Strengthening the Department of Health's Warehouse Management System in the Philippines

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Strengthening the Department of Health's Warehouse Management System in the Philippines

Emmanuel Nfor
Cristan C. Agaceta
Isaac Ireneo B. Linatoc
Chesa Desano

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About SIAPS

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to ensure 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

Warehouse Management System, Supply Chain Management, Medicines, Information Technology, Age of Inventory, Management Information System, Distribution, Procurement, and Logistics

Systems for Improved Access to Pharmaceuticals and Services
Pharmaceuticals and Health Technologies Group
Management Sciences for Health
4301 North Fairfax Drive, Suite 400
Arlington, VA 22203 USA
Telephone: 703.524.6575
Fax: 703.524.7898
E-mail: siaps@msh.org
Website: www.siapsprogram.org

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ACRONYMS

3PL	third-party logistics service provider
AS	Administrative Service
CHD	Centers for Health Development
DOH	Department of Health
DPCB	Disease Prevention and Control Bureau
FP	family planning
HEMB	Health Emergency Management Bureau
KMITS	Knowledge Management and Information Technology Service
LGU	local government unit
LMD	Logistics Management Division
NOSIRS	National Online Stock Inventory Reporting System
PD	Pharmaceutical Division
PTR	property transfer report
RHO	regional health office
RHU	rural health unit
RITM	Research Institute for Tropical Medicine
SCMU	supply chain management unit
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SOP	standard operating procedure
USAID	US Agency for International Development
WHO	World Health Organization
WMS	warehouse management system
WOM	warehouse operations manual

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EXECUTIVE SUMMARY

The goal of warehouse operations is to satisfy client needs and requirements while effectively utilizing space, equipment, and labor. Warehouse management refers to the monitoring, control, and optimization of warehouse and transportation systems.

The objectives of this assessment were to review the existing WMS, including space, equipment, tools, and processes, and identify key requirements and technical specifications for the implementation of WMS technology that is tailored to the Republic of the Philippines' public health supply system needs.

The assessment methodology consisted of a desk review; key informant interviews; and field visits to LMDs, third-party logistics service providers (3PLs), RHOs, Research Institute for Tropical Medicine (RITM) warehouses, and city/community health facilities. Commodities data collected from these warehouses were analyzed, and deductions were made to attain the objectives of the assessment.

Key findings from the assessment include:

1. Allocation inefficiencies

Inventory age analysis and periodic rejection of some deliveries, reported by 3PLs, point to a mismatch between allocation quantities and end user requirements. This leads to a backlog of commodities, which overburdens warehouse capacity at the central, regional, and provincial levels. Estimates of total commodity volume doubled from 2016 to 2017 with no disasters or disease epidemics found, necessitating a corresponding increase in user requirements in the same period. Reasons for this mismatch include weak coordination between programs and warehouse managers at all levels on allocation of commodities and budget-driven commodities procurement and allocations that may satisfy health program requirements but not match end user requirements.

2. Procurement inefficiencies

Inefficiencies in procurement by multiple procuring entities at all levels of the system are likely. For example, at the LMD, an inventory age analysis showed that approximately 26% and 56% of the total value of inventory in June and September 2017, respectively, had been in store for more than one year. However, the estimated total value of inventory still increased by 37% in this time period. In the surveyed regional warehouse, the value of locally procured commodities per quarter was well above 50% of the value of centrally allocated commodities (table 2). Regional warehouses may be procuring the same number of commodities that are allocated by programs.

3. Coordination and communication deficiencies

Program and warehouse operations teams need better coordination on procurement planning and allocation processes. Information on quantities in procurement plans and on warehouse physical inventory levels is not used when making important decisions. Automating procurement planning and warehouse operations will significantly enhance accountability and transparency in the DOH's procurement and supply practices.

4. Burden of paper-based warehouse management information system

Although computers are widely available in warehouses, they are not used for warehouse operations. Computers appear to have increased rather than decreased the workload because of double data entry into the computer and on paper.

There is a very heavy data burden on human resources for warehouse operations at all levels of the DOH's supply system. The underlying rationale for the labor-intensive data collection and paper-based documentation process is to satisfy the Commission on Audits' requirement. However, the collected data are inaccessible for decision making in warehouse operations and procurement and supply system operations.

5. Lack of business intelligence

The paper system makes data inaccessible and limits end-to-end visibility in the DOH's supply system. There are no analytics on collected data, which is a barrier to obtaining the business intelligence necessary for optimizing procurement and warehouse resource utilization, warehouse operations improvement, performance monitoring, and inventory and operations control.

6. Inadequate investment in the public health supply system

Investment in the development of supply system capabilities is inadequate. Programs do not allocate funds for WMS and supply system improvement initiatives. Potential efficiency gains in program procurement and allocation practices would free up funds that could be used to enhance supply system capabilities and better serve the Filipino population.

Conclusion and Recommendations

Three major action areas were identified as part of the improvement plan developed by the LMD with assistance from the USAID-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program following the validation and concurrence of the findings of the assessment:

- Establishing mechanisms to balance supply and demand of allocation at all levels
- Harmonizing processes and guidelines and building capacity for warehouse and distribution operations at all levels
- Automating these procedures and their corresponding data management

The DOH should implement a WMS technology solution with multilocation capability to enable end-to-end commodity flow visibility, significantly mitigate financial waste, and improve accountability and transparency, all of which will lead to improved availability of commodities at service delivery points.

The WMS technology solution option with the lowest resource burden for the DOH is to develop new WMS software. This report outlines the requisite steps for developing a WMS technology solution that will meet the needs of the DOH.

BACKGROUND

The goals of Republic of the Philippine's Health Agenda 2016–2022 are to ensure the best health outcomes for all without socioeconomic, ethnic, gender, or geographic disparities; promote health and deliver health care in ways that respect, value, and empower clients and patients as they interact with the health system; and protect all families, especially the poor, marginalized, and vulnerable, against the high costs of health care.

The Philippines has a population of approximately 100,699,000 and a health expenditure per capita of USD 135 (WHO 2014), which is far below the WHO regional amount of USD 800 (World Bank, 2012). This is also very low considering that the broad cause groups of death are cardiovascular disease, diabetes, and other noncommunicable diseases that are expensive to treat.[1]

The DOH is the national health policymaker and regulator. It comprises various central bureaus and services in the Central Office, Centers for Health Development (CHDs) in every region, and DOH-retained hospitals. The AS in the Central Office manages and monitors the DOH's medicines and non-medicine inventory items. Procurement of these items is decentralized, with decision making delegated to health programs. Nineteen programs procure items that are categorized as drugs, medicines, and nutrients; vaccines; chemical solutions, reagents, test kits, and other supplies; and health equipment and devices, with an estimated annual budget of PHP 13 billion, or approximately USD 260 million (DOH Annual Procurement Plan, FY2017). However, the total annual procurement budget, including all categories of items in 2017, was PHP 16.48 billion (approximately USD 330 million).[2] Procurement is managed through the Philippine Government Electronic Procurement System (PhilGEPS).

