Workforce Excellence in Health

Supply Chain Management:

Literature Review

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People That Deliver

The *People That Deliver* Initiative is a coalition of countries and global health stakeholders that seeks to improve health outcomes by developing sustainable excellence in the health workforce for supply chain management and overcoming health supply challenges.

Abstract

The objective of this review is to survey published documentation regarding health workers' capacity for supply chain management (SCM) in developing countries to provide insight about information gaps and needs for SCM workforce excellence. The primary goal of this document is to provide an initial evidence base to inform advocacy on the need for SCM workforce excellence. Findings from this review will inform planned research, including country studies and regional surveys.

Cover photo: This picture was taken at a health center in the Democratic Republic of Congo in 2010. Health professionals are participating in a training, which includes supply chain management topics such as ordering essential medicines, storage and distribution to clients. Photographer: Véronique Brossette

Acronyms

AIDS	acquired immunodeficiency syndrome
ART	antiretroviral treatment
CDC	Centers for Disease Control and Prevention
CP	commodity planner
CPD	continuing professional development
CSCMP	Council of Supply Chain Management Professionals
DLP	distance learning program
DTTU	delivery team topping up
EDL	essential drug list
GHI	Global Health Initiative
HCD	human capacity development
HF	health facility
HIV	human immunodeficiency virus
HR	human resources
HRC	human resources capacity
HRH	human resources for health
HRM	human resources management
HSS	health system strengthening
IST	in-service training
LCA	logistics capacity assessments
LMICs	low- and middle-income countries
LMU	logistics management unit
NGO	non-government organization
NOS	national occupational standards
OJT	on-the-job training
OPD	outpatient department
PAR	participatory action research
PBC	performance-based contracting
PEPFAR	President's Emergency Plan for AIDS Relief
PHC	primary health care
PHTN	Public Health Training Network
PIC	Pacific Islands countries
PMTCT	prevention of mother-to-child transmission
PST	pre-service training
RHSC	Reproductive Health Supplies Coalition
RTRC	Regional Training Reference Center
SCM	supply chain management
SHW	substitute health workers
TOT	training of trainers
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

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I. Introduction

Background

The 2006 World Health Report estimates that 57 countries worldwide are experiencing a crisis in human resources for health (HRH). This crisis is felt most profoundly in sub-Saharan Africa, where a combination of factors are straining HRH, such as brain drain of trained health professionals, loss of health workers due to HIV/AIDS, increased number of specialized health programs and expansion of health services to the community level (WHO 2006b).

A personnel shortage has deep implications for public health. While it is clear that a professional workforce is vital, there is little information available about how to best recruit, train, retain, monitor and supervise these workers in developing countries. In many countries, national human resource (HR) policies are weak and investment in training, deployment and ongoing development is inadequate.

Competent, well-trained health workers are essential for delivering health services, and effective supply chain management (SCM) is essential to ensure products are available at service delivery points. Significant resources move through supply chains in developing countries; more than $10 billion in donor-financed health commodities are expected to flow to low- and middle-income countries (LMICs) annually by 2011 (MIT-Zaragoza 2008). Thus, there must be visibility, accountability and capability along the entire chain of custody. Considering the substantial resources at stake, strategies and people must be in place to appropriately manage these health commodities. Efforts have been undertaken to strengthen health sector supply chains, such as developing guidelines and conducting logistics management trainings. However, studies in LMICs suggest that merely disseminating guidelines is insufficient; providing ongoing supportive supervision and feedback is important for sustained results. Furthermore, multifaceted interventions tend to be more effective than single interventions.

A guide on assessing human resource capacity in public health SCM developed the following definitions, which are used as points of reference for this review (Hasselberg 2010):

Workforce excellence in supply chain management: A series of activities intended to increase the capacity of national health systems to sustainably develop, recruit and retain health workers who have the qualifications, competencies and resources required for effective management of health supply chains, and to overcome existing and emerging health commodity challenges.

Public health supply chain manager: A person who has the responsibility to oversee specific in-country supply chain activities and functions that ensure the availability of health supplies at service facilities, including procurement, customs clearance, quality assurance, warehousing, distribution, logistics information management, and logistics monitoring and evaluation.

