

CONSUMPTION-BASED SUPPLY-CHAIN: HEALTHCARE MATERIALS MANAGEMENT USING MICROSOFT DYNAMICS GP AND BINARY STREAM ADD-ON SOFTWARE

Muhammad Razi

Bernard Han

Department of Business Information Systems

Haworth College of Business, Western Michigan University

muhammad.razi@wmich.edu

(269-387-5524)

bernard.han@wmich.edu

(269-387-5428)

Abstract: Materials management, in healthcare, can be defined as a process that requires the flow of products to satisfy the needs of those who serve patients. Material management functions consist of procurement, distribution, and inventory control of supplies while providing high quality care at reduced cost. In this article, we provide a guideline for teaching healthcare materials management in an undergraduate course using Microsoft Dynamics GP with healthcare materials management add-on functions created by BinaryStream. It is expected that these hands-on assignments will be useful for undergraduate majors in General Business, Management, Supply-Chain Management, Health Informatics, and Business Information Systems.

INTRODUCTION

Healthcare Materials Management (HMM), after years of being seen as a required but secondary function in the healthcare industry, is being recognized as cost saving, quality improving operation as well as a clinical and financial performance imperative. In the past, the primary focus of the healthcare providers was to provide high quality of care regardless of cost, however, in the event of intense competition and cost increase, HMM has gained importance. Studies have shown that between 1/3 and 1/2 of hospital expenses are invested in various HMM, and that a significant amount of the costs associated with materials management could be saved by appropriate use of software and best practices. Purchasing department, stores, the pharmacy, patient care units, emergency department, and operating rooms are involved directly or indirectly in the healthcare supply chain (materials management) process. Healthcare providers require hundreds of tools and supplies resulting in a fragmented internal supply chain process, for example, medical and office supplies are managed by one department, the pharmacy purchases pharmaceutical products, and food services manages the procurement and processing of food products. HMM is essentially a consumption-based process. Certain products (inventory products) are stocked before being distributed to specific departments. Other non-stock (non-inventory) items are ordered directly by specific departments and are delivered directly to them upon receipt of those products. Pharmaceutical products, on the other hand, are divided into two main categories: general products and prescription drugs. The inventory and non-inventory distinction doesn't apply to pharmaceuticals because all requisitions must go through the pharmacy (Poulin, E., 2007). Healthcare industry does realize that HMM is a significant cost segment and better materials management can benefit their bottom line by streamlining the supply-chain process and strategically aligning HMM with the organization's mission and strategic vision. In addition to cost reduction and process improvement, appropriate software based Materials Management may be able to:

1. reduce pain / issues in the control of inventory
2. strengthen reporting of inventory accuracy / consumption statistics
3. ensure that billable patient materials are sent to Billing.

The purpose of this paper is to provide a guideline for development and teaching of HMM in an undergraduate Health Informatics course providing in-depth experiential learning employing Microsoft Dynamics Great Plains (GP) and Healthcare Materials Management System (HMMS) developed by BinaryStream. BinaryStream's HMM contains many add-on functions to the existing MS GP 2010 software. Traditionally, MS Dynamics-GP is a

distribution-based Supply Chain solution. Binary Stream adds many healthcare supply chain/materials management functions/additions on top of GP.

Benefits of teaching materials management using ERP software are many (adapted from Sweeney, D., Campbell, J., and Mundy, R., 2010). Next section of this article presents a framework of the teaching materials. The final section summaries the work.

HEALTHCARE MATERIALS MANAGEMENT PROCESS (HMMP)

Learning objectives of HMMP are:

- Understand healthcare materials management process, especially, inventory management, vendor management, site management, purchasing, receiving, and invoicing.
- Comprehend the parameter set up process in ERP software for successful use of materials management.
- Apply the management and decision making aspects in materials management.