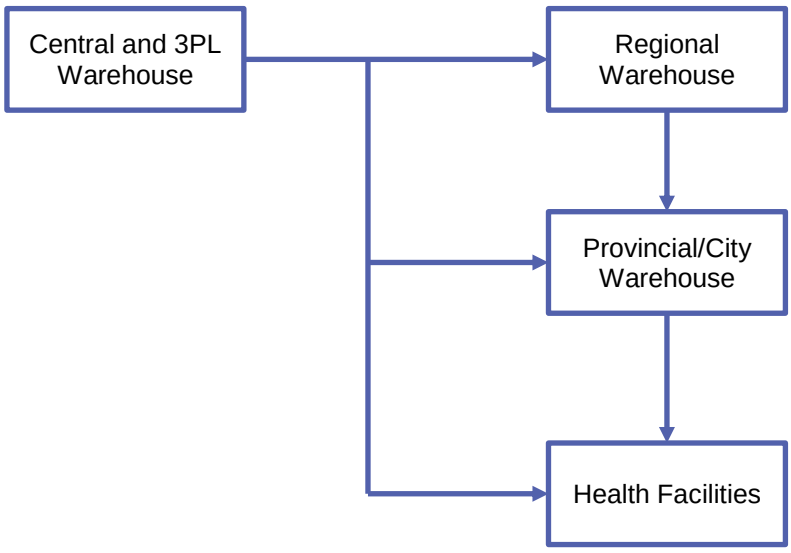

Figure 1. DOH distribution network

[1] WHO country statistical profile
[2] Philippine DOH Annual Procurement Plan FY2017

Suppliers deliver all procured items to the AS's LMD. The items may be stored at the DOH's own warehouses or at 3PL warehouses and subsequently transported by 3PLs to subnational warehouses.

The 17 regions in the country also procure medicines and non-medicine items to fill central supply gaps and manage warehouses. Regional warehouses serve 81 provincial warehouses across the country.

Local government units (LGUs) are divided into three levels: provinces and independent cities; component cities and municipalities; and barangays. These LGUs also procure and supply medicines and non-medicine items to health facilities in their jurisdictions.

Recent assessments of the DOH's medicines procurement and distribution management found numerous national policies covering critical aspects of medicine management. However, issues were identified in the areas of quantification, warehousing, distribution, utilization, monitoring, and disposal. Specifically, in the area of warehousing, poor storage conditions and inadequate storage practices, such as the absence of batch/lot management, no regular inventory, and missing or insufficient shelves, were identified in all warehouses, storage/supply rooms, and pharmacies at all levels (Salenga et al, 2014; NTP Joint Program review, 2016).

Procurement and distribution management issues affect all 19 programs run by the DOH. For example, since 2012, the DOH has been distributing centrally procured family planning (FP) commodities. However, weaknesses in the supply chain led to either stock-outs or overstocking of commodities. Across the five rounds of the KP Operations Monitoring Survey, an average of 38% of RHUs reported stock-outs of FP commodities. One identified key area of weakness is distribution (warehousing and transportation) of commodities.

According to interviews with LMD personnel prior to this assessment, the 3PL engaged by the DOH is often unable to follow the prescribed quarterly delivery schedule. Document preparation for delivery to more than 2,000 RHUs takes two to three months, which results in a delay in releasing the commodities for distribution. Because of this delay, some regions receive only two shipments per year. Among the underlying confounding factors is a lack of access to service delivery point data by central office managers.

Previous assessments have called for "continuous initiatives to strengthen and improve the current pharmaceutical supply system" in the Philippines (Bailey, Ocampo and Linatoc, 2015). As part of its effort to address identified issues, the Office of the Secretary of Health created a supply chain management unit (SCMU) under the Office for Health Regulations (DPO No. 2016-0789) on March 7, 2016. A memorandum was issued to all DOH regional offices recommending the decongestion of regional warehouses through the dispatch of health commodities and rental of regional warehouses.

The LMD, in collaboration with the Knowledge Management and Information Technology Service (KMITS), wants to enhance the capability of the DOH's National Online Stock Inventory Reporting System (NOSIRS) to allow reporting of medicine data from the facility level to the regional and central levels. In addition, DOH management is pushing to acquire and operate warehouses at the regional level. At the central and regional levels, there are gaps in creating efficient warehouse management operations, ensuring that the LMD is able to

serve the needs of the DOH, and improving service delivery to all health facilities in the country through the establishment of a fully functional WMS.

In line with the DOH's objective of strengthening its WMS, this short-term technical assistance supported the LMD to assess the existing system, including equipment, space, tools, and processes. The assistance identified key requirements and high-level technical specifications for implementation of an IT WMS that is tailored to the local context and needs.

METHODOLOGY

The assessment methodology consisted of a desk review; key informant interviews; and field visits to the LMD, 3PL, RHO, and RITM warehouses and city/community health facilities.

Scope of the Assessment

Included in the desk review were assessments carried out within the last two to three years; DOH administrative orders and memoranda on interventions in the DOH's procurement, warehousing, and transportation operations; and the current health agenda (DOH's health strategic plan).

Key informant interviews and field visits collected data on existing WMSs at the central, regional, provincial, and facility levels. Data were collected on:

- Material handling equipment
- Management information tools
- Storage space/capacity
- Standard operating procedures (SOPs)
- Information flow processes
- Inventory management policy (legal framework, procedures, records, reporting, guidelines for inventory valuation, adjustments, reserves, and disposition)
- Stakeholder and customer WMS requirements at central- and regional-level warehouses
- A technology function and user requirements gap analysis on existing and proposed WMSs

Based on the findings from the assessment and stakeholder knowledge of the DOH's warehousing and transportation operations, a WMS improvement plan was developed.

Sampling

A purposive sampling technique was used to select critical cases. Critical units included in the sample were two DOH-owned central-level warehouses, one third-party service provider warehouse, one regional office warehouse, one provincial warehouse, one rural health facility, and one city health facility. At least two key informants were interviewed at each surveyed warehouse, and at least one key informant interview was conducted per identified information technology and procurement and distribution policy and practice.

Details on the units and key informants included in the sample are shown in annex B.

Data Collection and Analysis

Data on the DOH's procurement, warehouse, and transportation operations were obtained primarily from transaction records and reports available in surveyed warehouses at all levels. Additional data were obtained using two questionnaires:

1. *Warehouse management information technology questionnaire:* This questionnaire collected data on available technology infrastructure and on technical and functional requirements. Identified IT systems available in the DOH were assessed for their capability to support warehouse operations.

   On the basis of the findings from this IT assessment, four WMS technology solutions were formulated:

   - Develop new WMS software
   - Purchase proprietary WMS software
   - Enhance existing solutions to include WMS functionalities
   - Purchase an open source WMS with DOH resources

   These four options were compared based on development cost and time, purchase cost, license fees, customization cost, deployment flexibility, support fees, support availability, version updates, vendor dependence, code ownership, documentation, resource expertise, and implementation time.

   The comparison applied a resource burden scale of 0 to 3, signifying a progression of very low (0), low (1), medium (2), and high (3) on a resource burden scale. More details on the comparison of these four WMS technology solutions are presented in the section on findings in this report.

2. *Physical warehouse infrastructure and procedures questionnaire:* This questionnaire collected data on warehouse infrastructure, operations, procedures, and practices.

   Collected data were analyzed using Microsoft Excel to determine storage capacity, aging of inventory, and total volume of commodities flowing through central warehouses. Availability and status of SOPs and warehouse operations and practices were also assessed.

FINDINGS

The findings from this assessment have been organized into the following thematic areas: commodity flow, stock information, procurement, and warehouse operations. Warehouse operations were further divided into receiving, putaway, storage, picking, packing, cross-docking, space management, transportation, task and labor management, and information technology.

Commodity Flow

Figure 2 shows the public health supply system commodity flow. The DOH's LMD centrally operates warehouses. These can be considered transit warehouses because items in storage are preallocated by different programs to regional, provincial, and city/community health facilities and cannot be picked for nonprogram orders.

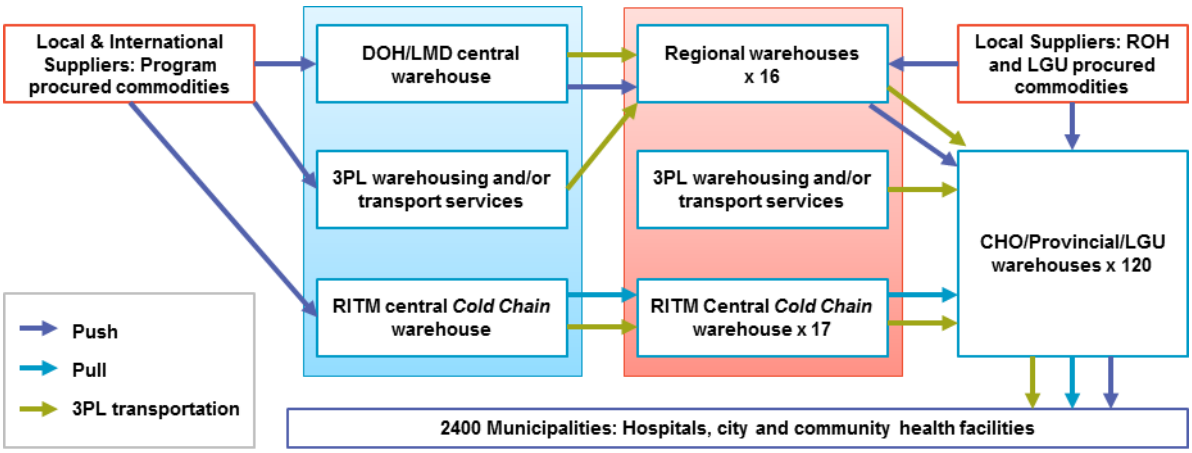

Figure 2. Philippines public health supply system commodity flow chart

Suppliers deliver procured commodities to LMD central warehouses or to 3PL warehouses. Based on program allocations, the LMD processes property transfer documentation for the delivery of allocated commodities to regional warehouses. This is a push distribution model.

Vaccines and other cold chain commodities are managed by the RITM with transportation outsourced to 3PLs. The RITM employs push and pull distribution models. The central office allocates commodities, and regional health offices also make requests (pull).

Transportation

In general, transportation operations among the central, regional, and provincial strata of the public-sector supply network are outsourced to 3PLs. The 3PL that was surveyed reported experiencing challenges with delivery due to delays in scheduling and issues related to the allocation of unwanted commodities.

Procurement

Public procurement is regulated by Republic Act 9184[3] of 2003. The DOH's central procurement is managed by Procurement Services. Health programs, the mandated owners of procured products, prepare project procurement management plans, which include allocation plans. The Bids and Awards Committee Secretariat consolidates the plan into the annual procurement plan, which is recommended by the Committee by resolution for approval by the Head of the procuring entity. No government procurement is undertaken unless it is in accordance with an approved annual procurement plan.

Programs follow a one-year procurement period plus an additional three-month requirement as buffer stock. Suppliers deliver procured products to the LMD warehouse for custody and subsequent delivery based on allocation plans prepared by the responsible health program. Regional, provincial/city, and health facilities cannot directly order products from warehouses as they do not have the mandate to fill orders placed by end users. Commodity allocations are done exclusively by programs.

Warehouses are not involved in tracking and updating program budget allocations. Central, regional, and LGU offices and hospitals are authorized to procure medicines and other health supplies to supplement shortages in program allocations (emergency procurements only).

Finally, the DOH outsources brokerage service to 3PL providers.

Central Warehouse Stock Information

The LMD handles more than 230 unique products, categorized as medicines; medical supplies; medical equipment; general supplies; appliances; information, education, and communication materials; t-shirts; and mosquito nets and other miscellaneous items.

Products that are procured by cartons may be picked and repacked into smaller units for delivery to subnational warehouses and health facilities.

Table 1. Estimated Value of Commodities Handled by the Central Warehouse in 2017

LMD Warehouse	Inventory value (PHP)
Central	370,251,634.06
QMMC	153,854,333.58
POPCom	188,981,172.35
PhilPost	98,802,673.23
XDE	183,170,792.34
NonParEll	1,034,819,045.35
Depo	3,780,842.12
*Estimated total	2,033,660,493.03
**Actual total value of inventory	2,059,864,352.77

*Based on contract with 3PL; includes three months of buffer stock
**As of June 2017

[3]The Philippines "Government Procurement Reform Act" is available here.

Table 1. Estimated Volumes of Products Flowing through the Public Health Supply System, 2016 and 2017

Program	2016 Estimated Volume, cbm	2017 Estimated volume, cbm [2x 2016 est.]	%
Family Planning	3,815	7,630	21.84
Pharmaceutical Division	3,240	6,480	18.55
National TB Program	2,416	4,832	13.83
Micronutrient Supplementation/IMCI	275	550	1.57
Emerging/Re-emerging Disease	20	40	0.11
Schistosomiasis	110	220	0.63
Filariasis Program and Soil Transmitted Helminthiasis	137	274	0.78
Leprosy Program	50	100	0.29
Health Emergency Management Bureau	500	1,000	2.86
Malaria Control Program, DBCB	20	40	0.11
Expanded Immunization Program	6,337	12,674	36.27
HIV/AIDS control & Prevention Program	550	1,100	3.15
Estimated total	17,470	34,940	100%

Family Planning, Pharmaceutical Division, and National TB Program represent the bulk of commodities handled by the LMD.

Regional Warehouse Stock Information

Based on information collected at one surveyed regional warehouse, items handled may be grouped into three broad categories. Table 3 shows the approximate value of each category of inventory items.

Table 2. Value of Inventory at Critical Case Regional Warehouse

Item category	Estimated value per quarter, PHP
Biological/vaccine items	75,000,000
Locally procured* medicines and medical supplies	30,000,000–50,000,000
Centrally allocated medicines and medical supplies	56,000,000

*Procurement policy allows the ROH to procure items to augment and fill gaps in allocated commodities.

Warehouse Operations

The DOH/LMD has a warehouse operations manual with an effective date of January 10, 2010. However, it is not in use and needs to be updated (annex C).

The surveyed warehouses perform basic operations, such as receiving, storage/putaway, replenishment and picking, inventory management, cross-docking, packing, and 3PL billing.

However, other important operations, such as space and location, are not systematically managed in the warehouses.

Additional storage, loading, and transportation/shipping operations are outsourced to 3PLs.

Receiving

The LMD handles deliveries from at least 80 suppliers for at least 25 DOH programs and offices.

Receiving operations include verification of product quantities and specifications by the Inspection and Acceptance Committee, which ideally comprises LMD staff and health program representatives. There are challenges in ensuring the availability of health program representatives during receiving operations.

This is followed by receipt of reports, routing of those reports to designated departments, and preparation of received products for movement into storage and picking systems. The operation is managed by a paper information system.

There is a designated space in the dock area for receiving, but it is currently utilized as storage space.

Putaway

There is no location management system in place in any of the surveyed warehouses. Location codes exist but are not used effectively, and there is a need to update and automate the system.

Storage

Storage at the surveyed warehouses is a combination of bulk and pallet rack systems with recording by lot/batch numbers on paper and Excel spreadsheets. Quantity on hand is monitored using bin cards and spreadsheets.

At the surveyed regional warehouse, color codes are used for bulk storage management:

- Red = short expiration date
- Green = recently received
- Yellow = more than six months until expiration date

In all of the warehouses surveyed, material handling equipment was found to be inadequate.

Space Management

LMD management estimated the total storage space utilized at its multilocation and 3PL warehouses to be approximately 23,390 cubic meters. Nearly 29% of this total storage space holds commodities, including pharmaceuticals at ambient temperature (tables 4 and 5).

Table 3. LMD Temperature-controlled Storage Capacity

DOH Warehouse	Estimated Ideal Capacity, cbm	Estimated Actual Usage, cbm
Tayuman (Building 25)	165	550
Quirino (Project 4, Q.C.)	440	660
POPCOM (Mandaluyong)	440	440
PhilPost (Port Area)	440	330

DOH Warehouse	Estimated Ideal Capacity, cbm	Estimated Actual Usage, cbm
Ximex (Taguig City)	6,000	4,000
Nonpareil (Paranaque City)	12,000	13,750
Total	19,485	19,730

Table 4. LMD Ambient Temperature Storage Capacity

DOH Warehouse	Estimated Ideal Capacity, cbm	Estimated Actual Usage, cbm
Tayuman (Building 25)	440	660
Nonpareil (Paranaque City)	6,000	5,000
Grand total	6,440	5,660

The LMD outsources additional warehousing and brokerage services to 3PLs.

3PL informed the assessment team that its temperature-controlled storage space, which is allocated to serve the DOH/LMD, has been fully utilized, as has additional allocated emergency storage space. Between 60% and 70% of this 3PL storage space is occupied by nonmoving commodities, such as depot medroxyprogesterone acetate, combined oral contraceptive, and levonorgestrel and ethinylestradiol + ferrous pills. The remaining 30% to 40% of 3PL storage space is allocated to fast-moving commodities, and to staging and temporary receiving operations. Warehousing of products requiring cold chain management is handled by the RITM, whose warehouse capacity is shown in table 6. This storage space is manually managed.

Table 5. RITM Storage Space

Name	Store Type	Net Volume (lit.)
Cold room 1	Above zero (+4°C)	27,100.08
Freezer room 1	Below zero (-15°C)	6,675.83
Cold room 2	Above zero (+4°C)	51,930.58
Cold room 3	Above zero (+4°C)	6,895.00
Dry store 1	Dry	13,633.43
Cold room 4	Above zero (+4°C)	22,959.57

Regional and provincial offices operate intermediate transit warehouses. The total storage space potentially available at the surveyed regional warehouse is approximately 670 sqm. However, only 493 sqm of this storage space is available in-house, 130 sqm of which is temperature controlled. The remaining 176 sqm is outsourced. The surveyed regional warehouse appeared to be operating at full capacity. However, pallet stacking, pallet racking, and location management would free up at least 20% of the currently occupied space. Also, the Central Office's authorization in March 2017 (DM No 2017-0135) for regional offices to rent an additional 1,000 sqm of storage space has not implemented in this surveyed region due to lack of qualified local 3PLs. There is a plan to relocate the regional warehouse to a new site by the end of 2018.

Surveyed central and regional warehouses appeared to be operating at full capacity, particularly considering that corridors and offices not intended for storing medicines were currently being used as storage and sorting areas. However, an inventory aging analysis done on LMD warehouse data showed that by implementing good procurement and warehouse

management practices, DOH warehouses may be able to free up anywhere from 29% to 73% of storage space, depending on the program/product category and associated inventory policy (table 7). For example, the Health Emergency Management Bureau's (HEMB) inventory policy requires warehouses to hold 25% of total stock requirements for emergency situations. Other programs have similar policies requiring 10% to 15% safety stock holding.

Inventory Management

Inventory record keeping and management practices are in place at the surveyed central and regional warehouses. These practices and procedures, along with relevant policies, are described in warehouse operations manuals (WOMs). However, the WOMs found at surveyed warehouses are outdated.

A draft version of a guideline on physical inventory counts is available at the LMD, pending finalization. The LMD conducted a physical inventory count twice in 2016, and the most recent count took place in August 2017.

There is no written, systematically applied inventory policy that provides guidelines and accounting policies to ensure that inventory is properly controlled and costed and that losses or shortages are prevented. Identified gaps in inventory management, which are linked to this deficiency, include absence of guidelines on inventory valuation, slow moving and excess inventory/reserves, reconciliation of perpetual inventory, obsolete items, and inter-region and inter-facility transfers.

The LMD operations team has a role in inventory information sharing with programs; however, "no information system is available to generate the information on available storage capacity, quantities in stock, etc.," according to the LMD operations manager.

It is expected that information on inventory status will be shared among central, regional, and provincial warehouses through quarterly reports, which regional warehouses send to the DOH Central Office. However, these reports are not systematically and effectively produced, shared, or utilized for decision making at the central level.

Within the LMD, the operations team shares paper-based monthly inventory reports with its monitoring team, which in turn shares them with programs. According to LMD managers, programs are unlikely to make use of these reports. Also, verbal advice the LMD has given programs on inventory status in the past has not influenced procurement and allocation decisions.

Programs use a paper-based system to manage allocations and generally follow two steps. Programs make allocations to fulfill the approved budget requirements and then make adjustments to the initial allocations after commodities have been delivered to the LMD. Allocations are finalized after procurement of commodities has taken place. There is no policy on allocations.

The LMD prepares a monthly consolidated inventory spreadsheet. These data were used as part of this assessment to analyze inventory aging and value. The assistance provided an opportunity to conduct these analyses at the LMD for the first time.

Age and Value of Inventory

As part of this assessment, the age and value of inventory were analyzed and estimated between June and September 2017 at the LMD central warehouse (table 7).

Table 6. Age and Value of Inventory Estimates between June and September 2017 at the LMD Warehouse

	June		September		% Difference in value of inventory
Program (line items)	**>180 days in warehouse**	**>365 days in warehouse**	**>180 days in warehouse**	**>365 days in warehouse**	
Drugs and Medicines - Disease Prevention and Control Bureau (DPCB) (n = 104 vs. 122)	92.40%	23.65%	88.85%	64.50%	+25.06
Drugs and Medicines - HEMB (n = 19 vs. 29)	79.52%	41.52%	44.32%	25.74%	+103.02
Drugs and Medicines - Pharmaceutical Division (PD) (n = 38 vs. 45)	43.51%	23.69%	17.05%	0.00%	+110.02
Medical and other Supplies - DPCB (n = 59 vs. 98)	67.36%	57.15%	58.13%	51.47%	+120.15
Medical and other Supplies - HEMB* (n = 32 vs. 34)	76.92%	29.27%	42.20%	25.69%	+37.70

*Number of "Medical and other Supplies" items for the other programs and offices varies from two to six items. Therefore, aging and value were not analyzed for these items.

This analysis found that between 23.65% and 57.15% of the estimated total value of the inventory per program had been in store for more than a year as of June 2017, and this climbed to 64.50% in September 2017. However, an estimate of the difference in the total value of inventory between these time points showed a 37.43% increase, suggesting that more commodities have been moving in than moving out during this period. This inference was validated through stakeholder interviews. Furthermore, there are still pending deliveries from suppliers.

The LMD is expected to hold commodities in storage at its warehouse for two to three months before delivery to regional offices. Based on this, there is no justification for commodities to remain in the warehouse for longer than one year, as shown by the age analysis (table 7).

Analyses of the commodities of the two major programs, FP and the national TB control program, are shown in tables 8 and 9.

Table 7. Age and Cost of Inventory between June and September 2017 (Family Health Office)

	June (n = 31)		September (n = 45)	
	>180 days in warehouse	**>365 days in Warehouse**	**>180 days in warehouse**	**>365 days in Warehouse**
Cost of inventory (PHP)	1.25B	1.19B	1.54B	1.27B
% cost of inventory	97.94%	92.80%	92.16%	76.04%
Total cost of inventory (PHP)		1.28B		1.67B
Difference in total cost of inventory (%)				PHP 395M (+30.91%)

Table 8. Age and Cost of Inventory between June and September 2017 (National TB Control Program)

	June (n = 31)		September (n = 35)	
	>180 days in warehouse	>365 days in Warehouse	>180 days in warehouse	>365 days in Warehouse
Cost of inventory (PHP)	63.58M	27.89M	52.38M	31.95M
% cost of inventory	47.94%	21.03%	45.69%	27.87%
Total cost of inventory (PHP)		132.61M		114.64M
Difference in total cost of inventory (%)				PHP -17.97M (-15.67%)

The percentage and value of near expiry inventory as of September 2017 are shown in Table 10.

Table 9. Percentage and Value of Near Expiry Inventory as of September 2017

Program	% value of inventory expiring in 18 months or less	Value (PHP)	**% value of inventory expiring in 12 months or less	Value (PHP)
Drugs and Medicines - DPCB	11.80	241,638,024.53	8.57	175,434,248.82
Drugs and Medicines - HEMB	7.43	4,984,583	1.62	1,082,455.50
Drugs and Medicines - PD	26.80	60,063,751.96	0.00	0.00
Medical and other Supplies - DPCB	7.03	19,329,552.91	3.59	9,880,824.02
Medical and other Supplies - HEMB*	22.41	4,804,258.00	7.11	1,523,538.00

**Number of "Medical and other Supplies" items for the other programs and offices varies from two to six items. Therefore, cost of inventory of near expiry products was not analyzed for these items.*
***Nearest expiry of stock found is approximately seven months*

3PL Service Management

The DOH/LMD has three service contracts with 3PLs: brokerage, warehousing, and transportation. Regional offices also outsource part of their warehousing operations and transportation to 3PLs. However, these contracts are not systematically managed. For example, the LMD expects the 3PL to complete commodity deliveries to regional offices within 21 days of receiving property transfer reports (PTRs), which are prepared by the LMD. However, key performance indicators have not been established. Therefore, no 3PL service performance assessments have been conducted as of this assessment, which is critical in managing 3PL performance. In situations of late deliveries, a letter is sent to the 3PL to inquire and trigger action.

Transportation and Shipping Management

Transportation and shipping management has been outsourced to 3PLs at central and regional warehouses. Delivery schedules are based on allocations by programs. 3PLs deliver commodities to 16 regional offices, 120 City Health Offices/Provincial Health Offices, and 2,400 municipalities. Transportation of products requiring cold chain is also outsourced to 3PLs.

Inefficiencies in allocation by program have resulted in instances of delivery rejection by regional warehouses and other end users (facilities) due to the delivery of unneeded stock and/or inadequate warehouse space to hold additional inventory.

Order Picking

Order picking is done with the help of PTRs prepared according to allocations received from programs. PTRs are initiated on a computer, finalized manually, and used to pick allocations. Lot/batch numbers are hand written on the PTRs during allocation picking. Order/allocation picking at the LMD and surveyed regional warehouse relies on memory of commodity locations in the warehouse because the locator card is not effectively used during putaway.

The RITM's online tool, wVSSM, has store location functionality that assists picking by tracking the storeroom where commodities are stored. However, there is no in-store location management system used in order/allocation picking operations.

Packing

Packing is manually managed using information from the PTRs.

Cross-docking

Cross-docking is not done at the LMD warehouse. At the surveyed regional warehouse, cross-docking is used only for fast-moving commodities, such as zinc sulfate solutions.

Task and Labor Management

Task and labor management and related tools were not found in surveyed warehouses. This is a huge gap considering that almost all warehouse operations depend on human memory and paper-based information systems. In the surveyed regional warehouse, 11 of 18 staff were designated for administrative and 7 for hands-on warehouse operations. Therefore, approximately 60% of the human resources in the surveyed warehouse primarily perform administrative tasks, such as data capture, record keeping, and communication. This task and labor situation was also observed at the LMD warehouse, and key informants confirmed that a similar situation exists in all regional warehouses.

The status of SOPs for operations at surveyed regional warehouses is shown in table 11.

Table 10. Status of SOPs at Surveyed Regional Warehouses

Warehouse Operations SOP Availability	Yes/No
Receiving	Yes
Storage	Yes
Putaway	Yes
Cross-docking	No
Picking	Yes, needs update
Packing	Yes, needs update
Shipping	Yes, needs update

Concerns Raised by Stakeholders

Table 12 shows concerns that were raised by key informants and warehouse managers.

Table 11. Concerns Raised by Stakeholders

Concerns	Central	3PL	Region	RHU	RITM
Overstocking of products	✔	✔	✔	✔	
Stock-out of products				✔	
Internet connectivity issues	✔		✔	✔	✔
Lack of IT system support	✔		✔	✔	
Duplication of data recording (paper and computer) for audit requirements	✔		✔	✔	
Warehouse renovation			✔		
Significant workload on paper documentation	✔		✔		
Shortage of human resource	✔		✔		
Inadequate warehouse management capability: HR and infrastructure	✔		✔	✔	✔
Manual tracking of available space	✔		✔	✔	✔

Information Technology

Four information technology systems—NOSIRS, Infor Supply Chain Execution, POMIS, and wVSSM—were identified during this WMS assessment. Technology function and user requirements gap analyses were conducted to determine their suitability for supporting warehouse operations. The only IT software with this capability was Infor Supply Chain Execution, which is used by 3PL.

DOH's KMITS team has recognized the need for an integrated procurement and logistics system (figure 3).

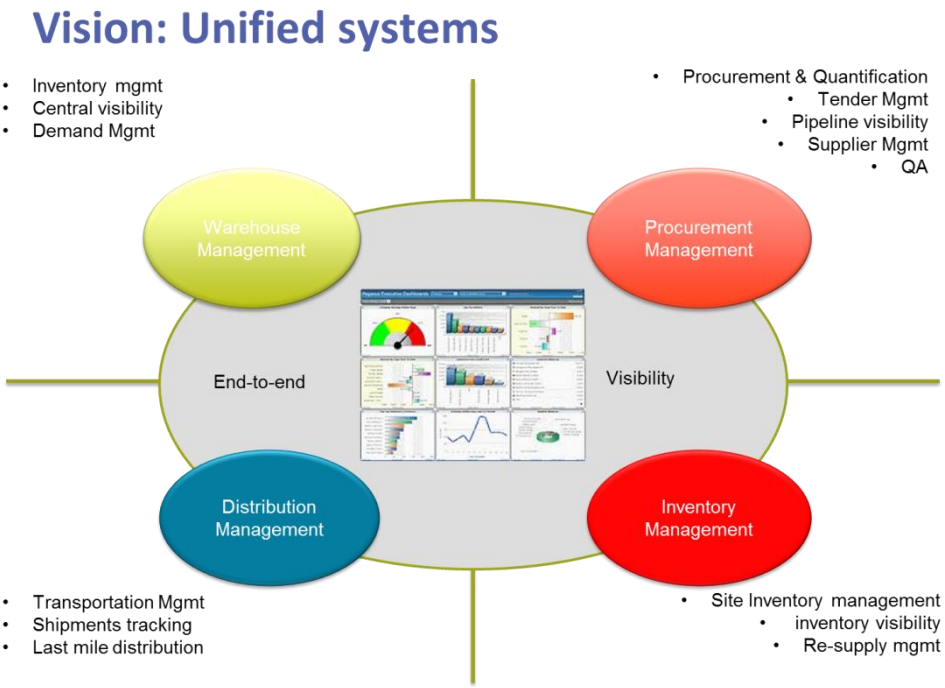

Figure 3. Integrated information systems, including WMS

Additional WMS functionalities (annex C) may be introduced to the integrated system as appropriate. Four WMS technology solution options for an integrated information system were formulated and compared (table 13).