Methods

This paper presents the results of a review of published literature related to workforce excellence in supply chain management in developing countries. It was conducted through desk review and online search. Focus was given to articles published during the past six years. Documents were solicited from key organizations via listservs and direct correspondence. Online search terms were: supply chain management in developing countries, professionalization, logistics systems, human resources, health personnel, HR retention, task sharing, task shifting, non-physician clinicians, substitute

healthcare worker, community caregivers, primary healthcare teams, cadres and nurses. Selected studies focused on public sector health care providers in developing countries, although some private sector and middle- and upper-income country studies were examined. There is not yet a great deal of data on this topic; unfortunately, one of the review's findings is that SCM human resource capacity (HRC) remains somewhat invisible.

The structure of the literature review focuses on areas that the "Promoting Sustainable Workforce Excellence in Health Supply Chain Management" initiative identified as key topics for global-, regional- and/or country-level research. Thus, topics in this review are:

- The current HRH capacity for supply chain management in Ministries of Health and other public health institutions of developing countries;

- Innovative and effective approaches for professionalizing supply chain management;

- Impact of strengthening HRH capacity on improving supply chain and health outcomes; and

- Cataloguing existing resources that could support strengthening HRH capacity.

II. Current capacity

Synthesizing and analyzing existing documentation on the current HRH capacity for supply chain management in Ministries of Health and other public health institutions.

As governments improve their public health programs, they recognize the need to strengthen supply chains. Thus, the demand for technical assistance, training and research in the field of health management is increasing. A review of current SCM capacity revealed weaknesses in the skills required to quantify needs for health products; appropriately order, receive and store products; and accurately record inventories.

Where dedicated personnel with logistics background or SCM competence are lacking, logistics functions often are performed by clinicians, pharmacists or drivers. Doctors and nurses tend to be responsible many non-clinical tasks; too often, they spend significant amounts of time on logistics activities, reducing the time they have to spend with patients. Overall, in decentralized public structures, personnel tend not to have specific logistics qualifications and dedicate a limited amount of time to SCM (Dicko 2010).

Moreover, there is not a formal career path for logisticians, so there is not incentive for staff to undertake specific logistics training. Usually, existing facility personnel end up assuming additional responsibilities without developing specialized expertise.

According to a WHO/AFRO initiative coordinated by Bioforce, the competency framework of a health logistician should include the following (Silve 2009b):

1. Plan logistical activities of health structures and programs.

2. Administrate and coordinate logistics of health programs and structures.

3. Manage the supply chain.

4. Coordinate the use and maintenance of medical and technical equipment.

5. Coordinate the maintenance of facilities and housing.

6. Ensure effective logistical support of health emergencies and humanitarian operations.

7. Foster intersectoral collaboration and community participation.

More and more, health systems are relying on "substitute health workers" (SHW), which are "health cadres who have been trained for shorter periods and required lower entry educational qualifications, to whom are delegated functions and tasks normally performed by more established health professionals with higher qualifications." SHWs take on functions normally performed by internationally recognized health professionals, such as doctors, nurses and pharmacists (Doylo 2004).

That said, there are some tools that can help countries determine profiles of individuals performing public health SCM. For example, *Human Resource Capacity in Public Health Supply Chain Management — Assessment Guide* can be used to identify which staff are involved in SCM and which function they perform (e.g., procurement, storage) (Hasselberg 2010).

The supply chain management national occupational standards (NOS) divide SCM tasks into three main categories or levels: technical (SC practitioners), management (SC managers or specialists) and strategic (senior managers). NOS can be used by both employees and employers: employees can improve their productivity through self-assessment, professional development and career development, and employers can refer to NOS when developing business and staffing plans, creating training curricula and developing benchmarks (Chartered Institute of Purchasing & Supply).

III. Approaches

Synthesizing and analyzing documentation of approaches for professionalizing supply chain management, and their impact.

Approaches for professionalizing supply chain management found through the literature review include: training (including pre-service and distance learning), task shifting, outsourcing, conducting costing studies, establishing logistics management units (LMUs), developing incentives, creating accreditation and strengthening policy.

Training

In general, there are not enough high-quality training courses and materials that specifically address health logistics. Too often, materials are not standardized, are not based on adult learning principles and do not follow a competency-based methodology. Generic materials may not be adapted to the local circumstances. Furthermore, some courses lack the hands-on practice and site visits required to solidify new skills and connect learning with performance. Many training activities are not linked to actual job functions, standard operating procedures or job descriptions. Where training does exist, it is often made difficult by the large number of students in courses.

