UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

HUMAN RESOURCES
DIVISION

November 7, 1983

B-205252

Mr. Clyde C. Cook
Assistant Deputy Administrator
for Procurement and Supply
Veterans Affairs

Dear Mr. Cook:

Subject: VA Medical Centers Could Determine Supply Requirements More Accurately By Updating Factors Used To Compute Economic Order Quantities (GAO/NSIAD-84-28)

We have completed our review of supply management procedures and practices at Veterans' Administration (VA) Hines Medical Center in Hines Illinois. During the review we found weaknesses which we believe increase procurement and inventory holding costs and cause inefficiency of computer and supply analyst buy decisions. We performed our review mainly at the Hines Medical Center. However, information obtained from the Austin Data Processing Center indicates that the weaknesses identified at Hines relate to systemwide procedures and computer operations throughout the VA supply system.

Weaknesses identified are shown below and discussed in detail in the enclosure:

--Use of outdated and inaccurate cost and procurement leadtime factors. The cost factors used to calculate the economic order quantity (EOQ) have not been updated for 15 years and many procurement leadtimes have been set at too high a level. We believe that the use of the EOQ concept with current cost data and corrected leadtimes would result in reduced costs to procure and hold inventory.

--Supply analyst and computer generated buy decisions do not always match, causing extra work for the supply

analyst and the computer to generate unneeded reports. The analyst orders stock on 30 day intervals as stated in VA regulations, but the computer generates buy decisions randomly based on EOQ principles. These decisions must be reviewed by the analyst even though the information is seldom used, resulting in inefficient and uneconomical operations.

We discussed these matters in January 1983 with your staff who generally agreed with most of our observations. However, they did not promise prompt corrective action because they said other priority work would require their continued attention.

We believe that VA could achieve significant savings, maximized through prompt action, at many centers by updating the cost and procurement leadtime factors and eliminating the differences between the computer and analyst ordering intervals.

Therefore, we recommend that you

--clarify procedures to periodically update the costs used in medical centers' EOQ calculations;

--develop automated systems to consistently and accurately define and update medical centers' leadtime calculations;

--justify any ordering schedules not consistent with EOQ calculations; and

--develop procedures for minimum operating levels and fixed intervals ordering levels to eliminate differrences between fixed ordering intervals and computer EOQ ordering intervals.

We would appreciate receiving your comments not later than 30 days from the date of this report.

Sincerely yours,

Joe E. Totten
Group Director

Enclosure

VA MEDICAL CENTERS COULD DETERMINE SUPPLY REQUIREMENTS MORE ACCURATELY

BACKGROUND

VA medical center supply management involves the operations of 172 medical centers of which 161 of the centers have warehousing facilities. During fiscal year 1982 these centers procured $340.7 million in related supplies. At the end of the year, each center was managing from 300 to 1800 items with a combined inventory valued at about $50.6 million. For the same period, the VA Hines Medical Center managed almost 1100 items, purchased $4.8 million in related supplies, and had an ending inventory of over $1 million.

Information on the supply operations is maintained on VA's computerized Logistics System operated by the Data Processing Center (DPC) Austin, Texas. The Austin DPC is the centralized computer facility which aids in controlling, ordering, storing, and issuing VA supplies and equipment.

VA's Logistic System, called Log I, was initially developed in the mid 1960s. Log I employs Economic Order Quantity (EOQ) and Reorder Point (ROP) principles and procedures. The Federal Property Management Regulations require that all Federal civilian executive agencies use the EOQ principle to determine inventory replenishment quantities. The EOQ principle is a mathematically proven method to minimize the total cost to order and carry inventory. Although agencies have adopted different formulas or models to establish EOQ, the objective is essentially the same--to order that quantity which will balance the cost of carrying inventory with the cost of repetitive procurements.

The ROP is a predetermined stockage level at which point orders are placed to replenish the items used. This is usually the amount of stock needed to meet demands that are estimated to occur during procurement leadtime--the time from when an order is placed until it is received and recorded as available for issue--plus an additional amount of stock (safety stock) to cover unanticipated demand surges and interruptions in deliveries.

These principles when understood and properly executed generally result in the lowest overall cost of ordering and holding inventory. Log I calculates an item's EOQ using computer updated demand history, price, and a manually provided multiplier. The multiplier, or cost constant as it

is called in VA procedures, represents in one figure the mathematical relationship between ordering and holding costs. The manual input also provides data on shelf life and packaging constraints and a systemwide ordering constraint of 9 months stock.

Log I also calculates the ROP based on history and a manually provided procurement leadtime. The ROP calculation includes provision for an added amount of stock (safety level) to satisfy unexpected demand surges and delivery delays. The procurement leadtimes represent the average number of days required to replenish stock.

Log I produces several different types of reports, but the only reports with order/buy recommendations are the two Requirement Analysis (RA) reports, RA 025 and RA 026. These reports are very similar and display Log I data, including the cost constant, procurement leadtime, stock status, and when appropriate, order recommendations.

Supply analysts at each medical center review these reports and accept or modify the recommendations based on their knowledge and contacts with users of the stocked items.

The main difference between the two reports is in the timing or frequency. The RA 025 is provided once a month on each item based on the analyst's request and ordering schedule. The RA 026 is provided on those days an item's stock status or stock reaches the ROP, the safety level, or a zero balance. The analyst, however, reviews all reports to determine whether or not an order should be placed and whether the order should be in accordance with the computer recommended quantity.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our objective was to determine whether supply management at the VA medical centers can be improved, and if so, what improvements were necessary.

We examined the procedures of the VA Data Processing Center, Austin, Texas; the VA Central Office Headquarters, Washington, D.C., and the medical center supply activity for items stocked at the VA Hines Medical Center, Hines Illinois. We developed information on (1) the volume and types of procurements and inventory; (2) policies, procedures, and decision rules for stocking items and making requirement determinations; and (3) the reliability and reasonableness of data used in requirements computation. We also obtained

and reviewed past studies and reports on VA medical center supply issues.

We evaluated the factors the computers use to inform the medical centers when and how many supplies to order. We obtained supply management policy information from VA headquarters, data on factors used VA-wide from the processing center in Austin, