Supply Chain Management for Pharmacy Services in the Northern Health Authority

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Project Submitted In Partial Fulfillment Of The Requirements For The Degree of Master of Business Administration

The University of Northern British Columbia

April 2008

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Executive Summary

The Northern Health Authority, a healthcare region located in northern British Columbia, executed a case study to analyze the current distribution relationship between G.R. Baker Hospital Pharmacy in Quesnel, B.C. and Prince George Regional Hospital Pharmacy. The purpose of the study was to examine the organizational structure, personnel relationships, and business processes that exist between the two facilities, in order to determine which processes in the current distribution network are working well, and to learn which areas require improvement

In order to complete the case study, a brief questionnaire was sent to G.R. Baker Hospital Pharmacy staff to glean further insight into the positive and negative factors of the service they currently receive. Further interviews were conducted with the Pharmacy Manager at G.R. Baker Hospital Pharmacy to determine satisfaction levels with the services provided. Finally, an observation of shipping practices was conducted to analyze the time and cost requirements for providing such service.

The study resulted in the identification of several factors that are working well within the distribution relationship between G.R. Baker Hospital Pharmacy and Prince George Regional Hospital Pharmacy, particularly with respect to the provision of pre-packaged and convenience packaged products. The study also identified problem areas, primarily with respect to the limitations on the number of

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days per week for ordering, and the early cut-off times required by Prince George Regional Hospital Pharmacy.

The primary recommendation resulting from this case study is to use this case as a building block for subsequent studies into the provision of drug distribution services and the establishment of distribution relationships with other regional facilities, leading to more efficient supply chain management and better utilization of limited resources.

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Glossary

Antineoplastic medications – literally, "against new cells", these agents are used in treating cancer and other immune conditions resulting in the proliferation of cell growth; these medications are considered "dangerous goods" because of their proven toxicity in healthy tissues

Biological Safety Cabinet (BSC) – a vertical laminar flow hood used in the preparation of antineoplastic medications and other potentially hazardous substances that contains a HEPA filter, and uses vertical air flow for the protection of the mixer and to maintain sterility of the product

Centralized Intravenous Admixture (CIVA) – a pharmacy-based asceptic manufacturing program that provides intravenous medications as pre-diluted solutions for infusion; the program is intended to improve the safety for intravenous medication administration through the provision of products that require little or no bedside manipulation by nursing

Drug Identification Number (DIN) – a unique eight digit number assigned to any licensed product considered to be a drug by the Health Protection Branch of the Federal Government of Canada

Formulary – the listing of all medications available for use in hospital; only certain medications are carried in hospitals and this listing is determined based on cost, efficacy, and availability of alternate products

Full Time Employee (FTE) – for the purpose of this paper, a full time employee is the Hospital Employees' Union definition of an employee who is regularly scheduled to work 37.5 hours per week

Generic drug – a medication that contains the same active ingredient as a trade name product but is manufactured by a rival company, following the patent expiry; generic drugs are considered to have equivalent efficacy to brand name medications

Group Purchasing Organization (GPO) – an entity that leverages the purchasing power of a group of businesses to obtain discounts from vendors based on the collective buying power of the GPO members

iPortal – an intranet website used by the Northern Health Authority for sharing documents, procedures, news, and other information for efficient distribution to the facilities encompassed by the NHA

Narcotic – a drug used to reduce pain perception and induce euphoria; the term narcotic generally refers to natural and synthetic opium derivatives; narcotic distribution is controlled by the federal government and requires signature-based chain of distribution from the point of sale to the final delivery point

Non-Formulary – any medication that is not on the formulary listing, but may be required for use in a certain patient

Order Cut-off – a soft time limit on when orders must be received by for same day shipping; for the PGRH Pharmacy Shipper/Receiver, this is a recommended time limit, and orders received after the cut-off may be processed

Pharmacare – a British Columbia government program that provides financial assistance to British Columbia residents who are eligible for formulary prescription drug and designated medical supplies coverage

Prepacks – medication packages containing a 24 hours supply of medication in a medication vial with a child-safety lid, labelled with the facility name and address, patient name, medication name, lot and expiry, and instructions for use in lay language

Unit Dose – medication packages that contain one tablet or capsule sealed in a foil package stamped with the product generic name, brand name, strength, lot, expiry, and manufacturer; used for distribution to inpatient wards to improve medication identification, provide better administration safety, and reduce contamination

Wardstock – medications, approved by the Pharmacy department, that are kept on the ward for nursing to administer to patients; usually includes medications required urgently (life-saving drugs) and inexpensive but frequently used medications (such as non-prescription pain relievers)

Acknowledgements

I would like to thank Cameron Egli, Coordinator for Pharmacy Information Systems at Interior Health, former Regional Director of Pharmacy Services for Northern Health (2004-2007) for his guidance as co-supervisor.

I also wish to extend my appreciation to Kyla Klein, Prince George Regional Hospital Pharmacy Shipper/Receiver for her participation in the collection of ordering and shipping data from G.R. Baker Hopsital Pharmacy in Quesnel.

Finally, I wish to thank the staff at G.R. Baker Hospital Pharmacy for providing their feedback on the current services they receive from PGRH Pharmacy.

Introduction

The province of British Columbia is divided into five geographic authorities and one provincial programme-based authority, which are responsible for providing healthcare services to the geographical areas they encompass. The Northern Health Authority (NHA) is the healthcare region in northern British Columbia, encompassing all communities from Quesnel to the northern-most part of the province, making it the largest geographical healthcare authority in BC. Despite the vastness of the area, the NHA services approximately 329,000 residents in the region.



Figure 1 – Map of Northern Health Authority

The NHA is divided into the following three Health Service Delivery Areas (HSDAs): the Northern Interior (NI), the North East (NE) and the North West (NW). The HSDAs have been established to allow a reasonable span of supervision and operations planning based on the large geographical area of the NHA. Operational administration occurs locally, at the individual sites, and is overseen by the HSDA Chief Operating Officer. Pharmacy in the NHA has a regional portfolio without any solid reporting lines to local administration; Pharmacy managers in regional facilities report only operationally at the local level. Within the NHA, there are 28 community health care facilities of various sizes, ranging from the full service tertiary care institution of Prince George Regional Hospital (PGRH) to small nursing outpost clinics in remote areas such as Atlin.



Figure 2 – Division of Health Service Delivery Areas

PGRH is the largest healthcare facility in the NHA and currently provides some inventory and purchasing services to other, smaller regional facilities in all of the HSDAs. However, many other sites still maintain their own purchasing and supply chain systems, which is a labour intensive process for sites dealing with small staffing numbers and unpredictable purchasing patterns.

The cost-effective and workflow-efficient procurement and distribution of pharmaceuticals in the NHA has been an area of difficulty for many facilities. Given the location of the NHA in the northern part of British Columbia, issues arise with respect to transportation, remoteness, staffing, and expenses. Due to inclement weather conditions, particularly in the winter, many northern facilities regularly experience difficulties in having shipments delivered in a timely fashion. The NHA has several remote facilities (e.g. Fort Nelson and Dease Lake) that are not easily accessible, even less so in the winter. In addition, the remoteness of these locations makes staffing a challenge; facilities have difficulties with both recruitment and retention of employees. Expenses, such as the cost of shipping, can also play a role in supply chain management. In this regard, a consideration is order size. Shipping is provided free of charge by most vendors; however, some have a minimum order value in order for shipping to be free. Small nursing outpost clinics don't regularly order enough medication from these vendors to meet these minimum values. A summary of minimum order values is provided in Table 1. Transportation, remoteness, recruitment, retention and expenses must

be considered when studying supply chain management for the procurement of pharmaceuticals within the NHA.

The hospital pharmacies within the NHA currently purchase medications through many suppliers; McKesson and Canadian Pharmaceutical Distribution Network (CPDN) are wholesalers from which approximately 90% of medications are purchased; their shipping warehouses are centred in Vancouver, and they offer next day delivery. Other vendors that hospitals purchase from include the following: Abbott, Alcon, Baxter, Ferring, Hospira, Merck Frosst, Novartis, and Wyeth. These direct suppliers have shipping warehouses located in Ontario and Quebec, and mainly offer 2 day delivery, unless an order is urgent and needs to be shipped by air. A summary of the minimum order values and cost of shipping from each vendor is provided in Table 1.

Company	Minimum Order Value	Cost of Shipping
CPDN	\$0	n/a
McKesson	\$0	.n/a
Abbott	\$0	rı/a
Alcon	\$0	n/a
Baxter	\$0	n/a
Ferring	\$100	\$0
Hospira	\$0	n/a
Merck Frosst	\$0	n/a
Novartis	\$0	n/a
Wyeth	\$1000	\$50

Table 1 – Vendor Ship	ping Da	ata
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With respect to medication procurement and delivery, there are different supply chains within all NHA pharmacies: an external supply chain bringing medications into the facility and an internal supply chain, where medications are distributed to the wards or nursing units. In the first supply chain, medications are procured from drug companies or wholesalers and are delivered to the pharmacy. In the second, internal supply chain, received medications are re-packaged and processed, and delivered to the appropriate units, either as patient-specific medications or as wardstock used for nursing administration. The supply chains for pharmaceuticals in the NHA have several points that must be considered.



Figure 3 – Prince George Regional Hospital Supply Chain

In the first (external) supply chain for both PGRH Pharmacy and the regional facilities (see Figure 3, processes 1,2 and 3 and Figure 4, processes 1, 2 and 3), the NHA works with Medbuy, a group purchasing organization (GPO) which negotiates contracts for both pharmaceuticals and medical/surgery supplies. The GPO works directly with the suppliers, who bid on contracts to provide certain medications at lower costs, offering bulk purchasing discounts and rebates. The NHA has representatives that sit on the contract committee, and participate in contract negotiation and formulary discussions. The contract negotiations occur between the facilities and Medbuy prior to the commencement of drug distribution; as such, this process is not included in the provided supply chain diagrams.

With its involvement with a GPO, the NHA is restricted in that they must have contractual compliance of 80% of all medications purchased for which contracts have been negotiated and signed. Both PGRH Pharmacy and other regional NHA facilities can purchase contract medications directly from suppliers or wholesalers; the suppliers and wholesalers ship directly to the facilities.