STEP 1: INTRODUCTION OF HMM STAKEHOLDERS (Adapted from Callender, C., 2007)

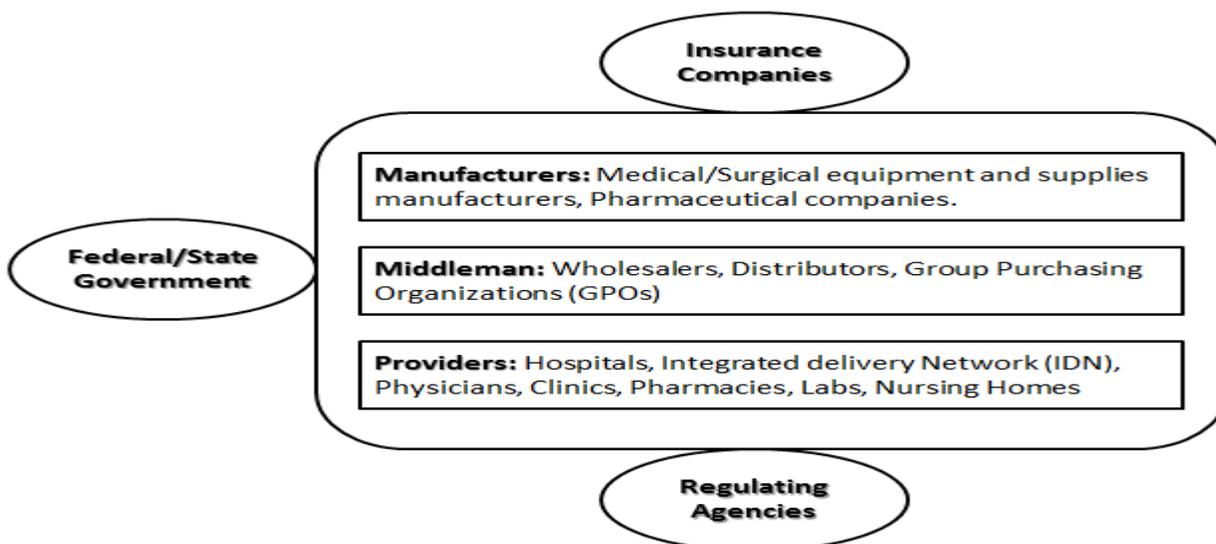


Figure 1: HMM Stakeholders (adapted from Callender, C., 2007)

STEP 2: SETTING UP ITEM AND SITE MAINTENANCE FOR INVENTORY MANAGEMENT

A number of key configuration tasks must be completed first.

1) **Item Maintenance (Handson Lab Component):** For inventory items, units of measure types apply to purchasing, issuance and patient charges. Items can be stored as stock or non-stock items and attribute related to a healthcare item such as expired item can be tracked and customized as needed. Items may be identified as patient trackable and chargeable. Patient Charge Codes and Patient Charge schedules are available for enhanced billing workflows in the BinaryStream add-on functionality in GP.

2) **Site Maintenance (Handson Lab Component):** Along with Site ID and description, Site Address, Site Characteristics, and other parameters need to be set for HMM.

3) **Par List Maintenance (Handson Lab Component):** Par list is the master list of all the items in a site. Par, Requisition, Generic Location, Replenishment Site, Stock/non-stocknot etc. parameters have to be set for items in the list:

STEP 3: PURCHASE MANAGEMENT (HANDSON LAB COMPONENT)

Purchasing is the process of buying goods and services. Steps of purchasing process include identification of demand (amount or quantity needed) for one or more items for a specific period, evaluation of suppliers, selection of suppliers, creating purchase orders, receiving items, and measuring and managing supplier performance. These stages generally vary by organization and type of items purchased. Characteristics of BinaryStream/GP Purchasing Management are (Tonzetich, G., 2012):

- Different PO Types can be established for different purchases (i.e. consumables versus capital items)
- Items can be allocated to Site, Department or Entity levels
- Capital Item POs are tracked
- POs can be transmitted in a variety of fashions such as EDI, Email, Fax and more
- Auto PO Process
- Auto Receiving

Purchasing Workflow: Purchasing workflow consists of following tasks (BinaryStream):

- Create Auto PO Preview Template
- Process Auto Preview
- Upload Inventory Count
- Process PO Preview and Create PO
- Process PO Preview, Create PO and Transmit PO
- Create a PO
- Transmit PO (if not done during PO Preview processing)

Step 3-1: Auto PO Preview Template Window

This window is used to create templates for purchasing inventory at a site. A template is processed in the Auto PO Preview–Transfer Preview Processing window to create PO Preview or Transfer Preview transactions. PO Preview Documents are created in the following conditions:

- Par List Maintenance Replenishment Site is empty
- Par List Replenishment Site for this item and site is non-stock
- Site is non-stock.