Table 12. WMS Technology Solutions

Comparison criteria	Develop new WMS software	Proprietary WMS software	Enhance existing solutions to include WMS functionalities	Open source WMS with DOH resources	Other comments
Development cost	High	None	Medium	None	
Development time	Medium	None	High	Medium	
Purchase cost	None	High*	None	None	*There may be proprietary solutions that use open source as their base In that case, there will an acquisition cost but it will be significantly lower than that of a commercial off-the-shelf solution
License fees	Low	High	Low	Low	
Customization cost	Low	High	High/Medium (DOH resources)*	Medium (DOH resources)*	*DOH resource cost is the cost of customization if DOH resources are used
Deployment flexibility	High	Low (per user license)	Medium	Low	
Support fees	None (DOH resources)*	Required: High/Medium	None (DOH resources)*	None (DOH resources)*	*DOH resource cost is the cost of support if DOH resources are used
Support availability	Yes*	Yes	Yes*	Limited or no vendor support*	*DOH resources will provide support
Version updates	DOH resources	Vendor dependent	DOH resources*	DOH resources*	*Open source versions are dependent on community contribution DOH will be responsible for downloading and implementing the latest version
Vendor dependence	None	High	None	Low/Medium*	*Open source is developed by community contribution
Code ownership	DOH owns*	Vendor owns	DOH owns*	DOH has access*	*DOH may manipulate the code per its needs and has ownership in that sense
Documentation	May not be detailed (usually sparse)	Detailed documentation	May not be detailed (usually sparse) or none	May not be detailed (usually sparse)	
Resource expertise	DOH will provide	Vendor provided	DOH will provide	DOH or community will provide*	*DOH and DOH partners may provide
Implementation time (functional at central level = 5 warehouses)	3–5 years	2–3 years	6–8 years	2–5 years*	*Dependent on available open source versions

To facilitate of the selection of a WMS technology solution option, a resource burden scale of 0 (very low), 1 (low), 2 (medium) or 3 (high) was applied to compare criteria. Evaluation scores for the four WMS technology solution options are shown in table 14.

Table 13. WMS Technology Solution Options Evaluation Scores

Comparison criteria	Develop new WMS software	Proprietary WMS software	Enhance existing solutions to include WMS functionalities	Open source WMS with DOH resources
Development cost	3	0	2	0
Development time	2	0	3	2
Purchase cost	0	3	0	0
License fees	1	3	1	1
Customization cost	1	3	3	2
Deployment flexibility	3	1	2	1
Support fees	0	3	0	0
Support availability	3	0	3	3
Version updates	0	3	0	2
Vendor dependence	0	3	0	1
Code ownership	0	3	0	2
Documentation	1	0	3	2
Resource expertise	3	1	3	2
Implementation time	1	0	3	2
Total	18	23	23	20

The WMS technology solution option with the lowest resource burden score (18 points)—develop new WMS software—is the most practical solution. This is further supported by stakeholder assumptions and recommendations when considering existing policies.

The development of WMS technology solution is shown in figure 4.

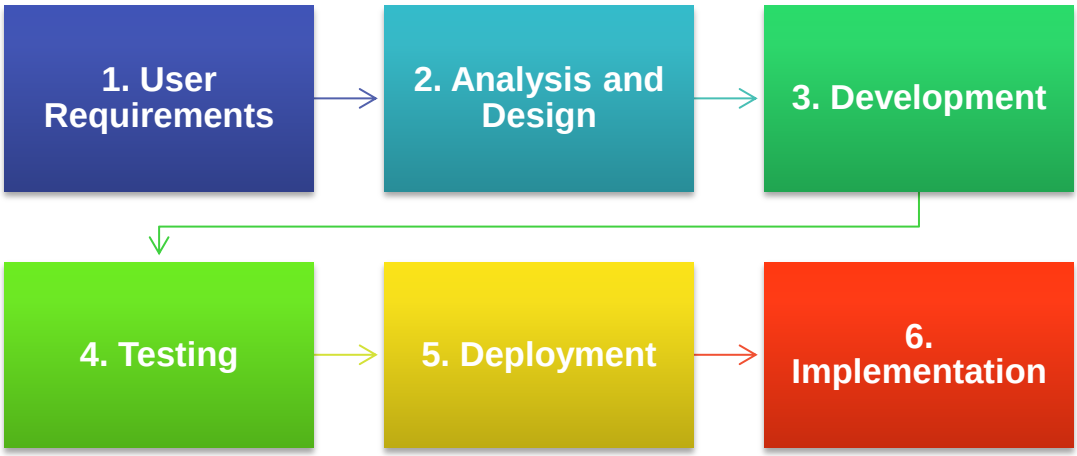

Figure 4. WMS technology solution development

The information provided in this assessment report is a significant portion of the information needed to complete steps 1 and 2 in the WMS technology development process.

Stakeholder Recommendations

During the data collection and presentation of findings from this assessment, key stakeholders made the following recommendations:

1. The DOH should develop and implement a supply chain management policy and guidelines
2. The DOH should pilot a WMS technology solution in the central and a few regional warehouses
3. The DOH should establish a mechanism to enable the LMD and RITM to fulfill an advisory role for programs in commodity procurement and allocation
4. The DOH-KMITS should speed up implementation of its vision to incorporate wVSSM into NOSIRS and to develop an integrated procurement and logistics system, including a WMS

Additional stakeholder recommendations are shown in table 15.

Table 14. Additional Stakeholder Recommendations

Recommendations	Central	Regional	RHU	RITM
Use of integrated IT system	✔	✔	✔	✔
Harmonized processes for SCM	✔	✔		
Improve human resource capacity through trainings	✔	✔	✔	✔
Use of reliable data for allocation of products	✔	✔	✔	✔
Regular consultative meeting of supply officers and program managers	✔	✔		

ANALYSIS

Important interpretations can be made from the findings of this assessment, which highlight opportunities for strengthening the DOH's WMS. These interpretations are presented in this section of the report.

Allocation Inefficiencies

An inventory age analysis and the periodic rejection of some deliveries, as reported by 3PL, point to a mismatch between allocation quantities and end user requirements. This leads to a backlog of commodities, which overburdens warehouse capacity at the central, regional, and provincial levels. Estimates of total commodity volume doubled between 2016 and 2017 (table 2) with no disasters or disease epidemics necessitating a corresponding increase in user requirements in the same period. Reasons for this mismatch include weak coordination between programs and warehouse managers at all levels on allocation of commodities and budget-driven commodities procurement and allocation that may satisfy a health program's budget requirements but not match end user requirements.

3PLs also face a challenge with delivery scheduling due in part to allocation issues.

Procurement Inefficiencies

Inefficiencies are likely in procurement because of multiple procuring entities at all levels of the system. At the LMD, for example, an inventory age analysis showed that approximately 26% and 56% of the total value of inventory in June and September 2017, respectively, had been in store for more than one year. However, the estimated total value of inventory still increased by 37% in that period. In the surveyed regional warehouses, the value of locally procured commodities per quarter was well above 50% of the value of centrally allocated commodities (table 3). Regional warehouses may be procuring as many commodities as are allocated by programs.