Further to the limits imposed by 80% contractual obligations with Medbuy, the NHA also has a formulary, which is the listing of all medications available for use in hospital. Only certain medications are carried in hospitals and this listing is determined based on cost, efficacy, demand, and availability of alternate products. Decisions regarding which medications are on formulary are made by

the Regional Pharmacy and Therapeutics Committee, as a result of research done by the Regional Drug Utilization Evaluation Pharmacist, regarding the aforementioned factors.



Figure 4 – Regional Supply Chains

In the second (internal) supply chain (See Figure 3, processes 4, 5, 5 (a) and 6, and Figure 4, process 4), Pharmacy takes the bulk medications and re-packages it into forms suitable for administration. This includes preparing unit-dosed tablets and capsules, which entails individually packaging the tablets and capsules into foil-sealed packages labelled with the drug generic name, strength,

lot number, expiry date, brand, and drug identification number. Pharmacy also prepares "pre-packs" which are vials of medication, usually a 24 hour supply, labelled with the drug name and strength, directions for administration in lav language, lot number, expiry date, drug identification number, and the facility name and address. These pre-packs are used to dispense an emergency supply to a patient going home, when a pharmacy is unavailable for a prescription to be Prepacks are also used in some inpatient units for patients to selffilled. administer medication therapy; in PGRH, these are used on the Maternity Unit for basic pain management following delivery. Pharmacy prepacks may also be vials of tablets/capsules for use on the ward that have been packaged from large bulk bottles into quantities more suitable for use and for space requirements. Pharmacy also prepares intravenous medications into safer forms of administration; through the Centralized Intravenous Admixture (CIVA) program, sterile products are compounded into pre-mixed bags, pre-filled syringes, and other patient-specific compounds that are not safe to be mixed by nurses on the unit.

Currently, the majority of medication re-packaging is done by PGRH Pharmacy technicians. Not all sites have the required technology (unit dose packager for unit dose products, or laminar flow hood for CIVA products), and not all sites have enough technician time to re-package medications. Looking at the regional supply chains, medications dispensed in process 4 (Figure 4) may or may not have been re-packaged. The re-packaged, or convenience packaged, products

manufactured by PGRH Pharmacy technicians are available as supply options for sites currently purchasing medications through PGRH Pharmacy.

In looking at the current practices of supply chain management at PGRH Pharmacy, the Cerner Millennium operating system is used for all aspects of supply chain management in the PGRH Pharmacy department, including purchasing, receiving, and distributing drugs. Purchase orders are generated based on pre-set reorder points set in the Cerner inventory, orders are received into the system when they arrive, and all distributions to the inpatient wards are managed through the Cerner supply chain system. In reference to Figure 3, Cerner is used in processes 1, 3, 5 and 5 (a). Cerner Millennium is a comprehensive, integrated electronic healthcare management system that encompasses nearly all services offered by PGRH: Admitting, Laboratory, Radiology, Pharmacy, and Nursing. The use of such an integrated system has led to a greater connectivity and continuity of care for a patient entering into the healthcare system at PGRH. While PGRH is, so far, the only facility in the NHA to be operating with the complete package, the NHA's goal is to have the Cerner Millennium system operating in all facilities throughout the region. Implementing Cerner region-wide will create a network whereby all patient data is transferable from one facility to another, creating better continuity of care for patients throughout the north. With respect to supply chain management for Pharmacy services, the implication of this regional network is that drug distribution has the

potential to be done completely electronically, through the use of Cerner supply chain management.

Currently, there are variable processes for the procurement of pharmaceuticals at NHA facilities; PGRH acts as a warehouse site for nine of the smaller facilities, as shown in Figure 4, processes 1 and 2 (a), some facilities order some products from PGRH but purchase other pharmaceuticals directly from suppliers, and some facilities are maintaining all of their own purchasing, as shown in Figure 4, processes 1 and 2.

Currently, PGRH Pharmacy regularly supplies some or all medications to the following sites: Quesnel, Vanderhoof, Smithers, Burns Lake, McBride, Mackenzie, Terrace, Valemount, Granisle, Fraser Lake, Nisga'a and Kitimat. In order to streamline workload, regional sites are requested to follow an ordering schedule (Appendix 2) which restricts the number of ordering days, depending on the size of the facility and the days of operation. The recommended cut off time for submitting orders to the PGRH Pharmacy Shipper/Receiver is 1000h. Orders sent after the cuftoff are filled time permitting only. The PGRH Pharmacy Shipper/Receiver is supported by another Regional Pharmacy Technician two days a week (0.4 FTE). The procedures for filling orders are provided in Figure 5. Once orders are received, they are picked, boxed, and labelled. A copy of the original order is sent with the items, and includes the quantities sent, with notes regarding any quantity that is different, or any items unavailable. The PGRH

Pharmacy Shipper/Receiver then bills the items to the appropriate site, and most sites are sent a printed copy of this requisition, which includes the number of items sent with the average cost per item. The PGRH Pharmacy Shipper/Receiver then takes all packages to be sent to the PGRH Materials Management Shipper/Receiver (an employee of the Materials Management department) who is responsible for arranging the pick up of all PGRH packages for shipping. The PGRH Materials Management Shipper/Receiver requires all packages to be sent to be sent that day by 1400h, in order to have time to process required paperwork and make pick up arrangements. This puts additional time constraints on the PGRH Pharmacy Shipper/Receiver for preparing packages.



Figure 5 – Ordering and Shipping Procedures

The PGRH Pharmacy Shipper/Receiver is responsible for picking and packing all drug orders, except for narcotics; shipping of narcotics is currently done by the PGRH Pharmacy Narcotics Technician. There is also an order cut off of 1000h on all regional narcotics orders, due to workload constraints.

In addition to picking and packaging all regional orders, an added responsibility of the PGRH Pharmacy Shipper/Receiver is to receive all incoming drug orders into the computerized inventory management system (Cerner), and put all stock away. This added workload is the rationale behind the order cut-off time recommended to regional sites.

PGRH Pharmacy ships various classes of medications, which may require specific handling, packaging and shipping procedures. Regular medications are shipped by DHL, with no special handling instructions. Refrigerated medications are also shipped by DHL, but require the use of ice packs and Styrofoam coolers for transport, in order to keep the temperature between 2 - 8 °C. Antineoplastic medications can also be sent by DHL, but these packages have an extra fee for handling of dangerous goods. Finally, narcotics must be shipped using Purolator, because they offer the chain of signatures that is required, by federal law, when transporting narcotics. Further discussion of shipping costs is provided in the Data Analysis, Table 4.

G.R.Baker Hospital (GRBH) Pharmacy, in Quesnel, B.C., is one of the regional facilities that purchases all of their formulary medication supplies through PGRH Pharmacy. This distribution relationship began approximately five years ago, initiated by the PGRH Pharmacy Manager at the time, as a result of two coinciding factors. The first was the recent integration of northern British Columbia as a health authority; forming internal distribution networks was part of a push towards integrating and standardizing services within the new health The second was the loss of the full-time pharmacist in GRBH authority. Pharmacy; at that time, GRBH Pharmacy was a sole charge pharmacy, meaning that there was only one FTE pharmacist on site. Given that GRBH Pharmacy was left to operate with only two pharmacy technicians, the PGRH Pharmacy Manager suggested that purchasing medications from PGRH Pharmacy would be a time savings for the technicians. GRBH Pharmacy was set up as a ward in the PGRH Pharmacy computer distribution system, the technicians would generate an order or requisition list, and the PGRH Pharmacy Regional Technician would pick, package and ship orders. At the time, the two GRBH Pharmacy technicians experienced an estimated time savings of 0.5 hours per day, or 2.5 hours per week.

The current shipping services provided by PGRH Pharmacy are considerably different. Many more sites are ordering from PGRH Pharmacy, and there are more staff involved. Further discussion of current practice is provided in the Service Analysis of GRBH Pharmacy, as a case study.

The most significant reason that PGRH Pharmacy has not taken on the provision of medications to all of the NHA regional sites is staffing. The workload associated with processing and shipping orders to the regional sites currently supplied by PGRH Pharmacy is prohibitive to undertaking provision of drug distribution services to other facilities.

A major concern of the regional sites is that PGRH Pharmacy may not be able to provide service equally effective and efficient to that of direct purchase from suppliers. Direct purchasing, as shown in Figure 4, process 2, allows for sites to order five days per week, with an order cut-off time of 1400h. With current staffing levels, PGRH Pharmacy is not able to provide five days per week shipments. Sites are limited to a maximum of ordering three days per week, which is restrictive and inconvenient because, if ordering direct from a supplier or wholesaler, sites would be able to order five days per week, and in an unpredictable field like healthcare, it is difficult to determine appropriate order items and quantities in advance. Furthermore, PGRH Pharmacy has a requested cut-off time of 1000h for receiving orders for shipping that day, which is also restrictive to regional facilities, because many changes can occur during the day that may require additional or different medications to be brought in. With an early cut-off time, it may take two days to deliver required medications to regional sites, which is considered unacceptable practice by many.

Research Question

The purpose of this study is to examine, as a case study, the current supply chain relationships between G.R. Baker Hospital (GRBH) Pharmacy, in Quesnel, BC, and Prince George Regional Hospital (PGRH) Pharmacy, in Prince George, BC. The study will examine the organizational structure, personnel relationships, and business processes that exist between the two facilities, in order to determine which processes in the current distribution network are working well, and to learn which areas require improvement. The objective of the study is to establish a baseline analysis of the current services provided, in order to create a foundation from which a centralized distribution network can be considered.

The desired outcome of examining GRBH Pharmacy as a case study is to determine the lessons learned from their experience using PGRH Pharmacy as a wholesaler, with respect to the business processes, the use of technology, the interpersonal relationships, and management's perspective on these daily business proceedings.

Literature Review

There is a need for an evaluation of supply chain management within the Northern Health Authority (NHA) that stems from a desire to create efficiencies in an area that is geographically very large with limited resources. Current practice has many small sites trying to maintain their own supply chains, which is a significant workload, particularly where staff is short. The motivation to develop a new system or model of supply chain management for the NHA is to decrease time spent on supply chain activities, creating more time for patient care activities, to create economic efficiencies by reducing the amount of workload duplication at the multiple facilities, and to reduce the amount of wastage caused by excessive inventories.

Before specific examining literature regarding hospital supply chain management, an investigation into generic supply chain models was completed. Lambert et al (2005) completed an evaluation of several different articles relating to supply chain management models. From this review article, five different models of supply chain management were identified. Before these models can be described, however, certain terms must be defined in order for the various models to be meaningfully compared. For the purposes of this study, supply chain management will be defined as the management and implementation of business processes within the supply chain (Lambert et al, 2005). Supply chain is defined by Lambert et al (2005) as the activities involved from procurement of raw material and inventory (point of origin) to the final delivery of product to the

customer. A business process is defined as a set of cross-functional activities with specific value-added business outcomes for customers in the supply chain (Lambert et al, 2005).

In order to achieve successful supply chain management, a company must focus not only on the technical aspects of business processes or transactions but also the relationships between the various customers involved in the supply chain (Lambert et al, 2005). Having technically efficient procedures alone will not satisfy customers if rapport and open communication between supplier and client are not established. Given that both factors should be considered, Lambert et al (2005) evaluated five accepted supply chain models to develop a comparison of utility of each model.

The first framework discussed by Lambert et al (2005) was developed by a group of multi-national companies which became known as the Global Supply Chain Forum (GSCF). The GSCF framework looks at "the integration of key business processes from end-user through original suppliers that provides products, services, and information that add value for customers and other stakeholders" (Lambert, Cooper, and Pagh 1998). The GSCF consists of 8 business processes through which value-added service can be achieved. They are Customer Relationship Management, Customer Service Management, Demand Management, Order Fulfillment, Manufacturing Flow Management, Supplier

Relationship Management, Product Development and Commercialization, and Returns Management (Lambert et al, 1998). Customer Relationship Management and Supplier Relationship Management are the two key elements in the supply chain; the remaining six processes are task-specific activities that allow customer and supplier relationships to be developed and maintained. The major focus of this framework is on the management of relationships between the members of the supply chain. It is quite broad in its description of management, and does not speak in great deal to the actual operations processes required.

The second framework of supply chain management discussed by Lambert et al (2005) was developed by the Supply-Chain Council, a group of 69 voluntary member companies, in 1996, and most recently updated in 2005. The Supply-Chain Operations References (SCOR) framework consists of five processes: Plan, Source, Make, Deliver, and Return (Lambert et al 2005). These five processes span all customer interactions from order creations to invoice payment, all product transactions from initial supplier to the final customer, and all marketing interactions including understanding demand to order fulfillment (Supply Chain Council 2005). Each processes in the supply chain for a specific company, level two defines a more detailed configuration of the processes in order to achieve the goals determined from level one processes, and level three is the most detailed and it consists of the "fine tuning" of individual operations strategy (Supply Chain Council 2005). The focus of this framework is on the

actual operations of the organization, with the incorporation of business relationships in terms of management and strategy. SCOR is used to develop a process map that will offer a precise layout of the processes involved in a supply chain for an organization. Although not specifically discussed in the framework, the SCOR model assumes that any user of the framework would incorporate the direction of corporate strategy into the operations plans of the organization.

The third supply chain management framework was developed by Srivastava et al (1999) in order to develop an understanding of the role of marketing in business processes and the creation of shareholder value (Srivastava et al, 1999). Srivastava et al identified three business processes to address the critical tasks for management of the organization. The three processes are as follows: the development of new or the redesign of existing customer solutions (product development management), the continual improvement of acquisition and transformation of inputs into outputs (supply chain management), and the creation of business relationships within the supply chain (customer relationship management) (Srivastava et al, 1999). Because the focus of the Srivastava et al (1999) study was to integrate marketing with business practice, only three general macro level processes were established in order to allow for establishing clear linkages between these processes and individual marketing activities. The second process the supply chain management process, which is further divided into several sub-processes which incorporate the "acquisition of all physical (and increasingly informational) inputs, as well as the efficiency and effectiveness with

which they are transformed into customer solutions" (Srivastava et al, 1999). The sub-processes identified by Srivastava et al (1999) are as follows: selecting and qualifying desired suppliers, establishing and managing inbound logistics, designing and managing internal logistics, establishing and managing outbound logistics, designing work flow in product/solution assembly, running batch manufacturing, acquiring, installing and maintaining process technology, order processing, pricing, billing, rebates and terms, managing (multiple) channels, and managing customer services such as installation and maintenance to enable product use. However, these processes are not described in detail, nor are there examples of implementation of the processes in an actual business setting. The bulk of this article deals with the implementation of marketing strategies which is not relevant to the task at hand.

The fourth framework was developed by Michigan State University (MSU) in response to the need to develop a more specific curriculum to teach supply chain management (Melnyk et al, 2000). MSU also wanted to establish a value-based system of supply chain management that focused on processes instead of activities (Melnyk et al, 2000). To create value-driven supply chain management, MSU determined a set of traits critical to the development of an effective and efficient supply chain (Melnyk et al, 2000). Supply chains ought to begin with a desired value and end with a realized value and reflect the core competencies of the integrated components of the supply chain. Resources are at the core of the supply chain to create the desired outcomes of information, products, services

and knowledge. A series of processes are required to accomplish these outcomes; the processes create a "chain of customers" using flows and storage (Melnyk et al, 2000)

The eight processes that Melnyk et al (2000) identified are as follows: Product Design/Redesign, Process Design/Redesign. Measurement. Capacity Management, Plan, Acquire, Make, and Deliver. These eight processes encompass both unique design and product modifications based on customer and competitor response, the design of the processes engaged throughout the company and its supply chain and quantitative and qualitative analysis of the supply chain (Melnyk et al, 2000). They also allow for the evaluation of capacity constraints and encourage the identification of both volume and skill requirements within the supply chain. Finally, this framework identifies the need to organize and coordinate resources to complete the processes, acquire the requisite inputs, create a product through the transformation of the inputs, and deliver the finished product to its final destination in the supply chain (Melnyk et al, 2000).

The fifth supply chain management framework discussed by Lambert et al (2005) is from a study by Mentzer et al (2001). Mentzer et al (2001) discuss in great detail a precise definition of supply chain management. Within their research, Mentzer et al (2001) have developed two frameworks related to supply chain management. The first framework establishes guidelines for the necessary

conditions required for successful supply chain management implementation, including having at least 3 companies within the supply chain, information sharing, shared risks and rewards, cooperation, similar customer service goals and focus, integration of key processes, long-term relationships, and interfunctional coordination. The second framework provides guidelines on the types of activities or business processes required for supply chain management planning and organization, such as marketing, sales, research and development, forecasting, production, purchasing, logistics, information systems, finance and customer service. It also emphasizes the importance of the value created in customer service created by maintaining relationships from the initial supplier to the final consumer and all the steps in between (Mentzer et al, 2001).

Having considered the basics to general supply chain management, further investigation into literature more specific to hospital practice was conducted. Literature specific to supply chain and Pharmacy services was scarce; however, literature pertaining to materials management and other areas of hospital supply chain was found, and can be extrapolated to Pharmacy practice.

When looking at supply chain management for Pharmacy services within the NHA, the use of technology should be considered. Danas et al (2002) considered how technology could be applied to create a virtual hospital pharmacy, which is a model that may work for the NHA. While they did not complete a practical application of their model, Danas et al (2002) have proposed

a system whereby information technology is used to keep a virtual inventory that has data from all facilities in a healthcare region and can be accessed by all facilities in the region.

Danas et al (2002) proposed that the logisitics concept of Just In Time (JIT) can be used in healthcare, despite the frequent need for emergency medicines. In their model, they use statistics from past ordering and stock levels to forecast future needs and set minimum stock levels and reorder points for every medication at every facility. They also suggested implementing a system that can track expiry dates, so that locations with stock about to expire would automatically be shipped a new supply. By using the virtual hospital pharmacy, orders for each site can be generated based on current levels of usable stock. In order to be prepared for emergent situations, Danas et al (2002) suggested that one central site be designated as a warehouse site to store certain "just in case" medications that are available to be sent to any site when required.

This model not only looks at the use of technology, but also considers expanding the buyer/seller relationship to have the supplier working for the customer. They look at Wilson and Cunningham's (1992) model of stockless inventory to bring in ideas to the supply chain. Stockless materials management is "a program under which the vendor takes over the hospital's central distribution function" (Rivard-Royer et al 2002). The stockless model was developed to address the duality of supply chain in a healthcare setting. Essentially, healthcare facilities must

manage two supply chains simultaneously: the external chain, from the vendor to the institution, and the internal chain, from the institution to the ward (Rivard-Royer et al 2002).

Danas et al (2002) suggest that there is room for negotiation when it comes to contracts with suppliers, and that better deals can be made if fewer suppliers are used (generating larger orders for those suppliers). If the NHA were to consider using a stockless system of materials management, communication with the suppliers would be vital to address packaging and shipping needs.

There are several concerns raised about a stockless management system in the healthcare field. Marino (1998) suggests that the model is not appropriate for use in regions where the distance between the supplier and the institution is greater than 450 km. Concerns are also raised by Rivard-Royer et al (2002) regarding the nature of healthcare, and how the needs of institutions are rarely predictable. Rivard-Royer et al (2002) suggest that the very fact that distribution is dependent on clinician-selected products demonstrates such a variety of product demand that JIT or a stockless system is not applicable for healthcare. Other concerns include the high administration costs of contract and rebate maintenance, paper-based information flow, and incompatible technologies (Rivard-Royer et al 2002).

The expected benefits from implementing Danas et al's (2002) model, including concepts from JIT and the stockless system, would include reducing the number of out of stock or expired drug incidents and minimizing the stock on hand in all facilities within the NHA. Rivard-Royer et al (2002) support these conclusions through a study done in a Quebec hospital using a hybrid stockless system. Where the stockless system described by Wilson and Cunningham (1992) focuses on maintaining no inventory and having all orders come from the supplier in packaging suitable for the wards, the hybrid stockless system uses a combination of ward-specific shipping from the supplier (for high-volume items) and the provision of low-volume items from the institution's central stores (Rivard-Royer et al 2002).

The use of information technology in supply chain management is supported by the research of Howells and Wood (1995), who looked at the implementation of electronic data interchange (EDI) in industry in the United Kingdom, particularly with respect to its application in the pharmaceutical and healthcare settings. Although their 1995 study looked primarily at the use of EDI interorganizationally, they also examine the benefits of use in an intra-organizational context. Like Danas et al (2002), Howells and Wood (1995) realize the potential of an integrated IT system to locate emergent stock at various sites within an intra-organization supply-chain system, in order to distribute emergency supplies more efficiently and effectively. While the NHA would be using a PC-based

system to manage such a system, the experience with EDI can be related, as the principles of supply chain management are congruent in both settings.