Step 3-2: The Auto PO Preview Exception Report lists data errors encountered during processing.

Auto PO Preview Exception Report			
User ID :	sa	Page #	1
User Name:	sa	Date:	12/7/2007
Item Number	Buyer ID	Site	Error Description
033218	sa	01.94540	Primary Vendor is not setup
033301	sa	01.94540	Par Value is not Setup
RIMPY-BSSIMISC	sa	01.94540	Primary Vendor is not setup
TESTSERIAL	sa	01.94540	Primary Vendor is not setup
011764	sa	01100	Par Value is not Setup
011907	sa	01100	Primary Vendor is not setup
033299	sa	01100	Primary Vendor is not setup
033300	sa	01100	Primary Vendor is not setup
BSS-SERIAL	sa	01100	Primary Vendor is not setup
011764	sa	02500	Par Value is not Setup
034066	sa	02500	Par Value is not Setup
033301	sa	02930	Par Value is not Setup
010966	sa	03.81400	Par Value is not Setup
MISC	sa	03.81400	Primary Vendor is not setup
MISC-7750	sa	03.81400	Primary Vendor is not setup

Figure 2: Auto PO Exception Report (BinaryStream User Guide, 2012)

Step 3-3: Purchase Order (PO) Entry

Purchase Order Entry window is to enter purchase orders and to modify purchase orders with New, Released, and Change Order statuses. Purchase orders that have never been printed or sent to the vendor may also be deleted or voided with a New status. In the Purchase Order Entry window, only purchase orders with New, Released, and Change Order statuses can be viewed. Purchase order that has been placed on hold can be printed. Printing a purchase order on hold doesn't change the purchase order's status. It is recommended that Purchase Order Review and Purchasing Batch Entry be completed before going into the PO Entry window.

Step 3-4: Mass PO Transmission Window (Figure 6)

This window is used to select a range of Purchase orders and transmit them all at one time. Once the POs are transmitted the status is changed from New to Released. Documents can be arranged by Buyer, Document date, Facility ID, Location code, PO number and Vendor ID. Purchase orders for a range of users may also be selected. The Process button will automatically send the Purchase order via the selected Transmission Method. If the transmission method is EDI, the system will automatically send the PO to the vendor using vSyncs EDI functionality. For Email Transmissions, the Purchase order will be emailed via Outlook to the email address set up in the Purchasing Address of the vendor. The Body and the subject of the email are pulled from the System setup window. The Purchase Order will be attached as a PDF document to the email. If the Transmission Method is Online and the cXML customization has been installed and setup, the Purchase Order will be processed and sent to the Vendor in cXML format. Otherwise, the Purchase Order will be printed to the window (BinaryStream User Guide, 2012)

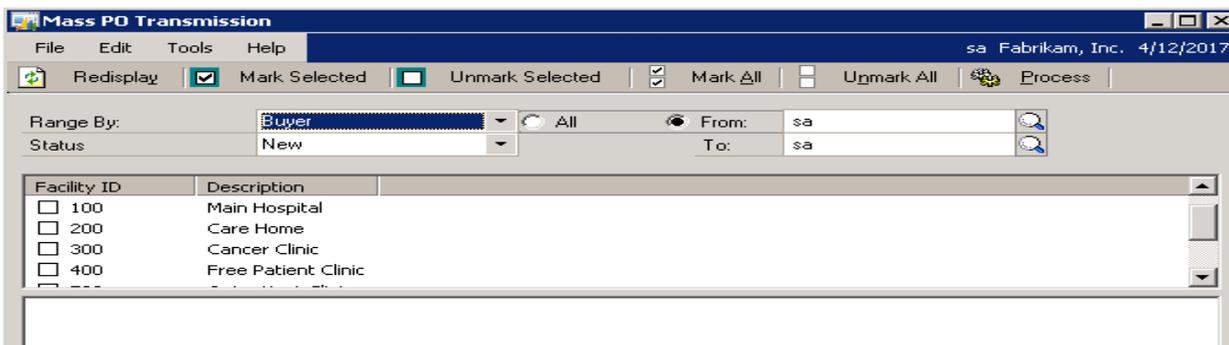


Figure 3: Mass PO Transmission

STEP 4: PURCHASE ORDER PROCESS (POP) RECEIVING TRANSACTIONS (HANDSON LAB COMPONENT)