LGUs also procure commodities, and there is no coordination or communication with central and regional procuring entities. The lack of visibility on the volume of commodities flowing through DOH warehouses enables unwanted procurements, which leads to financial waste and failure of the system to fully satisfy patient needs. Stakeholders at surveyed RHUs raised a concern about stock-outs of products (table 12).

Coordination and Communication Deficiencies

Program and warehouse operations teams do not coordinate or communicate on procurement planning and allocation processes. Therefore, information on quantities in procurement plans and warehouse physical inventory levels is neither shared nor utilized for making important decisions. Automating procurement planning and warehouse operations will significantly enhance the accountability and transparency of the DOH's procurement and supply practices.

Burden of Paper-based Warehouse Management Information System

Although computers are widely available in warehouses, they are not used for warehouse operations. Computers appear to have increased rather than decreased the workload because of double data entry in the computer and on paper.

The data burden on human resources for warehouse operations at all levels of the DOH's supply system is significant. The underlying rationale for the laborious data collection and documentation process is to satisfy the Commission on Audits' requirement. However, other than audits, the collected data are inaccessible for decision making in warehouse operations and procurement and supply system operations.

A WMS technology solution with multilocation capability will enable end-to-end visibility, significantly mitigating waste and improving the availability of commodities at service delivery points.

Lack of Business Intelligence

Data inaccessibility due to the paper system limits end-to-end visibility in the DOH's supply system. There are no analytics performed on collected data, which is a barrier to obtaining the necessary business intelligence for the optimization of procurement and warehouse resource utilization, warehouse operations improvement, performance monitoring, and inventory and operations control.

Because 3PLs provide warehousing and transportation services at the central and regional levels, their WMS or enterprise resource planning systems should have data that would be extremely valuable to the DOH/LMD and RHOs when making better procurement, warehousing, and delivery decisions (figure 2).

Inadequate Investment in the Public Health Supply System

Investment in the development of supply system capabilities is inadequate. Programs do not allocate funds for WMS and supply system improvement initiatives. Potential efficiency gains in program procurement and allocation practices would free up funds that could be used to enhance supply system capabilities and better serve the Filipino population.

CONCLUSION

The DOH's WMS has basic capabilities for running warehouse operations. However, several inefficiencies hinder satisfactory performance, including procurement and allocation practices and a heavy data burden on human resources linked to the Commission on Audit's requirement. These limit the effectiveness of the WMS and contribute to poor resource utilization.

Contrary to the common opinion among stakeholders about inadequate storage capacity, the findings from this assessment indicate that surveyed warehouses have adequate storage capacity. The root causes of the apparent storage capacity issues are poor procurement and allocation practices and reliance on paper-based information systems that do not adequately support warehouse operations. Technology-enabled management of storage space, the use of pallet racks and pallet racking storage systems, and the rationalization of procurement and allocations will free up significant portions of currently occupied storage space at all levels of the system.

Three major action areas were identified as part of the improvement plan developed by the LMD (annex A) during the assistance following the validation and concurrence of the findings of the assessment. These action areas included establishing mechanisms to balance supply and demand of allocation at all levels; harmonizing processes and guidelines and capacity building for warehouse and distribution operations at all levels; and automating these procedures and their corresponding data management.

Therefore, it will be critical to implement an IT-enabled WMS that will support all warehouse operations following the standardization of procedures and policies for warehousing and distribution operations at all levels. This, coupled with strengthening accountability and transparency mechanisms, would lead to significant cost savings, which would be reinvested into procurement of essential commodities to better satisfy the commodity needs of the Filipino population.

WMS Technology Solution Development

The WMS technology solution option with the lowest resource burden for the DOH is developing new WMS software.

The KMITS has a vision for an integrated IT solution for the DOH's procurement and supply system. However, the plan to enhance the capabilities of NOSIRS has stalled, and it would be helpful to identify a senior IT leader/champion who could put wind in KMITS' sails for creating a WMS technology solution that may later interface with the integrated procurement and logistics system envisioned by the KMITS.

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ANNEX A

Improvement Plan

October 3, 2017
LMD and RITM

Intervention	Specific Activities	Resources Required	Responsible Party	Implementation Timeline
Revision and harmonization of existing SOPs	Revise SOPs of the "Warehouse Big 5" (receiving, putaway, storage, picking and packing, and dispatch) through the conduct of writeshops/workshops	Funding for workshops/writeshops Technical assistance from partners and/or programs	AS LMD, RITM	Nov 2017
Enhance coordination in demand and supply planning	Support establishment of protocols for demand and supply planning through meetings/workshops	Technical assistance from partners and/or programs	AS LMD, PD, programs	Nov 2017
Orientation and training of warehouse personnel (DOH Central Office and RITM)	Conduct internal orientation and training of warehouse personnel	Funds for training	AS LMD, RITM	Dec 2017
Enhance the terms of reference for the DOH 3PL	- Meetings/workshops with stakeholders regarding the improvement of key performance indicators for the 3PL - Review and finalize terms of reference and 3PL specifications with improved penalties and requirements	Funds for meetings and workshops	AS LMD, programs, RITM, 3PL	Dec 2017
Hiring of personnel at the DOH central level	Recruit prospective candidates for the warehouse management section of the DOH (pharmacists and warehouse personnel)	Management approval and pool of applicants	AS	Jan 2018
NOSIRS roll out at the regional level	Conduct workshop for the regional roll out of NOSIRS (Luzon and VISMIN funds)	Funds for workshops (programs)	AS LMD, programs, RITM, USAID	Jan 2018
Identify possible health partners to improve the DOH's SCM system	Recommend that OAFP (as SCMU head) schedule a health partners meeting (e.g., USAID, EU, JICA, UNFPA) through BIHC	Funds for the health partners meeting Technical assistance from partners and/or DOH programs	AS, OAFP	Jan 2018
Initial development of the WMS	Meet with DOH KMITS to identify the best WMS for the LMD	Technical assistance from partners and/or DOH programs	AS KMITS	Feb 2018