Howells and Wood (1995) found that the cost of setting up an intergrated EDI was one of the biggest barriers of adaption. In addition to hardware, software and set up costs, the cost of training staff must be a consideration. Howells and Wood (1995) identified that this cost was prohibitive to some firms considering the use of EDI.

Like Danas et al (2002), Howells and Wood (1995) identify that securing the input and support of the suppliers in the pharmaceutical industry is critical to the success of an integrated system. Additionally, having the support of key business managers (in the case of the NHA, the pharmacy managers) will be necessary to successfully launch an electronically managed supply chain system. Howells and Wood (1995) suggest that developing smaller, interinstitutional working groups is a key step to ensure that such a system will meet the needs of all parties involved.

Further support of the benefits of an integrated IT system in supply chain management is found in McGrath and More's (2001) study of the implementation of such a system in Australia. McGrath and More (2001) found that the cost of a PC and Internet based system was less than that of developing an EDI. Again, the structure they studied is not directly comparable to the capabilities of Cerner,
their results demonstrate that there is financial benefit to using some sort of electronic system for supply chain management.

By considering a central distribution site for drug procurement and delivery, essentially the organization is looking at centralization of duties, which is effectively a variation of outsourcing. Although all activities would still be maintained internally by NHA employees, many regional sites would reduce or eliminate their involvement in the pharmaceutical supply chain. These duties would be taking on by one central site, reducing the training required and time spent on supply chain activities at smaller sites with fewer staff. Moschuris et al (2006) examined outsourcing in public hospitals in Greece, and found that the benefits were significant in a variety of avenues. Benefits found included improved performance in product/service delivery, cost savings, and increased time for management or other activities. With staffing at a premium at most NHA sites, taking time from supply chain activities to create more time for clinical activities is a common goal.

One of the key aspects of the Greek study was to look at the process by which decisions regarding outsourcing were made. Through a survey sent to one hundred Greek public hospitals, Moschuris et al (2006) identified that there were key functional areas involved in the decision to outsource, including finance, purchasing, administration and legal departments. This research supports

Howells and Wood's (1995) proposal of creating small working groups around the implementation of an integrated system.

Another aspect evaluated by Moschuris et al (2006) was the factors that affected the decision-making process regarding outsourcing. They wanted to determine what the primary factors driving hospitals to consider outsourcing as an option. Over half of the respondents rated cost savings and customer satisfaction as very or substantially important. Flexibility was the second-highest ranked factor when considering importance, with over 40% of respondents indicating very or substantially important. With that, lack of personnel was rated the same by just slightly less than 40% of respondents. One criticism of this survey was that respondents were asked to rank a list of pre-selected factors, without an avenue to indicate their own motivating factors in considering outsourcing. While the factors selected by the authors are certainly representative of many considerations, more insight may have been achieved by asking for "other" responses.

The third aspect Moschuris et al (2006) examined is how a successful contract was selected. Again, respondents were asked to rate a list of criteria on a scale of importance. The top criteria, in survey results, were the quality of service and the price offered, with past experience with the provider a close third.

The final area that was examined was the impact of outsourcing on the organization, in terms of cost reduction, improved customer satisfaction, and improvement of service provided by the hospital. Only one-third of respondents rated a high cost reduction, over half of respondents rated a very high improvement in customer satisfaction, and nearly two-thirds indicated a high improvement of service provided by the hospital. In terms of cost reduction, only about 15% identified the ability to reduce full time employees (FTEs).

Respondents were asked to identify areas of difficulty in implementing outsourcing within their organizations. Several key points were identified that can be directly linked to potential NHA concerns. Employees' resistance to change and quality problems are among the top concerns of NHA facilities, with respect to centralizing drug distribution. Moschuris et al (2006) do not specifically address solutions to these issues within their study; however, acknowledging the issues and concerns of other organizations is a critical step in developing and implementing a successful change in supply chain management.

Ultimately, literature regarding supply chain management, both general and hospital-specific, suggests that both the business processes and the customersupplier relationship are fundamental in establishing a successful supply chain. There is evidence to support the use of technology within the supply chain system, to aid in managing the individual steps and procedures of the supply chain processes. Finally, balancing the economics of efficient processes with

customer satisfaction is integral to developing a suitable supply chain system in any organization.

Methodology

As suggested by the literature surrounding supply chain management philosophy, there are two major areas of consideration: 1) the acceptability of the practices, or the customer satisfaction, and 2) the business processes, or steps involved in the physical procurement of the medications. In this case study, both factors were examined. The methods of data collection used for this study include:

- 1. A questionnaire.
- 2. An interview process.
- 3. Secondary information collected from shipping records.

To determine the customer satisfaction of current services provided by PGRH Pharmacy, a brief questionnaire was distributed to the study site, regarding the suitability of current practices, and an interview with the manager of GRBH Pharmacy was conducted, to further understand the positive functions and the problems of the current distribution system. To examine the business processes currently in place, the weekly orders of one regional site were tracked and analyzed.

The rationale for selecting GRBH Pharmacy Department, in Quesnel, was that the pharmacy has used PGRH shipping services for approximately four years, which has resulted in the establishment of a regular and reliable process. The distribution system to GRBH Pharmacy has been solidly established and the staff members are very experienced with the current procedures and are in the best position to provide feedback regarding the system.

In order to examine the acceptability, or the customer satisfaction of current practices, a brief questionnaire was distributed to the GRBH Pharmacy staff, containing the following three open-ended questions:

- 1. What is PGRH Pharmacy doing well?
- 2. What could PGRH Pharmacy do better?
- 3. What service(s) are missing that you would require to receive one hundred percent satisfactory service from PGRH Pharmacy?

In order to complete the case study of the business processes involved in the distribution relationship between GRBH Pharmacy and PGRH Pharmacy, three factors were examined: workload for receiving, preparing and shipping orders (Figure 5, processes 2 to 5), the cost of shipping (Figure 5, processes 6 to 8) and technician time (Figure 5, processes 1 to 5 and 9), and the spatial requirements of PGRH Pharmacy inventory.

Service Analysis

In order to examine the positive factors and the problems of the current distribution relationship between GRBH Pharmacy and PGRH Pharmacy, a brief questionnaire was sent to GRBH Pharmacy staff to determine the basic needs from a centralized drug distribution centre. GRBH Pharmacy staff includes 2 FTE pharmacists and 2.4 FTE pharmacy technicians. The staff members were asked three open-ended questions, all with respect to current ordering and shipping practices:

- 1. What is PGRH Pharmacy doing well?
- 2. What could PGRH Pharmacy do better?
- 3. What service(s) are missing that you would require to receive one hundred per cent satisfactory service from PGRH Pharmacy?

The format was a table which was completed manually as a collaboration of both the pharmacists and technicians. The responses provided were cumulative; all staff members collaborated to provide one set of answers to the questions. A copy of the questionnaire table and transcribed responses is provided in Appendix 1.

Given the background of PGRH Pharmacy's perspective on the current shipping processes provided in the Introduction, the questionnaire was distributed to the GRBH Pharmacy staff to glean information regarding the acceptability of how these procedures are implemented. The four staff members at GRBH (two

pharmacists and two technicians) completed the questionnaire together, providing one collective response set.

What is PGRH Pharmacy doing well?

In response to the query "What is PGRH Pharmacy doing well?", the GRBH Pharmacy staff felt that the pre-packaged medications, unit dosed medications. and Centralized Intravenous Admixture (CIVA) products were the most beneficial. As PGRH Pharmacy purchases medications in large, bulk sizes, most medications are re-packaged in a variety of formats to better service both PGRH nursing units and the regional facilities. These packaging formats include prepacks for use as self-medications, "to go" packs, blister-card packs, and simply smaller quantities for medications with less turnover. Additionally, most tablets and capsules are provided in unit-dose format for regular inpatient dispensing. This implies that each tablet/capsule is individually packaged in a foil package labelled with the drug name, strength, brand, lot, expiry, and Drug Identification Number (DIN). CIVA products include pre-filled medication syringes containing one dose of intravenous (IV) medications and prepared large-volume bags of medications for infusion. These types of packaging are more convenient and safe for nursing administration. By providing medications in these convenient and safe packaging forms, other sites save time in not having to repackage independently. Not only is time saved, the use of convenience packaging provides for safer medication administration, which is in line with national healthcare initiatives of safer healthcare.

GRBH Pharmacy does not have a unit dose packaging machine; as a result, they purchase all unit dose products from PGRH. GRBH Pharmacy has two biological safety cabinets; one is used for preparation of antineoplastic medications and the other is used for the preparation of CIVA and other sterile products. Regardless of the availability of technology for preparing sterile products, with only 2.4 FTE technicians, time does not permit extensive preparation of CIVA products, and the majority is still purchased from PGRH. When asked about current purchasing patterns of pre-packaged, convenience packaged, and CIVA products, GRBH Pharmacy staff indicated that, if more products were available, they would purchase more.

In addition to the convenience of re-packaged products, GRBH Pharmacy commented that inventory levels have improved. Staff identified that throughout their four year history of using PGRH Pharmacy as a wholesaler, they have had issues with not being sent full quantities requested due to insufficient inventory levels at PGRH Pharmacy. They feel that PGRH Pharmacy has achieved better management of inventory levels, more reflective of the ordering practices of GRBH Pharmacy. Inventory management has been and will continue to be a challenge for the PGRH Pharmacy staff as the variability of demand of medication procurement is unpredictable. The third area identified that PGRH Pharmacy is doing well in was a reduction in picking errors. Throughout the duration of GRBH Pharmacy's ordering from PGRH Pharmacy, there have been several PGRH staffing changes resulting in a degree of inconsistency and a higher error rate. Data regarding precise percentages of error rates is unavailable; however, the GRBH Pharmacy staff subjectively identified picking errors as a frequent issue. For the past year, the same technician has occupied the PGRH Pharmacy Shipper/Receiver position, and that technician has developed more consistent practices with respect to managing workload. The results of this have been observed with reduced errors in shipments, from the perspective of GRBH Pharmacy staff.

What could PGRH Pharmacy do better?