Receiving Transactions are for receiving actual products shipped from vendor and to record a shipment and/or invoice. A single receiving transaction may be created to include items from multiple purchase orders from a single vendor.

Receiving Workflow : Receiving workflow consists of following tasks (BinaryStream User Guide, 2012):

- Receive PO (Receivings Transaction Entry)
- Adjust Inventory to remove quantity if PO received for non-stock site
- Print Piggyback Labels (Label Printing Process)
- In Accounting, Enter Invoice/Match to PO (Enter/Match Invoices)

Step 4-1: Receiving Transaction Entry Window

In the Receiving Transaction Entry window, one has the option of receiving items that weren't included on the original purchase order or receive items without a purchase order. Line items on a purchase order can be received automatically. Receiving Transaction Entry window can also be used to correct shipment receipts, shipment/invoice receipts, or in-transit transfer inventory receipts before posting. One can delete or void unposted receipts, shipment/invoice receipts, or in-transit transfer inventory receipts. Shipment/invoice

or shipment receipt for a purchase order that is on hold can't be entered. If a purchase order is placed on hold after its receipt is saved to a batch, the receipt for that purchase order will not be posted and will remain in the batch. (Microsoft Dynamics GP Help).

Step 4-2: Enter/Match Invoices (Purchasing Invoice Entry Window)

Purchasing Invoice Entry window can be used to enter, save and post invoice receipts. Items from multiple purchase orders from a single vendor may be combined on an invoice receipt. Just as with Receiving Transaction entry, one can enter invoice receipts for items not included on the original purchase order or items not associated with a purchase order. Landed cost may be entered as line items. Purchasing Invoice Entry window may also be used for deleting and voiding unposted invoice receipts.

STEP 5: INVENTORY TRANSACTIONS (HANDSON LAB COMPONENT)

Inventory transaction allows users to create inventory issue and manage return transactions. Issue transactions are for managing consumption of inventory by departments. Issue transactions have the following key features (BinaryStream User Guide, 2012):

- Create Issue and Returns by department
- Update appropriate distributions based on department segment
- Create issues for 'Stock' items
- Allow issues to authorized users by department and site
- Track Patient Information

Issue functionality is built by BinaryStreams on top of Great Plains Inventory Transaction Entry screen. Additional details are tracked both at header and detail level throughout the life of the transaction.

Step 5-1: Item Transaction Entry Window

Item Transaction Entry window is used to issue items to a department, enter variance, manage returns, adjust inventory transactions, among other functions. The Document Types are adjustment, Variance, Transfer, Issue, Return, Expired, Vendor Return, Dept Trfs (transfers). This window uses the next document number and the account segment for sites set up in the Inventory Control Setup window. If you're not using a batch to group your inventory transactions, you must post each transaction as you enter it (Microsoft Dynamics GP Help).

Access to issue transactions is granted by selecting the Allow Issue option in the HMM User Setup window. Issue transactions will decrease the quantity for a given item site combination. No General Ledger transaction will be created for Issue transactions (BinaryStream User Guide, 2012).

Patient Tractable Button (BinaryStream User Guide, 2012)

This is the button with the green icon beside the Number and the Unit Cost Label (shown in Figure 12). The Patient Trackable window (Figure 13) will open when the button is clicked. If the item is not marked as Patient Trackable on the item maintenance window then the window will not open. The information entered on the header level will default as well as the Item Number, Item Description, Facility and Inventory Account from the line. If the issue transaction has a patient attached to it then this window will allow the user to enter information specific to that patient.