A study identified 150 courses that focus on logistics and commodity managers, many of which are university-based and located in the United States. Factors such as cost, time requirements, language and course prerequisites further impede access of staff in developing countries. Specialty courses covering some content areas, such as procurement, are more common than courses for other topics, such as logistics management information systems (Roche 2010). A follow-up study, currently in process, identified an additional 45 courses, some of which are offered in French, Spanish and Portuguese.

The training curriculum should take into account two "profiles" of supply chain managers: the one that "must possess a wide and general understanding of how a supply chain works in order to guide

system functions and improvements effectively" and one that "must work in specific technical areas or settings that require in-depth knowledge" (RHSC 2009). Training should include topics relevant to the functions staff perform, such as financial planning, transport and distribution, and stores management. Expertise in collecting and using data, both for routine services and in planning for and managing public health emergencies, is important. Training must be periodically updated to appropriately equip health staff to meet new challenges.

The curriculum for logistics management training is not yet standardized but tends to include data collection and information management (including basic use of Word and Excel), quantification, storage, transport, distribution and equipment maintenance.

Within trainings that do exist, there are various approaches, the most common of which include pre-service training, on-the-job training, group-based learning, self-directed study, experiential learning and distance learning. Among the training strategies that seem to have the greatest impact are using multiple training modalities (such as lectures, group problem-solving, role-playing and practical skills application), holding repeated sessions, providing onsite training, and using opinion leaders or district-level staff as trainers.

Strategies that encourage peer review and group commitment to standard treatment guidelines and prescribing protocols appear to have an impact. Furthermore, supervision or performance monitoring (using indicators or simple protocols in combination with audit and feedback) has proved effective in improving specific practices (Laing 2001).

In terms of developing a set of "guiding principles" that should be considered when creating training materials, researchers undertook a study in Pacific Islands countries (PICs) during which principles were refined through focus groups involving local practitioners, international organizations and academics from the region. The study explored how to apply cultural understanding and local ways of learning to the development of pharmacy competencies. Historically, pharmacy technician training in PICs had been fragmented and based on Western traditions, and had not formally involved local universities. A cultural-based approach to training was undertaken to create sustainable approaches to developing pharmacy technicians' competency in managing the essential medicine supply. This research yielded a better understanding of the cadres involved in essential medicine supply management in PICs and the competencies required by these cadres. Also it demonstrated that an interactive, cultural-based training approach is accepted by primary health care workers (Brown 2010a).

The University of Canberra's Participatory Action Research (PAR) is developing a framework that involves health workers in refining the training methods that will prepare them for medicine supply management. The PAR is exploring three different competency development approaches:

- A five-day skills-based workshop with workplace follow-up for nurses, primary health care workers and nurse aids who work at the primary health care level (Level 1).

- A 10-month on-the-job certificate using a combination of distance and intensive sessions with workplace follow-up for health care workers in medicine supply at the provincial level (Level 2).

- A short, intensive workshop with workplace mentoring and follow-up for pharmacists and stores managers at a national level (Level 3).

The focus on practical competency development resulted in a range of health care workers in different countries able to achieve proficiency and immediately apply their new skills in the workplace. Preliminary observations show that a range of health care workers are responding well to

this approach. Researchers have found that engaging local practitioners, international organizations and academia is a constructive way to promote the needs and best practices in medical supplies education (Brown 2010b).

Pre-service training

WHO's Global Training Network and other competency-based training approaches look at training as a continuum composed of pre-service and in-service training periods. This approach provides evidence on what works and why. To support establishment of pre-service training (PST), a country will need to undergo a shift in mentality; this cultural shift will occur when a country understands SCM's importance in achieving overall health objectives.

One mechanism to support PST is establishing a network of Regional Training Reference Centers (RTRC) — with a central coordinating body and locations in sub-regions — that brings together universities, training centers and research organizations. The RTRC can design a PST that takes into consideration the diversity of training needs and time available for training. Another mechanism is to implement training programs at the university level in developing countries, bringing logistics training to higher education instead of training nurses and pharmacists as needed. The USAID | DELIVER PROJECT has PST programs underway in Rwanda, Malawi, Zambia and Ethiopia (USAID | DELIVER PROJECT 2010b). It has published a step-by-step instruction guide, complete with a sample curriculum and lesson plan (Eombe 2010).