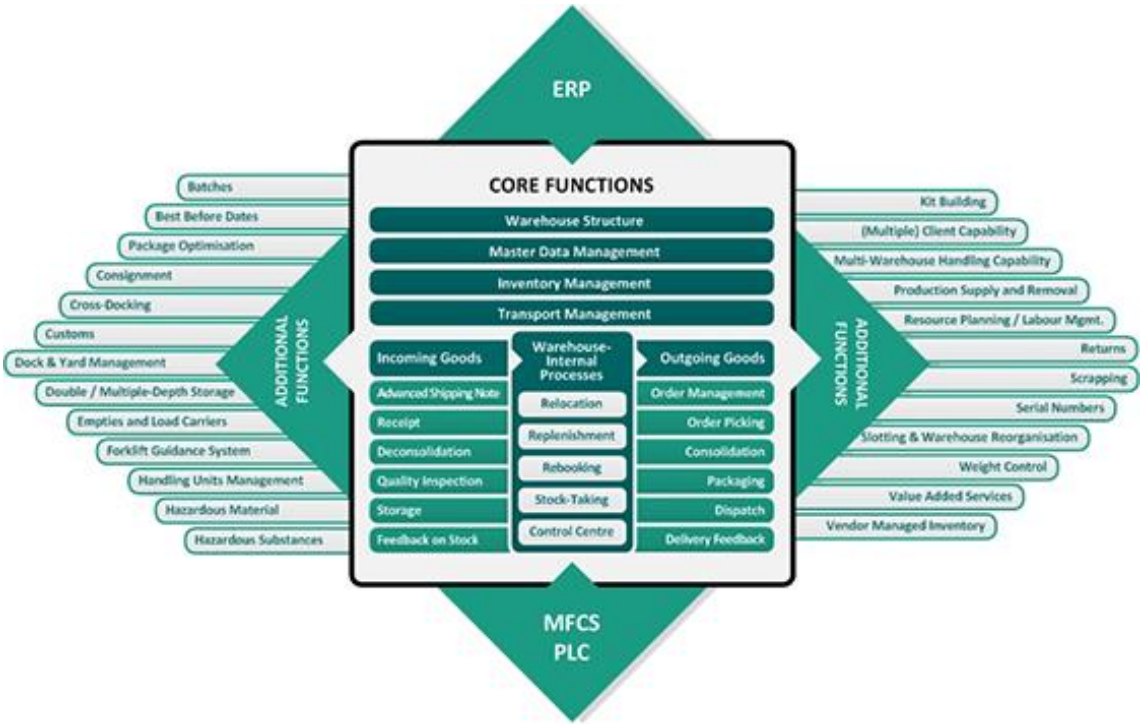
Intervention	Specific Activities	Resources Required	Responsible Party	Implementation Timeline
Revision of related SOPs (e.g., monitoring, payments)	Revise SOPs for other warehouse processes through writeshops/workshops and meetings	Funding for workshops/writeshops	AS LMD, RITM	Mar 2018
Finalize SOPs, WOM, and training package	Finalize SOPs, WOM, and training packages through partners and stakeholders meetings and workshops	Technical assistance from partners and/or programs	AS LMD, RITM, regional supply officers	2019
Fully functional WMS and LMIS (central, regional, and LGU level)	-Full implementation of WMS and NOSIRS for all levels within the SCM system - Monitoring and evaluation of warehouse and 3PL performance	Funding for workshops/writeshops	AS LMD, KMITS, RITM, supply officers, programs	2019
Functional SCMU	-Collaborate with stakeholders to support the establishment of a functional SCMU to handle all issues within the supply chain - Finalize policy on SCMU and processes	Technical assistance from partners and/or programs	AS LMD, RITM, regional supply officers	2019

ANNEX B

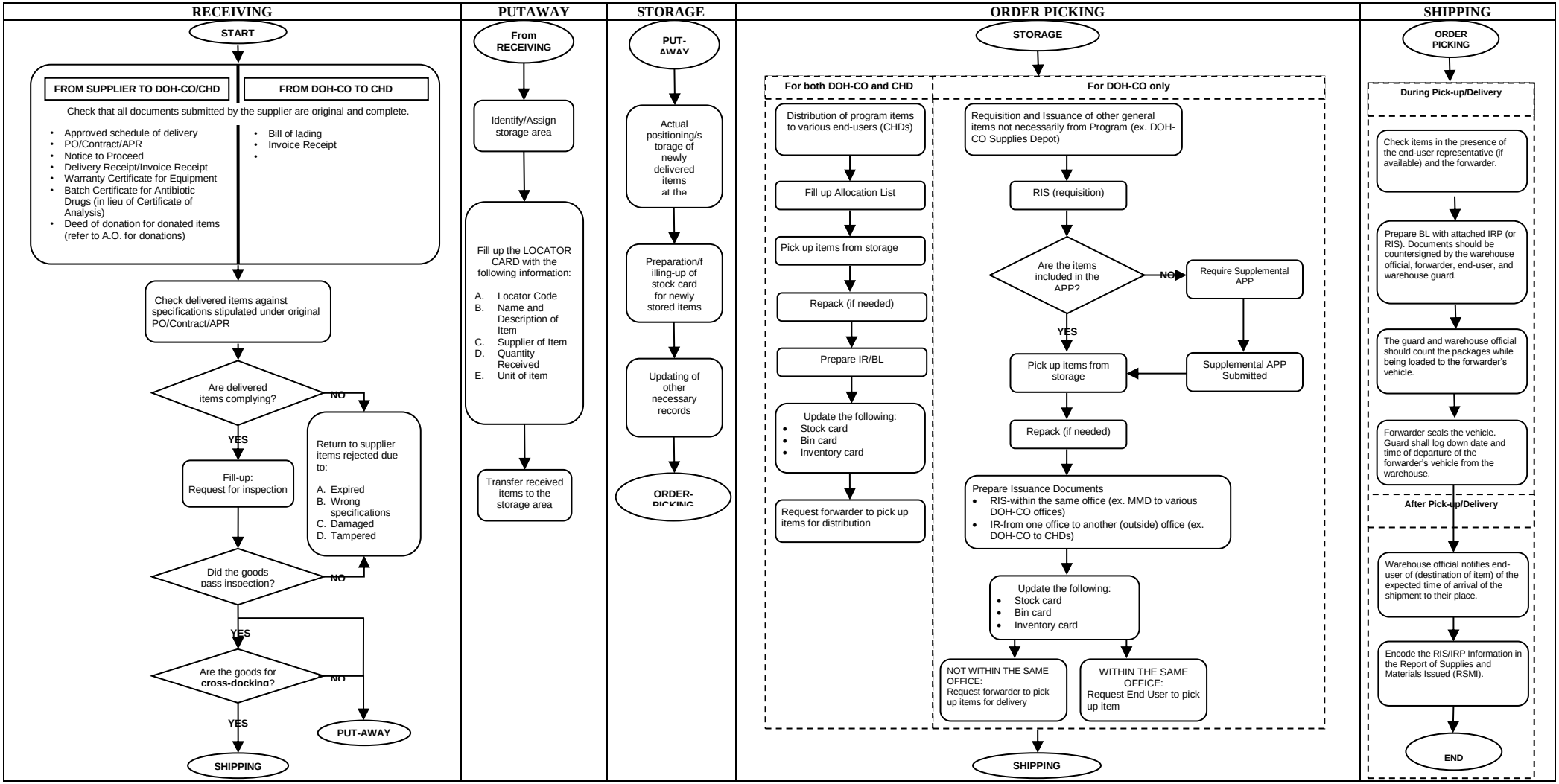
Key Informants

Name	Position	Unit
Marlyn W. Concovar	Regional Director	DOH Region VI
Ma. Julia Z. Villanueva	Assistant Regional Director	DOH Region VI
Josephine Tapales	Supply Officer III	DOH Region VI
Sofia Palmones	Chief	DOH Region VI
Rhenard Catilo	Provincial Supply Officer	DOH Region VI
Jansen Lester Chan	Pharmacist	DOH Central (PD)
Angelina Del Mundo	Director	DOH Central (LMD)
Naomi Simon	Chief	DOH Central (LMD)
Richard Paul Jimenez	Monitoring Supervisor	DOH Central (LMD)
Paul John Casihan	Warehouse Operations Supervisor	DOH Central (LMD)
Ferdinand Dela Cruz	Warehouse Operations Team	DOH Central (LMD)
Jacqueline Hui	Pharmacist	DOH Central (LMD)
Armand Enriquez	Pharmacist	DOH Central (LMD)
Noel Macalalad	Chief, Biologicals Production Division	RITM
Jennifer Joana C. Snow	Pharmacist	RITM
Erwin Pacala		Nonpareil
Russel Santos	Programmer	KMITS
Maria Francia Laxamana	Assistant Secretary	OTS
Allan Millar	Consultant	OTS
Gomel Gabuna		OTS
Management and Staff of Sta. Barbara Health Center		
Management and Staff of Quezon City Health Center		

WMS Functionalities



Source: http://www.warehouse-logistics.com/en/definition-wms-ims.html



Warehouse Operations Process