In response to the query of "What could PGRH Pharmacy do better?", there were a variety of comments regarding both the inventory and the shipping procedures. In regards to the inventory itself, the feedback received indicated that PGRH Pharmacy needs to have different sizes of formulary items available. Because of the CIVA program, PGRH Pharmacy often stocks only the individual dose or the large multi-dose sized products. In many cases, there are intermediate sized products that may be more suitable for the needs of the smaller regional facilities, including GRBH Pharmacy. PGRH Pharmacy receives many requests for these sizes, but they are not currently stocked due to space limitations in the physical inventory space. Additionally, there was feedback regarding the dating of products; concerns were raised with respect to receiving stock with short dating. GRBH Pharmacy staff defined short product dating as less than or equal to three months to product expiry. This is a concern for GRBH Pharmacy because of the small size of their facility and the reduced likelihood of using certain products within three months. While every attempt is made to provide products with the best dating possible, there are situations where PGRH Pharmacy receives short-dated products from the manufacturer and, therefore, doesn't have better dated product to supply the region. A solution, as identified by GRBH Pharmacy staff, would be for the PGRH Pharmacy Shipper/Receiver to notify regional sites with a phone call when products with short-dating are to be sent, allowing the smaller sites to modify their order quantity based on expected future use of the product.

In regards to the shipping procedures, the area of most concern was order addons. Given the early order cut-off of 1000h, GRBH Pharmacy often sends requests in addition to their order after the cut-off time. This becomes a problem for the PGRH Pharmacy Shipper/Receiver because she has generally completed and packaged the order when add-on requests are received after the 1000h cutoff time. Add-ons require either an additional box to be packaged, with further cost to the NHA for shipping, or the original package to be re-opened for packing additional items. This increases the time required for preparing orders, and takes time away from the PGRH Pharmacy Shipper/Receiver's other duties of receiving and putting away inventory. However, given that GRBH Pharmacy cannot

maintain a large inventory, there are regular occurrences of new patient medication orders that require stock as soon as possible that couldn't have been prepared for, considering the unpredictable nature of healthcare. Ultimately, GRBH Pharmacy is looking for more flexibility in ordering from a centralized distribution centre.

The other primary process concern was receiving special orders from the vendor in a timely fashion. GRBH Pharmacy feels that the time lag on receiving special orders (PGRH Pharmacy must first order from the vendor before shipping out to GRBH Pharmacy) is too long, stating that it takes at least a week to receive the product(s). This particular concern would require further investigation, as, unless there is a manufacturer shortage, there should only be a two day lag in delivering special orders. Providing they receive the request before 1400h, the PGRH Pharmacy Purchaser can order the item from the vendor for next day delivery. PGRH Pharmacy would receive the item the following afternoon and ship it out next day. If orders are truly taking greater than a week to receive, there is a bottleneck in the system that would require further investigation. Since special orders are usually non-formulary items, a possible resolution is for GRBH Pharmacy to order their special orders directly from the suppliers.

What service(s) are missing that you would require?

The final question that was asked was "What service(s) are missing that you would require to receive one hundred per cent satisfactory service from PGRH

Pharmacy?" The responses were primarily focused around process and procedural issues. The main issue is regarding ordering frequency. GRBH Pharmacy has concerns that they are limited to only ordering three days per week, for regular drug items, and only twice a week for narcotics. If they were ordering directly from the wholesaler, they would be able to order five days per week, which is considered to be more acceptable service.

To provide service five days per week, the Pharmacy Shipper/Receiver would need to be able to provide more dedicated time to processing orders for GRBH Pharmacy. This prospect is further examined in the following discussion of current business processes.

Another request for service enhancement is a better system to manage backorders. Currently, sites are made aware if a requested item is backordered via a note attached with the purchase order. Backorders occur frequently, with approximately three items per week being listed as backordered, as a result of an inability to keep up with product demand, availability of necessary additives, availability of packaging, or product integrity concerns. Backorders can take weeks to months to be resolved, sometimes resulting in products being discontinued altogether. The PGRH Pharmacy Purchaser, in conjunction with the Regional Drug Utilization Evaluation (DUE) Pharmacist, works to find alternate suppliers or alternate products, as required. When the PGRH Pharmacy Shipper/Receiver is unable to provide an item due to a backorder,

sites are asked to reorder the item; records of requested backordered items are not maintained by the PGRH Pharmacy Shipper/Receiver because of workload issues. The concern that GRBH Pharmacy expressed regarding backorders is that they sometimes have to order several times before the backorder is resolved. Furthermore, if backordered items are discontinued, or are unavailable indefinitely, this information is not always passed on to the GRBH Pharmacy technicians.

A reasonable solution to this issue could be to have the PGRH Pharmacy Purchaser maintain an electronic list of backordered items on the iPortal, the NHA intranet site. Through the iPortal, all regional sites would be able to monitor which items are backordered, expected release dates, and which items have been taken off the backorder list. With this information more readily available, sites would know when to reorder. Furthermore, within this site, information regarding alternate suppliers or products could be made available, for backorders with no estimated availability dates.

Further service enhancement requests centre around the processes for managing returns. The first request is that PGRH Pharmacy must accept returns of overstock medications, that is, medications ordered in excessive quantities that are no longer required. Currently, PGRH Pharmacy will only accept overstock if PGRH Pharmacy shipped an excessive quantity in error. If a regional site ordered more than was needed, that overstock is not accepted as a

return. This procedure is unlikely to change, as generally, if larger than normal volumes were ordered, PGRH Pharmacy would have had to order extra. If PGRH Pharmacy were to accept the returned stock, it is unlikely that the extra volume would be used before expiring. Furthermore, if GRBH Pharmacy was ordering directly from a supplier or wholesaler, they would not be able to return stock simply because they ordered too much or no longer needed it. While PGRH Pharmacy may be considered the primary wholesaler for GRBH Pharmacy, GRBH Pharmacy is still responsible for their own inventory management.

In an effort to assist sites with inventory management, the NHA has created a position, the Regional Pharmacy Operations Coordinator (RPOC). The duties of the RPOC include providing direction to regional Pharmacy managers with respect to optimizing drug distribution services, and ensuring that pharmaceutical services comply with current legislation, professional standards, and organizational policies. In addition, the RPOC works in conjunction with the regional Pharmacy managers and the Regional Director of Pharmacy Services to contribute to the management of financial resources by assisting with budget preparation, monitoring the budget, identifying variances and taking corrective action. The current RPOC has a financial background and has expertise in the area of inventory management; the RPOC could be instrumental in assisting both PGRH Pharmacy and GRBH Pharmacy in developing procedures for inventory

management in order to facilitate each facility maintain appropriate levels of inventory.

The other issue around the returns process is the paper work required prior to send expired products and overstock returns to PGRH Pharmacy. Examples of the paperwork required can be found in Appendices 3 and 4, respectively. GRHB Pharmacy feels that these processes are too complicated; there are too many steps involved in completing the required forms. There are different processes for managing overstock returns from the pharmacies, overstock returns from the wards (or nursing units) and returned expired products, due largely to the fact that receiving credit from the suppliers or wholesalers is dependent on certain criteria being met.

First, products that are still within date that were simply over-ordered are not generally accepted. PGRH Pharmacy management feels that lack of inventory management at the regional level is an unacceptable reason for product returns (as previously discussed), and the paperwork and procedures that must be completed as a result. Moreover, accepting in date returns is a service that is above and beyond that provided by direct suppliers. PGRH Pharmacy purchases all medications either directly from the supplier, or through a wholesaler, and there are very limited circumstances in which they will accept in date returns. As per a Health Canada policy, no injectable medications may be returned in date. Some, but not all suppliers will accept returns of other

medications; however, the products must be in complete, unopened containers, with seals in tact.

There are occasions where GRBH Pharmacy will order medications they do not normally carry to meet the specific needs of a patient. If the patient no longer requires it, they may return unused stock to PGRH, where it is more likely to be used prior to expiring. Similarily, if the PGRH Pharmacy Shipper/Receiver made a picking error and sent a wrong product or quantity, these returns would be accepted. When sending returns within date, regional facilities are asked to ensure that the value is at least \$50 in order for the processing to be worthwhile. The region completes an electronic form (Appendix 4) and e-mails it to the PGRH Pharmacy Regional Technician. The PGRH Pharmacy Regional Technician credits the facility, and returns the stock to PGRH Pharmacy inventory.

For expired products, there are different procedures for processing depending on whether they expired on the wards or in the pharmacy. For items that expired on the ward (either as ward stock or patient-specific dispensed medications), the ward receives no credit. These items do not need any written documentation, and can just be shipped to PGRH Pharmacy, where they are sorted and processed as per policy. For items that expired in the Pharmacy, credit is given to the facility (for facilities that have a valid inventory account). Sites returning expired Pharmacy items are asked to complete the same electronic form as for returned in-date goods. The completed form is e-mailed to the PGRH Pharmacy Regional Technician, who credits the facility (providing the product is no more than three months expired and we can receive credit for the product). All expired products, from both the region and PGRH, are then processed as per policy and returned to the drug companies for credit.

The final issue identified as a required service was related to the use of formulary and non-formulary items. The first request was to revise the formulary and the second was to carry items that are currently non-formulary but that they consider should be formulary items. Revising the formulary is not the responsibility of the PGRH Pharmacy. All formulary decisions are dealt with at a regional level, at the Regional Pharmacy and Therapeutics (P&T) Committee. While it is undeniable that the formulary needs a revision, it is not the place of PGRH Pharmacy. Formulary revision has been problematic over the past three years because there has not been a Regional Drug Utilization Evaluation (DUE) pharmacist in place. With this position being filled only recently, the formulary revision will begin, and many items that the region considers should be formulary will likely be reviewed and added in the near future.

Interview Responses

In order to ensure that all areas of the current distribution relationship between GRBH Pharmacy and PGRH Pharmacy were discussed, an informal telephone interview with the GRBH Pharmacy Manager was conducted. Three open-ended questions were asked:

- 1. What is your level of satisfaction with narcotics distribution services?
- 2. What are the drawbacks to the narcotics distribution services?
- 3. Are there any additional areas you would like to discuss?

As previously mentioned, narcotics distribution is the responsibility of the PGRH Pharmacy Narcotics Technician, which is a position within the eleven person technician rotation. The implication of this is that, from week to week, different people perform the Narcotic Technician duties. This has the potential to create inconsistencies in the processes of shipping narcotics. In addition to distributing narcotics to regional facilities, the PGRH Pharmacy Narcotics Technician is also responsible for the delivery of all narcotics to the PGRH inpatient units, receiving and putting away new narcotic and controlled stock, pre-packaging any narcotic or controlled medications into usable format, and maintaining an inventory count of the narcotics room twice weekly. Because of this workload, all narcotic orders for local nursing units and for regional facilities, must be received by 1000h in order to be processed for same day distribution or shipping.