Distance learning

Distance learning can be cost-effective, and evidence shows that it can be useful for refreshing and updating existing knowledge, as well as teaching new skills. Virtual learning centers can serve as an information exchange — expanding or supplementing content to focus on building the technical knowledge and skills of public sector supply chain professionals — as well as developing and promoting additional online or other distance-learning opportunities. A logistics help desk or other system for providing ongoing distance technical assistance should be considered; it could provide proactive, ongoing support directly to the target audience through email listservs, moderated website forums or Voice over Internet Protocol (VoIP).

The Council of Supply Chain Management Professionals (CSCMP) offers Supply Chain Management Essentials (SCME), an online course that covers SCM fundamentals, including forecasting, procurement, transportation, inventory management and warehousing.[1]

The USG supports distance-learning initiatives in SCM and other areas. USAID developed a Distance Learning Program (DLP) for health logistics, based on a pilot program in Peru. The Centers for Disease Control and Prevention (CDC) established the Public Health Training Network (PHTN)[2] as a distance-learning network of people and resources designed to take training and information to the learner. PHTN relies on a variety of media — including satellite, web, CD-ROM, videotape/DVD, onsite courses and conferences, and print — to provide instruction. Evaluation studies demonstrated that programs delivered through PHTN, and distance learning as a medium, were effective ways to update and enhance professional competencies. The HRH Global Resource Center (GRC),[3] a service of Capacity*Plus*, supports HRH stakeholders and decision makers by providing essential HRH information. USAID | DELIVER PROJECT's "Lessons in Logistics

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[1] http://cscmp.org/education/essentials/index.asp#/education/essentials/mod2.htm
[2] http://www2.cdc.gov/phtn/
[3] http://www.hrhresourcecenter.org/

Management for Health Commodities" contains five interactive learning sessions that can be accessed online or through a CD[4]: Introduction to Logistics, Logistics Management Information Systems, Assessing Stock Status, Maximum-Minimum Inventory Controls Systems and Selecting Maximum-Minimum Inventory Controls Systems.

As a follow-up to distance learning, creating networks at the central, regional and international levels — for example, the International Association of Public Health Logisticians (IAPHL)[5] — can help participants retain their skills and join a virtual community whose members can serve as technical resources for one another.

Task shifting

Task shifting has been promoted in recent years as a strategy to compensate for health worker shortages. In general, task shifting occurs when "specific tasks are moved, where appropriate, from highly qualified health workers to health workers with shorter training and fewer qualifications in order to make more efficient use of available resources for health" (WHO 2006a). Although some equate the term "task shifting" with "task sharing," there is a distinction. Task sharing occurs when services that require clinical staff expertise, such as initiating patients on ART or PMTCT, require existing clinical staff and pick up the additional workload without dropping their pre-existing tasks. On the other hand, task shifting, in the context of SCM, entails shifting SCM responsibilities from clinical or pharmacy staff to dedicated SCM staff.

A recent literature review found that task shifting can be an effective strategy for addressing HRH shortages in HIV treatment and care, resulting in high-quality, cost-effective care to more patients than a physician-centered model. However, the review noted implementation challenges, such as adequate and sustainable training, support and pay for staff in new roles, the integration of new members into health care teams and compliance with regulatory bodies. Nonetheless, the review concluded that task shifting should be considered for careful implementation when HRH shortages threaten rollout programs (Callaghan 2010).

WHO produced global guidelines and recommendations for task shifting in the health sector, such as a model whereby nurses initiate ART, with doctors supervising and managing complex cases (WHO 2008). In Uganda, Rwanda and Malawi, community health workers are providing ART counseling and HIV testing. Some research suggests that shifting high functions to less qualified or inadequately trained staff may not only result in low performance, but also cause stress for ill-equipped staff. On the other hand, experiences in Zambia and Botswana illustrated that shifting ART initiation to nurses had the potential to improve ART coverage (Stringer 2006).

Pharmacists' roles are evolving from medicine compounders and dispensers to medicine experts who conduct ward rounds as part of a multidisciplinary team of health workers (MOHSW 2009). Because of their medicine knowledge, pharmacists could be further trained to undertake functions such as clinical management, laboratory diagnostics and logistics management. Indeed, pharmacists have been shown to be willing, competent and cost-effective providers of "pharmaceutical care interventions" (Anderson 2009). In Ghana, for example, pharmaceutical personnel have an enlarged scope of activity, including dispensing, quantification and stock management (Pharmacy Council/MOH 2009).

