented so that it can be easily replicated by other projects or teams. The currently used framework could be adapted and improved upon by reflecting upon the DMAIC approach.
- Survey existing solutions for creative solutions to manage customs barriers to decrease lead times at borders. Investigate pre-clearing commodities before they enter a country. Identify availability of mobile warehouses in country.
- Agility is a term used to measure the ability of a supply chain organization to respond to volatility of demand. There is a trade-off of different levels of agility with the cost of this capability.
- Knowledge in public health care supply chains is related to humanitarian logistics. Certification is available in these fields including the Chartered Institute of Transportation and Logistics and Georgia Tech. This subject matter is not sufficiently gained through Masters of Public Health programs.

- SCM techniques can improve SIAPS technical team’s performance by inserting transparency into the supply chain.
- Customer focused SCM offers potential for the SCM cluster to offer knowledge to the non-direct supply chain workforce, i.e., human resources, finance, operations.
- The International Association of Public Health Logisticians offers online discussions and an annual conference.
- The case study on Haiti noted creative solutions such as using churches to overcome poor infrastructure. Faith-based organizations are a worthwhile, albeit non-traditional alternative to distribution to community health centers.
- Long-term planning with countries should include SOPs on how to respond to emergency supply chain issues

Participant Observations

- Evidence-based solutions provide the best value for donor investments in supply chain system strengthening.
- Pushback from donors may still occur and present challenges—partial solutions sometimes end up being the best option (compromise)
- This workshop has provided the opportunity to standardize the SIAPS approach to supply chain management. The SCM team now has a standard way of explaining the terms used in SCM approaches. Tools (e.g., Six Sigma, DMAIC) have been provided to achieve this standardization when confronted with diverse contexts. An evidence-based approach will help the SIAPS SCM team to offer better options to clients/stakeholders for improving SCM in their country.
- Improvements in training SIAPS staff on software used in SCM will improve service delivery to the clients.
- Agreement on assumptions between stakeholders/clients and SIAPS technical staff is critical for moving forward with a technical activity, particularly when looking at a cost benefit analysis.
- Translating cost of an activity into “lives saved” is another critical step, but it is challenging.
- Another way to look at the investment in supply chain is by demonstrating the economic benefits of saving lives/providing health commodities to the country.
- The tools acquired during this workshop will help the SCM team better organize their activities and approaches before providing Technical Assistance in-country. Relationships

with clients will also be improved as a result—a collaborative relationship with clients to discuss options for addressing bottlenecks in SCM.

- Private sector principles and best practices can be applied to the non-profit sector. There is an increased focus on developing partnerships with the private sector. The private sector tends to be customer-focused – lessons for the non-profit sector can be found in being customer-focused.
- Accurate forecasting can only be done with accurate data.
- SCM cluster will conduct a workshop to put together a how-to guide on conducting an options analysis or situational analysis with the goal of best serving client needs (integration of tools: theory of constraints, TCO, cost benefit, customer relationship management, SRM, customer-focused SCM).
- SCM cluster will determine groups each having a focus on various supply chain issues. This can be conducted over social media to be fully inclusive.

Session 9

We continued with resource management and tools to enable maximizing the effectiveness of resources, such as the DMAIC tool. Supply chains have improved in disasters to meet the needs of people, government, businesses, and countries during and after disasters, and the lessons learned from this can be utilized within the public health care supply chain. Resources are enhanced by better aligning with customer-focused SCM, allowing customers to pull inventory while supply chain managers develop resources to meet customer requirements.

- **Dedicated workshops**—There are a variety of tools which can improve public health care supply chains. SIAPS can plan sessions to demonstrate how best to integrate these tools to meet client needs (theory of constraints, total cost of ownership, cost benefit analysis, customer relationship management, supplier relationship management, root cause analysis with fishbone diagram).
- **Inventory issues**—Different challenges may exist throughout the public health care supply chain. SIAPS can work collaboratively with stakeholders to prioritize inventory issues within public health care supply chains.

Session 10

The final capability of professional and personal competencies was covered in this session. supply chain professionals utilize skills in warehouse management, transportation management, supply chain synchronization, risk management, sustainability, distribution, warehousing, logistics, international regulations, strategic sourcing, supplier relationships, customer relationships, and application of Lean principles.