Step 5-2: Return Transactions (Figure 14, BinaryStream User Guide, 2012)

Access to return transactions is granted by marking the Allow Return checkbox on the HMM User Setup window. The Distributions consists of a debit to the items inventory account and a credit to the items inventory offset account. The inventory offset account is substituted with the facility and the department segment values from the site maintenance window. The inventory account is substituted with the facility segment from the site maintenance window. The transactions cannot be posted individually; they must be posted by batch. If the return type is On Hand then when the document is posted the On Hand Quantity will be increase for this item site combination. If the Return type is not On Hand then when the document is posted, then:

- On Hand Quantity increases
- Allocated quantity increases
- Inventory Transfer is created

The quantity change for any other return type is:

- On Hand Quantity decreases
- Allocated Quantity decreases

- Return Type Quantity increases

STEP 6: INVENTORY TRACKING FORM (ACME HOSPITAL)

Students will be asked to create several PO, Inventory Issue, and Return transactions in several handson labs. Students will keep track of inventory level of stock items using the Inventory Tracking Form. They will be able to learn Purchasing and Inventory Control process by going through the labs several times.

Transaction #	Transaction Type	Item #	Opening Inventory	Issue/Purchase Quantity	Closing Inventory
1					
2					
3					
4					
5					

Table 1: Inventory Tracking Form

CONCLUSIONS

In this article, we provide a guideline for teaching healthcare materials management in an undergraduate course using an ERP system that is capable of handling healthcare materials management. We start with explaining materials management process and identifying some subtle differences between materials management process in healthcare and other industry. Next we go through several handson labs using Microsoft Dynamics GP with healthcare materials management functions created by BinaryStream's add-on software. Parameter setup example is shown first in lab handson. Purchasing process is described next followed by the inventory transaction process. An inventory tracking form is used in the lab to track inventory level of stock items. It is expected that these hands-on assignments will be useful for undergraduate majors in General Business, Management, Supply-Chain Management, Health Informatics, and Business Information Systems. One or two of these labs may also be used in the MIS course that is required for all business majors.

APPENDIX – A

SUGGESTED TOPICS, READING MATERIALS, AND LABS

	Topic	Reading Materials	LAB	Time (suggested)
1	Healthcare Materials Management/Supply Chain Concept	Razi_Han article, Appendix-B: Resource 1, 3 and a textbook chapter of instructor's choice	None	1 Week
2	ERP Systems	Appendix-B: Resource 2, 4. A textbook chapter or Resource 5	MS Dynamics GP Navigation	1 Week
3	Materials management (MM) Setup and Transactions	Razi_Han article, Appendix-B, Resource 2 and Lab Handout*	MM Setup and Transactions, Inventory Tracking Form	1 Week
4	Purchase Order Process (POP)	Razi_Han article, Appendix-B: Resource 2 and Lab Handout*	POP Setup and Transactions, Inventory Tracking Form	1 Week
5	MM and POP Reporting	Appendix-B: Resource 2 and Lab Handout	MS Dynamics GP Reporting tools	½ Week
6	Exam			½ Week

* Outlines of the Labs have been provided in the Razi_Han article, students will require a little more detailed handout for all labs.

APPENDIX – B **[RESOURCES]**

1. What is Supply Chain Management? <http://www.youtube.com/watch?v=M1QBxVjZAw>
2. BinaryStream User Guide, 2012: Healthcare Materials Management™ User Guide for Microsoft Dynamics™ GP 10 and GP 2010 An Enterprise Solution developed by BinaryStream. **Binary Stream Software, Inc.**, 201 - 4238 Lozells Avenue, Burnaby, BC V5A 0C4, Canada
3. Callender, C. and Grasman, S.E. (2010), 'Barriers and Best Practices for Material Management in the Healthcare Sector', *Engineering Management Journal*, Vol. 22, No. 4, pp. 11-19
4. Introduction to ERP Systems. <http://www.youtube.com/watch?v=SIge-EAUXiI>
5. Moller, C. (2005), 'ERP II: a conceptual framework for next-generation enterprise systems?' *Journal of Enterprise Information Management*, 18. 4, 483-497.
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