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[4] http://www.jsi.com/Independent/Deliver/LogisticsCD/htdocs/
[5] http://knowledge-gateway.org/public/Default.aspx?c=ca7f45ec-3b4a-400f-a055-b19ed8771066

In terms of shifting SCM tasks in particular, some supply chain tasks, such as storage, transport, customs clearance and distribution, should be managed by specialized logistics personnel, not health professionals. On the other hand, tasks such as logistics data collection, facility stores management, and reporting and resupply functions are health professionals' responsibility. Some countries are taking innovative approaches to shifting tasks from medical staff. In Zimbabwe, for example, the Zimbabwe National Family Planning Council (ZNFPC)/Delivery Team Topping Up (DTTU) is based on the vendor-managed inventory system used in the commercial soft drink industry. This system puts the burden of stocktaking and calculating top-up amounts on delivery teams that serve as a mobile warehouse, instead of on the already busy medical staff at facilities. The system achieves high product availability for the contraceptives and health products it carries and is being expanded to carry additional essential medicines (Sarley 2010). The Project to Support Programa Alargado de Vacinação (PAV) worked with Mozambique's provincial health departments to develop a vendor-managed inventory system for vaccines and related supplies, which shifts logistics management tasks from frontline health workers to dedicated provincial logistics staff (Kane 2008). In Zambia, the Essential Drugs Public Pilot, funded by the World Bank, U.S. Government and Department for International Development (DFID), introduced a commodity planner (CP) at the district level who is responsible for coordinating health facility orders and managing district-level stock. Of the 16 intervention districts, four relied on the pharmacy technologists who were already in place, and 12 recruited and trained external CPs since the pharmacy technologist position had been vacant (Vledder 2010).

Outsourcing SCM functions

SCM functions that are outsourced or subcontracted to external organizations or ministries include procurement, customs clearance, storage, distribution and cold chain maintenance. When considering outsourcing, it is important to examine the external structure's capacity to ensure efficient, performing and sustainable management of activities. Outsourcing could potentially reduce process costs but entails careful management and oversight.

Many different types of health services have been outsourced through performance-based contracting (PBC), including offering primary health care (PHC) services, providing HIV prevention services, establishing health insurance systems, managing hospitals and operating diagnostic services. In areas where existing government services are not achieving adequate results, there may be an opportunity to contract in management services, including supply chain management. Contracting is often a form of "pay for performance" and has been used sometimes for individual health workers; it can result in health workers correctly implementing procedures and processes (Loevinsohn 2008).

Measuring cost-effectiveness

When assessing new supply chain approaches, such as outsourcing or system design, it is important to determine cost-effectiveness. In Zimbabwe, a costing analysis used a supply chain costing tool to guide SCM decision making. A key cost driver for DTTU is the amount of time the delivery team spends in the field. As the number of products increases, more time is required to count inventory at facilities and pick products for resupply. At some point, if the number of products becomes too large, the costs of the team's time and their per diem become too high. Also because DTTU operates like a mobile warehouse, there is a limit to the number of products that can be managed in one drop. Furthermore, program management is another important cost driver, as is transport cost. Overall, the study found decreased costs associated with DTTU, as long as it continues to manage an appropriate number of products (Sarley 2010).

In Mozambique, the Project to Support PAV, which delivers vaccines to health units monthly, showed significant cost savings over the Ministry of Health's (MISAU's) vaccine logistics system, which is a mixed system that varies by location and month. The Project to Support PAV has vehicles and staff dedicated exclusively to vaccine logistics, and integrates supportive supervision and information management into vaccine distribution. The MISAU system, on the other hand, does not have transport or personnel dedicated exclusively to vaccine logistics (VillageReach 2009).

In Zambia, the Essential Drugs Public Pilot evaluated the comparative cost-effectiveness of two alternative supply chain models, as well as their operational effectiveness. Model A continues to hold stock at the district level while introducing CPs. Model B eliminates the intermediate storage of medicines at the district level, converting the district store into a "cross-dock" point of transit, while also introducing CPs. Results from the evaluation showed significant improvement in facility-level access to essential medicines for both models, particularly in districts where Model B was implemented. For the cost-effectiveness analysis, cost categories included recurrent costs (salaries, transport, etc.) and fixed costs (staff recruitment, training, etc.). Although Model B had a higher additional cost than Model A, it may be worth the investment considering its superior performance (Vledder 2010).