When asked about the satisfaction of narcotics distribution services, GRBH Pharmacy staff identified several positive points. The primary benefit is the reduction in paperwork and signatures required. By law, when purchasing narcotics directly, a pharmacist must sign the purchase order and the receipt. By purchasing from PGRH Pharmacy, because GRBH Pharmacy is set up like a nursing unit, this paperwork is avoided. Additionally, when GRBH Pharmacy has expired narcotics, which requires two pharmacists present for destruction, they are able to send them to PGRH Pharmacy for destruction. This is a benefit because, with GRBH Pharmacy only having two pharmacists, taking the time to destroy narcotics prevents any other pharmacy work from being done. PGRH Pharmacy has twelve FTE pharmacists, and can better manage the workload of destroying narcotics. Finally, as with the provision of regular medications, GRBH Pharmacy finds that the provision of narcotics in blister packs and pre-filled syringes is very beneficial in time savings.

The only shortcoming to purchasing narcotics from PGRH Pharmacy identified by GRBH Pharmacy staff was the limited order days. GRBH Pharmacy (and other regional sites) is only able to order narcotics three days per week: Tuesday, Wednesday and Thursday. Narcotic orders are not filled by PGRH Pharmacy on Mondays because of workload issues with distribution of narcotics to local nursing units. Orders are not shipped on Fridays because of issues with packages sitting in warehouses over the weekend, if there is no one there to receive them. Because of the laws governing narcotics transportation, packages containing narcotics cannot sit unattended; they must be received and signed for upon arrival at their destination. Despite this challenge, GRBH Pharmacy is appreciative of the services they do receive, and feel that the benefits outweigh the drawbacks. In order to address the shortcomings, GRBH Pharmacy staff has identified alternative methods of obtaining emergent narcotic items. They can purchase oral narcotics from any of the retail pharmacies in Quesnel, which is an option they have used on occasion. Since injectable medications are not usually available at retail pharmacies, they maintain higher stock levels in order to compensate for the limited service.

After completing the brief questionnaire and the first two interview questions, the GRBH Pharmacy Manager felt that all areas of the distribution relationship had been discussed, and had no additional areas of discussion.

A summary of the strategic considerations of the NHA's current supply chain scenario with GRBH Pharmacy is provided in Figure 6.

Figure 6 – SV	VOT Analysis o	f Current Supply	Chain Practices

Strengths	Weaknesses			
 Time savings for regional sites purchasing through PGRH Pharmacy Cost savings to NHA for bulk buying/rebates Time savings by returning narcotics for destruction at PGRH Convenience packaging Ability to order in smaller quantities 	 Limitations to days per week when regional sites can order Unreliable access to non- formulary medications and other products not stocked by PGRH Pharmacy Increased workload for Materials Management Current situation of manual ordering (incompatible computer systems in various regional sites) Picking errors Reliable coverage for PGRH Pharmacy Shipper/Receiver Not all formulary product sizes are available Some stock sent with poor dating Early order cut-off Lag time on special orders Lack of provision of non- formulary items 			
Opportunities	Threats			
 Increase the number of sites supplied Create greater cost savings through more bulk purchasing Increase the availability of pre- packaging/convenience packaging Create greater efficiencies with returns/expired drug management 	 Backorders and supply shortages affect regional sites more greatly Transportation costs increasing as a result of fuel charge increases Inclement weather delaying shipping 			

Data Analysis

In addition to examining the customer service aspects of the distribution relationship between GRBH Pharmacy and PGRH Pharmacy, the business processes were monitored and tracked for evaluation.

Order Time

For a four month period, all orders for GRBH Pharmacy were tracked. Records were kept of the time required by the Shipper/Receiver Technician to pull, package and prepare orders for shipping (provided in minutes), the number and quantities of items ordered (provided as number of line items per order), and the number of boxes required to ship the orders (See Table 2). Using this data, an average of the order time was calculated and used to determine the average weekly order time, based on the current service level of three orders per week. Over the four month observation period, an average order took 66.43 minutes to pull, package and label for shipping. The estimated average time required to ship medications to GRBH Pharmacy, 3.3 hours, includes the distribution of all medications, excluding narcotics. Expanding the time required for an average order, filling three orders per week, as per the current level of service, would take approximately 200 minutes or 3.3 hours. Information provided by the Finance business analyst for GRBH Pharmacy indicates that the hospital was operating at 100% capacity during the period where shipping data was collected.

Looking at the data set statistically, during the four month analysis period, 42 orders were observed, with respect to time required for processing and shipping. The mean time required to complete the processes for shipping was 66.43 minutes, with a minimum order time of 25 minutes, and a maximum order time of 150 minutes. The standard deviation of these processing times was 29.62 minutes; 76.19% of the order times fall within 1 standard deviation of the mean time, 95.24% of the order times fall within 2 standard deviations of the mean time, and 100% of order times fall within 3 standard deviations of the mean time.

Date	Pull time	# items	Boxes	Date	Pull time	# items	Boxes
5-Oct-07	40	30	2	10-Dec-07	90	27	3
8-Oct-07	75	27	5	13-Dec-07	60	25	3
10-Oct-07	90	35	5	14-Dec-07	45	31	3
15-Oct-07	25	20	3	17-Dec-07	90	28	2
17-Oct-07	60	35	3	19-Dec-07	150	80	3
24-Oct-07	75	53	3	21-Dec-07	150	46	4
26-Oct-07	40	27	3	26-Dec-07	90	58	4
29-Oct-07	75	36	4	2-Jan-08	45	21	3
31-Oct-07	40	27	3	4-Jan-08	45	20	4
4-Nov-07	90	27	5	7-Jan-08	70	31	5
7-Nov-07	90	32	1	9-Jan-08	70	36	4
9-Nov-07	45	29	2	11-Jan-08	60	33	2
12-Nov-07	30	21	2	14-Jan-08	60	26	2
13-Nov-07	120	36	3	16-Jan-08	75	29	2
16-Nov-07	60	39	3	18-Jan-08	30	17	1
19-Nov-07	30	18	1	21-Jan-08	105	66	3
23-Nov-07	30	15	3	23-Jan-08	60	29	3
28-Nov-07	90	34	3	25-Jan-08	45	21	2
30-Nov-07	75	41	3	28-Jan-08	60	26	4
3-Dec-07	55	33	1	30-Jan-08	35	19	1
7-Dec-07	45	23	1	1-Feb-08	75	43	3
Sum	1280	638	59	Sum	1510	712	61
			-	Totals	2790	1350	120

Table 2 – Summary of GRBH Pharmacy Orders

To generate the total time required for processing an order, the technician time required to generate the order or requisition list must also be considered. From the informal telephone interview conducted, the GRBH Pharmacy technicians estimated that, on average, they required 1.5 hours to generate the order list to send to PGRH Pharmacy (Figure 7, process 1). To generate three orders per week, the technicians require approximately 4.5 hours. The time required for order generation was provided as an estimate only; no formal time trials were

conducted to be able to provide an accurate value. Further study is required to determine an accurate time requirement prior to any change implementation.

The other process in the ordering and shipping procedures that requires time is billing the ordered items (Figure 7, process 4). The PGRH Pharmacy Shipper/Receiver requires approximately 20 minutes (or 0.33 hours) to complete the billing for an average GRBH Pharmacy order. Again, this value is an estimate provided by the PGRH Pharmacy Shipper/Receiver; no formal time trials were conducted to provide an accurate value. Further study is required to determine an accurate time requirement prior to any change implementation.

The final process in the distribution relationship from the Pharmacy perspective is when GRBH Pharmacy receives the order. When an order is received, the GRBH Pharmacy technician checks the items sent to the requisition list provided by PGRH Pharmacy to ensure proper quantities and drugs were sent. After verification, stock is put away, with older stock being rotated to the front of the storage bins. Finally, the prices from the requisition list are verified in GRBH Pharmacy's computer system. This process takes approximately 1 hour. This estimate was obtained from the informal telephone interview, and is only an approximation. The actual time for this process was not observed; further study is required.

The time required for the processes relating to the Materials Management department (Figure 7, processes 6 to 8) was outside the scope of this study. However, because the time required to complete these processes does represent cost to the organization, further studies should be conducted prior to implementing any changes to the distribution system.



Figure 7 – Timed Ordering and Shipping Procedures

Table 3 – Analysis of Time Required to Service GRBH Pharmacy Three Days Per Week

Factor	Calculation			
Approximate time to generate order (Figure 7,	90 minutes			
process 1)				
Average time spent per order (Figure 7,	2790 minutes/42 orders			
processes 2 and 3)	= 66.429 minutes per order			
Approximate time to bill order (Figure 7,	20 minutes			
process 4)				
Approximate time to receive order	60 minutes			
Total time to process order (Pharmacy	90 + 66 + 20 + 60			
perspective)	= 236 minutes			
	= 4 hours			
Average time per week	4 hours per order x 3 orders per			
	week			
	= 12 hours per week			
	= 0.32 FTE technician time			

Shipping Costs

In addition to time and staffing requirements, the cost of shipping packages to GRBH Pharmacy must be considered. Where orders shipped from suppliers or wholesalers are generally free of charge, shipping from PGRH to regional facilities incurs cost to the organization. Although these costs are not borne directly by the Pharmacy Departments, they do represent increased cost to the Materials Management department, and the organization as a whole. The costs of shipping packages within the NHA are summarized in Table 4. GRBH Pharmacy is located within the NI HSDA; the costs incurred for shipping to that facility are shown in Table 4, column 3. A summary of the cost of shipping medications to GRBH Pharmacy for the four month observation period is found in Table 6, with the required numbers of boxes per order listed to distinguish between boxes required for regular or refrigerated items (labelled "Boxes") and the boxes required for antineoplastic medications (labelled "Chemo"). The results of the rudimentary cost analysis and extrapolation of cost to all regional shipping can be found in Table 7. DHL is the courier used for shipping all of the products shipped in this study. Narcotics, which were excluded from this case study, are shipped using Purolator, because of the federal regulations surrounding mandatory chain of signatures for shipping these products. Shipping costs to GRBH Pharmacy are \$12.85 per ten pound box, with a charge of \$0.15 per pound greater than ten, plus an additional fee of \$15 for any package containing antineoplastic (chemotherapy) agents which are considered dangerous goods. Routinely, packages sent from PGRH Pharmacy do not exceed ten pounds; accordingly, the base rate of \$12.85 per package was used in the analysis of shipping fees.