- **Onsite options**—SIAPS staff learned about strengths and weaknesses of stakeholders' workforce personnel. SIAPS can select a project team to evaluate onsite options with stakeholders in SIAPS' areas of responsibilities for further training.
- **Job Descriptions**—Training attendees learned about cross functional responsibilities within supply chain management which flow to supply chain professionals. SIAPS can establish a project to modify job descriptions.
- **Customer Focused Supply Chain Management workshop**—All organizations focused on supply chain management also have personnel who are not directly involved in SCM. SIAPS can target the non-supply chain workforce at SIAPS as well as other stakeholders to conduct one day workshops on Customer Focused Supply Chain Management.

Session 11

Session 11 focused on professional and personal competencies. We reviewed African organizations and what their capabilities are such as the West African Institute for Supply Chain Leadership and SAPICS in South Africa. Supply chain techniques learned in this workshop were reviewed and then there was an exercise on how these techniques could be applied in SIAPS areas of responsibility. A case study on Haiti was also reviewed

- **Haiti action items**—After reviewing the Haiti case study, SIAPS staff members learned to establish timelines to implement a variety of supply chain techniques offered during the workshop.
- **Haiti tool set**—A variety of supply chain tools were discussed in this workshop. SIAPS can prioritize an appropriate number of tools which were reviewed in this class to be used in Haiti.

Session 12

The last session was a wrap up and forecast of future actions that may be taken by SIAPS after this workshop. This workshop was a pilot on how to best develop content to meet SIAPS' staff requirements and how to best delivery that content to enable SIAPS supply chain professionals to leverage their knowledge with supply chain clients and other stakeholders in public health care supply chains. The session also finalized aspects of the Haiti case study

Key Instructor Observations

- The sweet shop was interesting to participants. They were very engaged and picked up on the importance of inventory accuracy.
- The stakeholders' card game was fun but it was a bit hard to get to a winner. They understood the point clearly.

- The bullwhip exercise had mixed reaction but two of the three groups grasped it pretty well. They clearly understood the dilemma of insufficient communication and Point Of Sale data collection
- The flash cards were very interesting to participants. The groups were competitive. The nuances between some words (forecast vs. forecasting) were understood. This is an educated group with everyone having a college degree and most having a graduate degree such as Master of Public Health, as well as four doctors. If this is reflective of SIAPS, we can feel comfortable in challenging them to think. This is a much different group than the instructor's average health care inventory managers' classes elsewhere
- Participants did well in drawing a map of stakeholders in their respective national medical infrastructure system. This exercise might benefit from doing a joint exercise before they undertake the exercise individually.
- The exercise on moving pharmaceutical products to a sick child in a village didn't go well. Its wording needs to be improved.
- The total cost of ownership exercise had mixed results. The concept was understood but the process was not clear enough. Finding a simulation on line and allowing participants to complete data could allow them to see and manipulate the results.
- The crossword puzzle was very interesting to participants, as it is similar to the flash cards that challenge them to understand terminology. Almost none of the attendees had professional backgrounds in supply chain; they've largely come to this field from different backgrounds. Their confidence would increase with better grasp on terminology.
- The ABC exercise was grasped by most participants quite quickly (more so than students at classes that have been conducted elsewhere) but the instructor had set it up too easily as some could even eyeball the results without having to do the math.
- Completing the warehouse racking exercise was OK but we didn't spend much time before hand on setting this up. There was uncertainty about our suggested plan.
- The 5S concept was complicated. Participants understood the intention but this is not a familiar concept for them. A longer simulation might be better.
- The exercise on understanding trading partners requirements was interesting but it seems the participants' knowledge is limited and there are a number of assumptions made by them on how exporting and importing works.
- The exercises on the third day were very good. These gave them an opportunity to formalize participants' comments from the first two days. These contributed well to future take away actions.