Creating dedicated logistics management units (LMU)

Increasingly, countries have recognized the value of forming a logistics management unit (LMU), which is a management structure responsible for organizing, monitoring and supporting all supply chain activities in the logistics system. Through a process of continuous improvement, the LMU identifies supply chain problems, develops interventions to address those problems and implements those interventions. LMUs are typically based at the central level and are a vehicle to institutionalizing good SCM practices. Although an LMU may require a substantial human resource investment, it enables service providers to focus their time and energy on serving patients and allows logisticians to build stronger SCM skills (USAID | DELIVER PROJECT 2010a).

Incentives for increasing SCM staff retention

Supervision and management

Motivation is a critical influence on performance. While an adequate salary is important, there is little data on what constitutes "adequate" or how health workers rank the importance of other incentives, such as living and working conditions, training, feedback and advancement opportunities. Supervision, for example, not only improves job performance, but also can increase health workers' job satisfaction. A survey in Ghana showed distribution of pharmaceutical manpower is distorted, resulting in underserved rural regions. Introducing incentive packages (e.g., higher pay, nice housing) could attract pharmacists to underserved regions (Pharmacy Council/Ministry of Health 2009).

In Indonesia, a self-monitoring system was implemented in which health center staff sampled their own prescription records monthly. The data were used to track three rational use indicators: number of drugs prescribed, percentage antibiotic use and percentage injection use. Managers provided education, surveys and supervision to discuss the data with staff, and the system saw improvements in rational use (Sunartono 1995).

Retention of SCM personnel can be improved if dedicated personnel are part of a logistics coordination unit within the facility. Logisticians should be under the supervision of managers and participate in regular meetings and planning activities. The unit can foster information exchange on issues such as commodity procurement, packaging, storage, cold chain, transport and supply.

Career ladders

Although efforts are underway to provide technical logistics training, training alone is insufficient; organizations must establish logistics-focused positions, and graduates of training programs must be able to secure relevant employment and receive ongoing support. A logistics-related career ladder could encourage retention and promotion. In particular, it would be useful to develop a career ladder for within pharmacy; a new cadre of "pharmaceutical technician" could be developed as a third year of training for pharmacist's assistants that leads to a diploma.

Professional associations

A WHO-funded evaluation explored how to improve the performance of health systems in developing countries. The study looked at training as well as organizational and human resources management (HRM) and concluded that:

- Health logistics should be recognized as a profession, relevant to all developing countries, and organizations should include health logistician positions.

- Health logistics training and expertise should be organized through a network connected to field operations through nodes at the sub-regional and national levels (Silve 2009a).

SCM certifications or qualifications relevant to health systems in developing countries

SCM functions need to be defined and translated into a set of competencies (e.g., stock management, quantification); competencies, in turn, are placed into a framework of performance-based measures. The framework should systematically describe the minimum aptitude standard for logistics staff. Supervisors could use such a framework to assess gaps in staff skills and knowledge, compare performance before and after training, and improve training approaches and resource material content.

Certain logistics certifications for transportation of dangerous substances do exist, such as ATEX[6], International Air Transport Association (IATA) and International Maritime Dangerous Goods (IMDG). There are also certification processes for movement of non-hazardous products, such as health supplies, like the UK's Chartered Institute of Logistics and Transport and the Chartered Institute of Procurement and Supply. There are also internationally recognized humanitarian logistics certifications from the Humanitarian Logistics Association, as well as program-based certifications.

In terms of competency frameworks, World Federation for Medical Education (WFME) developed a global competency framework that helps ensure physician competencies are globally applicable and transferable, accessible and transparent. According to WFME, international standards can be defined for basic medical education, taking into account country variations due to differences in teaching, culture, socioeconomic conditions and health systems, among others. Such guidance could be created for pharmacists and supply chain managers.[7] A health logistics professional council could develop a performance-based framework for the accreditation, develop professional standards for certification and assess performance.