Table 4 – Regional Shipping Costs

	1	Northern Interior HSDA	North East HSDA	Northwest HSDA
DHL	Box (up to 10 lb)	\$12.85	\$13.85	\$13.85
	Charge per excess lb	\$0.15	\$0.15	\$0.15
	Dangerous goods fee	\$15	\$15	\$15
Purolator	Box (up to 10 lb)	\$6.50	\$6.50	\$6.50
	Charge per excess lb	\$0.15	\$0.15	\$0.15
	Dangerous goods fee	\$15	\$15	\$15
	Chain of signature charge	\$10	\$10	\$10

Table 5 – GRBH Pharmacy Orders Costs of Shipping

Date	Boxes	Chemo	Cost	Date	Boxes	Chemo	Cost
5-Oct-07	2	0	\$25.70	10-Dec-07	1	2	\$68.55
8-Oct-07	5	0	\$64.25	13-Dec-07	2	1	\$53.55
10-Oct-07	5	0	\$64.25	14-Dec-07	2	1	\$53.55
15-Oct-07	3	0	\$38.55	17-Dec-07	2	0	\$25.70
17-Oct-07	2	1	\$53.55	19-Dec-07	3	0	\$38.55
24-Oct-07	1	2	\$68.55	21-Dec-07	4	0	\$51.40
26-Oct-07	2	1	\$53.55	26-Dec-07	2	2	\$81.40
29-Oct-07	4	0	\$51.40	2-Jan-08	2	1	\$53.55
31-Oct-07	2	1	\$53.55	4-Jan-08	2	2	\$81.40
4-Nov-07	3	2	\$94.25	7-Jan-08	3	2	\$94.25
7-Nov-07	1	0	\$12.85	9-Jan-08	3	1	\$66.40
9-Nov-07	1	1	\$40.70	11-Jan-08	1	1	\$40.70
12-Nov-07	2	0	\$25.70	14-Jan-08	1	1	\$40.70
13-Nov-07	2	1	\$53.55	16-Jan-08	2	0	\$25.70
16-Nov-07	2	1	\$53.55	18-Jan-08	1	0	\$12.85
19-Nov-07	1	0	\$12.85	21-Jan-08	2	1	\$53.55
23-Nov-07	2	1	\$53.55	23-Jan-08	3	0	\$38.55
28-Nov-07	1	2	\$68.55	25-Jan-08	2	0	\$25.70
30-Nov-07	2	1	\$53.55	28-Jan-08	3	1	\$66.40
3-Dec-07	1	0	\$12.85	30-Jan-08	1	0	\$12.85
7-Dec-07	1	0	\$12.85	1-Feb-08	2	1	\$53.55
Sum	45	14	\$ 968.15	Sum	44	17	\$ 1,038.85
Shiping Costs - DHL			Totals	89	31	\$ 2,007.00	
\$12.85 10lb box							
\$15.00 Chemo charge							

Table 6 – Analysis of Regional Shipping Costs

Factor	Calculation
Average cost per order	\$2007 for observation period/42 orders = \$47.79 per order
Cost per year (based on three orders per week)	\$47.79 per order x 3 orders per week x 52 weeks per year =\$7455.24 per year

Not only do the costs of shipping need to be considered, but also the increased workload for Materials Management staff. Currently, there is only one FTE responsible for meeting the shipping demands of PGRH, the PGRH Materials Management Shipper/Receiver. This individual is responsible for physically ensuring that any packages sent from PGRH Pharmacy or any other PGRH department are appropriately labelled and picked up by the appropriate delivery service. Data on the PGRH Materials Management Shipper/Receiver's workload was not available, so a direct analysis of PGRH Pharmacy's impact on workload is not provided.

Physical Location of Inventory

In addition to considering the time and staffing requirements, the cost of shipping, and the impact on other services required to meet the needs of GRBH Pharmacy, one further aspect needs to be reviewed. The space currently occupied by the PGRH Pharmacy Department is barely adequate to handle the number of employees and the inventory. Since taking on the provision of distribution services to GRBH Pharmacy and other regional facilities, PGRH Pharmacy underwent remodelling to accommodate the larger space required for inventory. To contemplate increasing inventory to include more product sizes, as was indicated to be necessary to provide complete services to GRBH Pharmacy, PGRH Pharmacy would likely need to find more space to work with. An estimate of potential required space was not calculated, as specific data regarding the required increased products was not available. This matter would require further

investigation to determine what products would be most valuable to GRBH Pharmacy, in addition to drug utilization evaluation of these items to determine requirements for inventory.

To accommodate a potential need for increased inventory space, PGRH Pharmacy could consider moving its inventory to an off-site warehouse location; however, there are significant cost implications to this consideration, including warehousing investment costs and finance requirements, which are outside the scope of this study. Furthermore, NHA Pharmacy inventory practices warrant further study, as previously discussed, as there is room for improvement in inventory management at all regional sites.

Although there are costs to both the regional Pharmacy departments and external departments, there are also benefits to outside areas. One example is in Finance. With only PGRH Pharmacy dealing with direct purchasing, the amount of invoice-processing and workload around invoice matching, receiving and other purchasing activities decreases, which lightens the workload of the Accounts Payable department. An exact value of workload reduction could not be obtained for the purpose of this study, as these statistics are not kept by Accounts Payable; however, initial discussions with the Regional Pharmacy Operations Coordinator suggest that the impact is significant.

Further Considerations

A concern that was not brought forward by GRBH Pharmacy was with respect to the shipping service providers. Shipping services are currently provided by two main companies, DHL or Purolator, depending on the regional facility location, the available delivery times, and the type of product being shipped. The bulk of shipping services are supplied by DHL, which uses unheated trucks. This becomes a significant problem in the winter, where outside temperatures can sometimes fall below -40 °C. With unheated trucks, there has been a history of medication orders freezing, either because of the time spent as a result of distance travelled, or because trucks are left overnight. Although this is a risk only at certain times, it may mean that alternate avenues for winter shipping must be considered. Furthermore, given that the majority of transport for medication shipping is by ground, winter road conditions can be an issue. Weather and road conditions have a history of closing highways, making ground deliveries to some communities impossible. Again, alternate avenues of delivery may need to be considered at certain times, including the use of air delivery.

Another potential avenue to investigate is the possibility of special shipping arrangements with the suppliers and wholesalers. There is the potential to create savings in the first supply chain if we are able to make local agreements regarding alternate shipping arrangements, like drop shipping for bulk, highlyused items. Much of the literature published regarding supply chain focuses on

drop-shipping as an avenue for savings. While this was not within the scope of the study, it is an area that requires further consideration.

There are further cost considerations outside the scope of this study that must also be examined. PGRH Pharmacy would experience an increase in packaging costs if creating more convenience packaging, pre-packaging and CIVA products for regional use. Although the costs of these types of packaging are not currently included in drug costs charged to wards and regional facilities, an increase in the creation of these package types would imply an increased cost to the PGRH Pharmacy materials budget. Furthermore, the cost of distribution of narcotics was not included in this study, and further study into the implications of this added cost are required.

The processes and procedures currently in place, like those being considered for a centralized distribution system, are very manual in nature. At this point in time, not all sites are operating with the same computer supply chain management systems. This situation makes it difficult to create an interface, or interfaces, to allow for the work of ordering and shipping to be done electronically. While PGRH Pharmacy is operating with the Cerner supply chain management program, other sites have not yet been brought live. As a result, when GRBH Pharmacy generates an order, they must manually write a list of required products, and fax it to PGRH Pharmacy. Once the receive the products, GRBH Pharmacy staff must manually receive the stock into their computer system.

Once every site in the region is operating with the Cerner Supply Chain management system, the processes for ordering, shipping and receiving medications between GRBH Pharmacy and PGRH Pharmacy could look very different.

Although literature identified that the cost of implementing an integrated electronic system for supply chain management was a cost barrier, both with respect to hardware and training, the cost barrier is not really applicable for the NHA with respect to distribution relationships. The NHA has previously committed to the implementation of the Cerner Millennium system, with all of its functionalities, including supply chain, in all regional facilities. From this point, it is to the advantage of the organization to examine ways in which the system can be better used to reduce cost throughout.

Cerner's Supply Chain management software maintains a perpetual inventory, with the ability to pre-set minimum stock levels, reorder points and quantities. With Cerner Supply Chain operational in both sites, pick lists for GRBH Pharmacy needs could be generated in PGRH Pharmacy, based on pre-set minimum stock levels and reorder quantities. These pick lists would serve as the orders for the facility, saving GRBH Pharmacy staff considerable time by not having to manually generate an order list.
However, before that can happen, there are some functionality issues that must be resolved. Experience with implementation at PGRH has demonstrated that there are still significant deficiencies to be corrected prior to the implementation of the Cerner supply chain tool throughout the remainder of NHA facilities.

Given that, the view of the future of ordering is strictly theoretical at this point, although Cerner does have the capacity to manage supply chain from a centralized location. In the ideal situation, with Cerner supply chain implemented and fully functional at all regional sites, each site would be able to view the inventory at all other sites in the region. Each site would still be responsible for setting local minimum and maximum levels and reorder points for each product, and this information would be attached to each inventory item in the computer system. Setting minimums, maximums and reorder points for both the regional facilities and for PGRH Pharmacy would be done in conjunction with the Regional Pharmacy Operations Manager, who has considerable experience in inventory management. Once this information is set, manual ordering will not be necessary. PGRH Pharmacy will be able to print a pick list for each site, based on items that have reached the reorder point. Required items will be picked, packed and shipped automatically, greatly reducing the current efforts of manually generating lists of requested items. With respect to billing, when the PGRH Pharmacy Shipper/Receiver bills for the sent items, billing to the sites will be automatic, and the inventory levels at each regional site will be automatically increased when billing is done. This also reduces effort at the regional level, because orders would not have to be manually received, only checked to ensure that the quantities billed were accurate. Other than a printed requisition to be used as a packing note, the system can be paperless.

Further to centralizing distribution, the maintenance of minimums, maximums, and reorder points could be maintained by a central FTE. Once input was received from the regional facilities regarding the starting points of inventory management, updates could easily be maintained centrally by analyses of items and quantities routinely ordered. This would potentially further reduce the efforts required regionally in supply chain maintenance, freeing more time for clinical and direct patient care activities. The only responsibility left for regional staff would be phone ordering last minute or emergent orders. In order for a system like this to be successfully implemented, regional managers would need to accept the prospect of change, develop a vision for the re-distribution of resources, and establish buy-in from their staff.