Below are general workshop observations–

- The workshop had ambitious goals. Setting a high standard of learning is important in asking participants to extend themselves.
- The main concepts offered in the workshop were understood by most participants and, in some cases, by all. There was skepticism if all of these concepts could be applied in the SIAPS working environment, not necessarily because the concept is not applicable but the natural resistance that may be offered by stakeholders who may resist change.
- There were some differences noted in concepts, terminology, and resources from other available logistics guides including “Measuring Supply Chain Performance” from the Deliver Project
- The processes supported by SIAPS are consistent with supply chain best practices, however there is variance in the application of Quantification, as applied by SIAPS, which combines Forecasting, Sourcing and Making, as identified by the Supply Chain Council SCOR model.
- The time allotted for the workshop was insufficient for the amount of content to be presented. Leaving time for more discussion, with discussion parameters to achieve specific goals is important.
- Participants were prepared and participated very well. The enthusiasm offered by participants enhances the success of the workshop
- The exercises were well received but they were uneven in how well they worked. Some modification is needed before the next workshop.
- The facility was a bit small. It was narrow and limited some interaction by the instructor and participants.

Workshop Evaluation

Instructor Evaluation summary gave the instructor a 5.45 rating out of the maximum of 6. This is a score of 91 on a scale of 100. A common thread in the evaluation was to allot more time to the workshop and deal with more actual SIAPS challenges. The course format was very acceptable. Many thought the instructor's knowledge about Supply Chain was very good but more knowledge was needed about their conditions. It is the instructor's opinion that, similarly to courses conducted elsewhere with public sector health care personnel, health care supply chain professionals feel that customization of SCM training is required to deal with situations involving life and death. It is also the instructor's opinion that future workshops have a stronger focus to gain greater buy-in from participants to be more open to change, within realistic limits.

CONCLUSION, RECOMMENDATIONS, AND PROPOSED NEXT STEPS

The SIAPS Supply Chain Workshop enabled the transfer of knowledge of best practices to an experienced supply chain staff. The workshop continues SIAPS's efforts to positively impact the health outcomes in its areas of responsibility. The timing of this workshop was beneficial as globally supply chain managers increasingly develop tools, processes and assets that can be applied in a variety of health care environments

Recommendations

- Conduct a work survey analysis of key SIAPS technical staff including those with direct, as well as those with indirect, supply chain responsibility to determine current capabilities
- Consider development of different course levels which will address staff capabilities. This workshop could be considered the beginning of the workshop series.
- Consider extending the length of the workshop to 4 to 5 days.
- Consider adding the tour of a medical warehouse, where applicable, if the workshop is held in a country setting.
- Consider developing videos of commercial pharmaceutical stakeholders' experiences that demonstrate supply chain lessons learned; these could be used for future workshops covering key SIAPS' SC functional areas
- Consider certification credentials in supply chain including APICS Certified Supply Chain Professional, to develop a top level group of credentialed supply chain professionals
- Explore conducting similar regional workshops with SIAPS field-based staff in Africa or Asia in future

ANNEX A. SESSIONS

Session 1:

- a. Introductions and icebreakers
- b. Supply Chain terms and definitions
- c. The four stages of Supply Chain Management
- d. Discussion on the role of public health care supply chains within national medical health systems
- e. An exercise on stakeholder identification
- f. An overview of the case study on Haiti

Session 2:

- a. Introduction of Quantification
- b. Definitions and terminology of quantification, including forecasting
- c. The role of forecasting in demand driven supply chains
- d. Performance measures in quantification including KPI's.
- e. An exercise to simulate the pharmaceutical delivery chain
- f. Applying the theory of constraints
- g. The principle of Collaborative Planning, Forecasting and Replenishment
- h. KPI's to be applied to Quantification
- i. Continue the case study

Session 3:

- a. Continue with Quantification with the financial impacts managing supply chains.
- b. Definitions and terminology of quantification, including forecasting
- c. Forecasting tools including naïve forecasting, moving averages, weighted averages and standard deviation.
- d. Understanding evidence based approaches
- e. An exercise to understand the application of the bullwhip effect in forecasting
- f. Actions to mitigate the bullwhip effect
- g. KPI's to be applied to forecasting
- h. Continue the case study

Session 4:

- a. Procurement
- b. Utilize the Total Cost of Ownership approach
- c. Definitions and terminology of procurement
- d. Examine inventory management
- e. The value of collaboration among supply chain stakeholders
- f. Supplier Relationship Management
- g. An exercise to demonstrate collaboration
- h. KPI's applied to procurement
- i. Continue the case study

Session 5:

- a. Continue with Procurement
- b. Continue with Total Cost of Ownership
- c. Definitions and terminology of procurement
- d. Customer Focused SCM – globalization, outsourcing, risk management, collaboration, information technology, Lean Six Sigma tools, product design, sustainability
- e. Common purchasing tradeoffs
- f. An exercise to determine lowest total cost
- g. KPI's applied to procurement
- h. Continue the case study

Session 6:

- a. Warehousing, storage and distribution
- b. Definitions and terminology of warehousing, storage and distribution
- c. Examining different types of inventory
- d. Cycle counting to manage inventory
- e. An exercise to demonstrate inventory accuracy and root cause analysis
- f. A puzzle to test knowledge of warehousing and distribution terms
- g. KPI's applied to manage warehousing
- h. Continue with the case study

Session 7:

- a. Continue with warehousing, storage and distribution
- b. Definitions and terminology of warehousing, storage and distribution
- c. Utilization of ABC inventory in warehousing
- d. Lean practices in warehousing
- e. Technology applications for inventory management
- f. Placement practices in warehousing
- g. An exercise to simulate goods' positions in a warehouse
- h. Risk management in distribution
- i. KPI's applied to manage warehousing
- j. Distribution and transportation with planning, sourcing, making, deliver and return
- k. Continue the case study

Session 8:

- a. Resource management
- b. Definitions and terminology in resource management
- c. Collaboration, integration and performance
- d. Customer Relationship Management
- e. Integrated supply chain networks
- f. Logistics synchronization, information sharing, incentive alignment and collective learning

- g. The 5S approach incorporating good workplace processes
- h. An exercise in personal lean 5S utilizing a worksheet demonstration
- i. KPI's applied to resource management
- j. Continue the case study

Session 9:

- a. Continue with resource management
- b. Definitions and terminology in resource management
- c. Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control)
- d. Visibility in the humanitarian supply chain
- e. Continue with Customer Focused SCM
- f. An exercise on trading partners
- g. KPI's applied to resource management

Session 10:

- a. Professional and personal competencies
- b. Managing supply chain talent in your organization
- c. The International Association of Public Health Care Logician
- d. An exercise for participants to reflect on their goals in SIAPS
- e. Professional credentials in SCM

Session 11:

- a. Professional Development training in Africa
- b. Ten Leadership theories
- c. An exercise to brainstorm the implementation of techniques from the workshop
- d. An exercise to prioritize the concepts from the workshop

Session 12:

- a. Overview of the workshop
- b. Complete the case study
- c. An exercise to develop resolutions learned from the Haiti case study

ANNEX B. WORKSHOP PARTICIPANTS

| Participant's name | Title | Work location | Workshop role |
|---------------------------|---|------------------------------------|--|
| Francis Aboagye-Nyame | SIAPS Program Director | SIAPS HQ | Observer |
| Joseph Adu | Senior Technical Advisor | SIAPS Ghana | Participant |
| Alison Corbacio | Project Associate | SIAPS HQ | Admin/logistics support |
| Simon Conesa | Senior Technical Advisor | | Participant |
| Gabriel Daniel | Principal Technical Advisor | | |
| Suzanne Diarra | Senior Technical Advisor | | |
| Seydou Doumbia | Principal Technical Advisor/SIAPS Health Element Cluster Lead | | Observer |
| Reem Ghoneim | Technical Advisor | | Participant |
| Wonder Goredema | Senior Technical Advisor | | Participant/workshop coordinator/activity lead |
| Oliver Hazemba | Senior Technical Advisor | SIAPS HQ (based in Lusaka, Zambia) | Participant |
| Kanjinga Kakanda | Senior Technical Advisor | SIAPS HQ | |
| David Mbirizi | SIAPS Deputy Director, Country Programs | | Observer |
| Maheen Malik | Senior Technical Advisor | | Participant |
| Andwele Mwansasu | Senior Technical Advisor | | |
| Emmanuel Nfor | Principal Technical Advisor/SIAPS Supply Chain Cluster Lead | | Participant/workshop coordinator |
| Arthur Ostrega | Project Associate | | Admin support |
| Andualem Oumer | Senior Technical Advisor | | Participant |
| Chinwe Owuna | Senior Technical Advisor | | |
| Sheena Patel | Technical Advisor | | |
| Stephanie Rotolo | Project Associate | | Admin support |
| Mavere Tukai | Principal Technical Advisor | | Participant |
| Irvin Varkonyi | | Consultant | Facilitator |