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[6] ATEX derives its name from the French title of the 94/9/EC directive: *Appareils destinés à être utilisés en ATmosphères EXplosibles*.
[7] http://www.fip.org/pharmacy_education

A competency framework for health logisticians, composed of seven core competences, was developed by the Bioforce Institute, with the support of Agence de Médecine Préventive (AMP) and other partners (Bioforce Institute 2010a). WHO/AFRO and UNICEF organized two seminars during which delegates from several African countries, as well as the USAID | DELIVER PROJECT, refined and reached consensus on the final framework (Bioforce Institute 2010b).

Policies and enabling environment required to professionalize SCM

WFP and UNICEF administer logistics capacity assessments (LCAs) when preparing humanitarian responses. These evaluations are designed to obtain a fundamental understanding of a country's transportation infrastructure, focusing on logistics links such as port/airport capacities, road and rail networks, storage facilities, handling procedures and labor rates. Particular consideration is given to identifying shortcomings that may result in bottlenecks in the delivery pipeline.[8] While LCAs are conducted for the purpose of delivering humanitarian or emergency aid, in some countries these assessments could be utilized to improve health supply chain management performance.

IV. Impact

Synthesizing any documentation showing that strengthening HRH capacity for health supplies can improve both supply chain outcomes and health outcomes.

It has been assumed that strengthening HR capacity for managing health supplies can improve both supply chain outcomes and health outcomes. However, to date there have not been thorough studies to determine the impact of interventions of SCM trainings and other capacity-building activities on health outcomes. There are multiple confounding factors that would make such impact difficult to attribute and measure.

Factors and environmental contexts that can influence health worker practices and impact the supply chain and health outcomes include:

Health-worker factors: Knowledge (e.g., of guidelines), skills, motivation, job satisfaction, remuneration, experience, attitudes, professional and personal goals, comprehension of roles and responsibilities and the worker's own health.

Patient or client factors: Severity of illness, patient demands and patient socioeconomic factors (e.g., age, sex, education, economic status).

Characteristics of the work: Complexity and clarity of responsibilities, type of services required (acute vs. chronic care) and changes in guidelines over time.

Health facility environment: Clinical practices and attitudes of coworkers, peer pressure, leadership, supervision, presence of quality improvement processes, patient caseload, availability of supplies and equipment, access to communication, health facility type and level, location, organization and health worker participation in planning.

Educational and professional environment: Network of colleagues, professional associations and certifying bodies; formal and informal educational and professional development opportunities; and employment opportunities.

Administrative environment: Policies governing health worker behaviors and working conditions, salary levels, regularity of payment, non-financial incentives, job security, leadership, presence of

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[8] http://www.logcluster.org/tools/lca

quality improvement processes, supervision of supervisors, availability of information and decentralization.

Political/economic environment: Economic conditions of the country and health system; and ideologies, political structures and corruption.

V. Resources

Cataloguing existing resources that could support strengthening HRH capacity.

Currently, there is a gap in literature available on SCM studies. However, some frameworks, assessment tools, networks and other resources do exist that could support strengthening HRH capacity:

1. "A framework for developing effective procurement systems in developing countries" proposes establishing pre-training selection criteria based on core competencies. Training focuses on closing identified gaps in knowledge and skills. Follow-up utilizes the same measures of performance. This set of reinforcing performance enhancement techniques seems to achieve improvements (OECD/DAC – World Bank. 2004).

2. A training program for health logisticians conducted in Benin in 2008 recommended developing seven competencies into a framework for assessing staff performance, identifying training needs and developing a competency-based curriculum for in-service learning. Pre-service curricula could be adopted by schools offering training in public health logistics and supplies management. A competence matrix describes the knowledge, skills and aptitudes required for a logistician at each level of the health system (WHO/AFRO-Bioforce 2008).

3. An assessment guide on human resource capacity in public health supply chain management was designed to document the state of a country's human resource capacity in supply chain management and its workforce excellence efforts, and identify areas of improvement.

4. The Regional Technical Resource Collaboration for Pharmaceutical Management (RTRC) was established to help address skills shortage in pharmaceutical management in Africa. The initiative helps conduct assessments of pharmaceutical supply management systems and develop and implement skills-building. RTRC has undertaken a number of activities related to assessment, training and evaluation.