Another benefit of an integrated regional inventory management system, with each site having access to view the inventory of other sites, is the potential for interfacility trade. Potential examples include redistributing overstock and locating urgently required products. Facilities that have overstock will be able to look in the system to see which other facilities are using that product, and re-distribute (or re-sell) the product, reducing their need to manage in date returns. In the same line of thought, if a facility required an urgent medication that they didn't

stock, they would be able to view inventory at other sites to determine if a location closer than PGRH Pharmacy stocked the item, potentially reducing the time required to procure emergent medications.

Conclusions

With respect to customer satisfaction, it is clear that the current levels of service provided are not wholly acceptable to GRBH Pharmacy; survey results indicate that several aspects of the service provided would need to change (see Table 7). The most prominent need determined was to expand service to five days per week, representing greater costs in terms of technician time and shipping costs. There would also be an unquantified increase in workload and cost to Materials Management as a result of an increase in the number of packages sent from PGRH Pharmacy daily. Furthermore, the increase in inventory space for PGRH Pharmacy that would be required to provide all desired products and sizes would add another unspecified cost to the organization.

With respect to the business processes of the distribution relationship between GRBH Pharmacy and PGRH Pharmacy, the data collected showed that there is cost to both pharmacies for technician time, and there is cost for shipping medications.

However, there are benefits to the Northern Health organization in other ways. There is an unquantified time savings for the Finance department, with respect to invoice processing. Technician workload for ordering medications and maintaining contract updates would be reduced. Ultimately, the intention of this workload reduction would be to not eliminate FTEs but to use them more effectively for patient care. By saving technician time at GRBH Pharmacy

through the reduction of workload surrounding medication procurement, that time can be spent towards more direct patient care activities, which is more in line with current national healthcare initiatives.

Table	7	-	Summary	of	Service	Needs
				_		

What is PGRH Pharmacy doing well?	What could PGRH Pharmacy do better?	What service(s) are missing that you would require to receive one hundred per cent satisfactory service from PGRH Pharmacy?
 Provision of prepacks, unit dose, and pre- filled syringes Less picking errors Better inventory levels maintained 	 Carry more sizes of formulary items Better dating on products sent More flexible with add-ons to orders Quicker vendor ordering on special order items Accept returns on overstock Alert site when not able to ship full quantities of narcotics 	 Formulary revision Carry items that should be formulary Better delivery days Narcotic orders on Mondays Have PGRH process paperwork for returns Tracking of backorders

Recommendations

Based on the results obtained from the service analysis, there are a number of recommendations for changes to the current distribution system that would increase the end user's (GRBH Pharmacy) satisfaction. The problem areas and recommended changes or process implementations are provided in Table 8.

Problem	Resolution
Insufficient inventory to fill requested order quantities	Work with RPOC to enhance inventory management practices at both GRBH Pharmacy and PGRH Pharmacy
Unavailability of certain formulary product sizes	Resolution requires increased inventory space; no immediate resolution identified
Receiving short-dated products	Phone call to GRBH Pharmacy to notify staff of short-dating; could develop a pre-printed form that could be completed and faxed with product information and dating
Early order cut-off time	Additional staffing support
Lag time on special orders	Further investigation into the cause of excessive lag time; consider GRBH Pharmacy purchasing their own special orders
Limited shipping days	Additional staffing support
Backorder management	Create an on-line table with backorder information (item, estimated release date, actual release dates) maintained through iPortal
Overstock returns management	Work with RPOC to enhance inventory management practices at both GRBH Pharmacy and PGRH Pharmacy
Paperwork required to send returns	Work with RPOC and PGRH Pharmacy Regional Technician to develop acceptable returns management processes
Provision of non- formulary medications	Consider GRBH Pharmacy purchasing their own non-formulary items; improved formulary maintenance at a regional level by DUE Pharmacist

Table 8 – Summary of Resolutions to Identified Problem Areas

The data analysis provided some data regarding the costs of technician time and shipping; however, the data set was incomplete and could not be used to determine an accurate total cost. Further studies are recommended to complete this data set, including time trials to accurately determine the time required for GRBH Pharmacy to generate an order, for GRBH Pharmacy to receive an order and for the Materials Management department to complete their processes for shipping.

Based on the case study of the distribution relationship between GRBH Pharmacy and PGRH Pharmacy, there is an opportunity to perform further studies with respect to other regional facilities in the NHA. It is important to consider that different regional facilities have different needs, and that the data obtained from the study of GRBH Pharmacy may not be directly transferable to other regional facilities.

I recommend that the data obtained from this case study can be used as a building block in designing future studies; considering the provision of wholesaler distribution services to regional facilities. In considering service expansion, or centralization of services, a project team should be assigned to solely focus on the implications of such expansion. Several key players should be involved in this project team, including representation from Pharmacy management, senior NHA management, the Finance department, the RPOC, and the IT department. In addition to the local key players, further investigation into the supply chain

practices in other British Columbia health authorities, and possibly international practices such those in Australian and Norwegian healthcare facilities, could provide insight in the development of an efficient supply chain model for the NHA.

Senior management involvement would be required to ultimately make a decision on whether or not any further services should be implemented following an analysis. Regional facility site managers would need to be involved to work on the personal aspects of the distribution relationships, and to ensure that the processes being considered are suitable for all needs. The RPOC would be instrumental in assisting with the development of inventory maintenance processes and other operational processes regarding interfacility distribution networks. Furthermore, the role of IT in developing future models would be extensive, in looking at the role of Cerner and how its capacities can be best used to support the supply chain.

If senior management were to accept centralization of pharmacy services in the NHA as an acceptable way to approach federal mandates of improving medication safety and patient healthcare outcomes, I would recommend that a more formalized project of implementation be set up, using a three year timeline to ensure that all sites have initiated the Cerner supply chain management system. Moreover, further time and planning are required to ensure that all aforementioned regional concerns regarding shipping processes have been

addressed and that procedures have been developed to satisfactorily manage product availability, returns and expired products.

Based on the outcomes of the case study, a minimum sample of four months of orders from each site purchasing products from PGRH Pharmacy (or other regional facilities) should be obtained. Given the time taken to study the information for one site, I estimate that a study on the remaining 26 sites would take at least one year to complete. After detailed studies of each site were completed, an implementation team would need to focus on the soft skills required to establish working relationships between the various sites. Consideration should be given to various options for distribution, including one centralized distribution site, or a distribution site within each of the HSDAs.

Over the years, discussion surrounding the primarily decentralized nature of pharmacy services has led to a desire to examine the feasibility of completely centralizing pharmacy services for the NHA. Due to the difficulties in finding staff, both pharmacists and technicians, in northern communities, creating processes to centralize services such as drug distribution (through centralized purchasing), inpatient dispensing (through the use of Telepharmacy), and clinical pharmacy (through Regional Clinical Pharmacy Specialists) has been fundamental in managing pharmacy services where staff is limited.

With respect to the discussion of centralization possibilities, the case study of Quesnel should be used as the starting point to complete a more comprehensive analysis of current drug procurement procedures, and to determine how internal distribution networks could be the future for the NHA.

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Appendix 1 – Regional Shipping Questionnaire

What is PGRH Pharmacy	What could PGRH	What service(s) are
doing well?	Pharmacy do better?	missing that you would
		require to receive one
		hundred per cent
		satisfactory service from
		PGRH Pharmacy?
 inventory levels better than at start less picking errors like pre-packs and pre-filled syringes love unit dose 	 carry more sizes of already formulary items i.e. clindamycin (4 mL) inj more flexible with add- ons don't like being questioned about add- ons, if we need drug, we need it quicker ordering from vendor (when they have to order something in for us takes at least a week when if we order it ourselves, can get it next day even if we send it late) Returns – <u>must accept overstock</u> (they only do now if they sent in error) 	 revise formulary (1st) carry items that should be formulary i.e. Clavulin better delivery days i.e. can't receive drugs over weekend, especially narcotics, can't order Monday, have to know by Wed or Thurs what we need for one week Process paperwork for returns for us. Too many steps for us! Maybe they could track backorders, we have to re-order, seems like several times before we see any product.

Appendix 2 – Regional Shipping Schedule

Monday	Tuesday	Wednesday	Thursday	Friday
Quesnel	Fraser Lake	Quesnel	Quesnel (fridge items only)	Quesnel
St John Hospital (Vanderhoof)	Fort St. John	St John Hospital (Vanderhoof)	St John Hospital (Vanderhoof)	Mackenzie (Emergency only)
Smithers	Mackenzie	Smithers	Smithers	Terrace
Burns Lake	Valemount	Terrace	Burns Lake	
McBride			McBride	
Mackenzie				
Terrace				
Valemount				

Appendix 3 – Regional Expired Product Returns Form

Regional Returns for Credit (Expired Drugs Only)

Location (site):

Ï

Please note:

1) Please do not include overstock returns on this sheet. There is a separate sheet (tab) for overstock returns.

2) Please send back expired drugs returned from WARDs and put WARDs in the location. Do not credit the WARDs in your system.

Also, please separate pharmacy returns from WARDs returns by using two separate sheets.

3) Please see the list of non-returnable items. Non-returnable items should not be returned to PGRH.

4) PGRH will value the expired drugs returned & Finance will process the credits back to each site.

5) Please use a new form for eech package of returns (one form per box).

6) Please email this form to amanda.witt@northernhealth.ca & send a copy of the form along with the physical returns.

CREDIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL NO										
TOTAL CREDIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRICE										
QTY NO CREDIT										
QUANTITY										
EXPIRY										
LOTS										
DIN										
SIZE										
FORM										
STRENGTH										
RED DRUG RETURNED										-

Update December 7th 2007

Total return from regional alte (column J + K)

Appendix 4 – Regional Overstock Return Form

Regional Returns for Credit (Overstock Only)

Location (site):

Please note:

Date:

1) Please do not include expired drugs on this sheet. There is a separate sheet (tab) for expired drug returns.

2) PGRH will value the overstock returned and credit your site.

3) Please use a new form for each package of returns (one form per box).

4) Please email this form to amanda.witt@northernhealth.ca & send a copy of the form along with the physical returns.

OVERSTOCK DRUG RETURNED	STRENGTH	FORM	SIZE	DIN	LOTE	EXPIRY	QUANTITY	QTY NO CREDIT	PRICE	TOTAL CREDIT	TOTAL NO CREDIT
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
										0.00	0.00
TOTAL										0.00	0:00

Updated December 7th, 2007

Total return from regional site (column J + K)