5. The "Profile of Human Resources for Health in Ten Countries in the Asia and Pacific Region" includes a mapping survey that summarizes available information on the cadres working at the community level in each PIC — their diversity, distribution, supervisory structures, education and training. The report's recommendations include strengthening leadership and management, enlarging workforce size, improving staff categories, upgrading staff mix and distribution, using mobile teams to provide supervision and improve services available at health centers, and offering greater financial incentives for staff in remote areas. The strategy focuses on community-based and primary health care and includes health providers operating outside the formal sector. As more health systems extend their reach to the community levels, it is important to train facility health workers in community engagement and health promotion, as well as training up community health workers on SCM principles (Dawson 2010).

6. IAPHL is a community of practice dedicated to facilitating the exchange of professional experiences and innovations in public health logistics management and commodity security, supporting continued learning, promoting the use of local and regional expertise, and expanding

members' professional network. Members are part of a global network and serve as a pool of professional resources for countries and programs worldwide.[9]

7. The Knowledge for Health website (k4health.org) contains eToolkits, which are electronic libraries of resources on particular health topics that are vetted and selected by technical experts. They are designed for health program managers, service providers and policymakers and include resources for managing, measuring, monitoring and optimizing the logistics of health commodity supply chains.

8. The following organizations are key contributors to the People that Deliver conference (in addition to the conference website — http://www.peoplethatdeliver.org/ — their websites may provide additional relevant tools and resources): Reproductive Health Supplies Coalition, CHAI, UNICEF, UNFPA, USAID, WHO, World Bank, AMP, Bioforce, CapacityPlus, CILT, CIPS, Crown Agents, USAID | DELIVER PROJECT, IPPF, JSI, Marie Stopes International, Project Optimize, RTT, SCMS, Bayer Schering Pharma, i+ Solutions, CIES (Nicaragua School of Public Health), East African Community, PRISMA (Peru).

9. The OPTIMIZE project developed a 2020 vision for human resource involvement in immunization supply systems. This vision is structured along four axes: the 2020 vision, a landscape analysis of the 2011 situation, existing gaps and the priorities to achieve the vision. These documents can be found at http://www.peoplethatdeliver.org/?q=content/2020-vision.

VI. Conclusion

Supply chains are complex systems for which management requires significant technical and managerial capacity. Inadequate human resource capacity has dire consequences for health systems in developing countries. On the other hand, increased skill and coordination can help reduce lead times and costs and improve overall performance of the supply chain. Thus, creating both *demand for* and *supply of* individuals with appropriate competencies for public health SCM is of utmost importance.

Some countries have undertaken initiatives to develop, train and maintain a cadre of logisticians for public health care commodities. But efforts have not been consistent globally and the question of financial sustainability remains. In addition to training and guidelines, supply chain management also requires communication and information management systems. In some cases, technology has evolved at a more rapid pace than workforce capacity, which can impact job design and skill requirements (Canadian Logistics Skills Committee. 2005).

Based on the literature reviewed, the following key messages are summarized below:

- The availability of a health workforce in adequate numbers with appropriate competencies is crucial to ensuring a well-functioning health system.

- Accurate, detailed and up-to-date data is a prerequisite for HR management.

- Appointing logistics staff at all levels and establishing consistent "norms" enhances SCM.

- In some countries, a single, centrally held (payroll) database of all health workers in the public sector is the sole source of staff information (name, cadre, salary and allowances, but not location of work). However, there is usually no way to track health workers in the private sector.

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[9] http://knowledge-gateway.org/public/Default.aspx?c=ca7f45ec-3b4a-400f-a055-b19ed8771066

- Ministerial departments of human resources recognize the need for more detailed and accurate data on health staff, their skills, their workload and staffing patterns.

- Health workforce density varies considerably among countries and is associated with economic development.

- Pharmacy technicians form an important component of the pharmacy workforce, comprising up to 75 percent of this workforce in some countries. Further developing this cadre may help improve SCM.

- Ensuring mechanisms for assured practitioner competence is a key goal for health education policy. Systems and continuing professional development (CPD) support should be oriented to enable competence-based development.

- Health workforce planning should strive for self-sufficiency as part of an integrated system encompassing all health services cadres. The planning process should be informed by reliable workforce data and evidence on factors affecting the workforce, and should be aligned to local needs.

- Performance expectations, timely feedback, adequate environment, incentives, and skills and knowledge are required for a worker to perform well.

- Strategic partnerships among stakeholders such as Ministries of Health, Ministries of Education, training institutions, professional bodies, and regional and international organizations, among others, have proved valuable in enabling progress in health workforce planning and development, regulation and reform in education and practice.

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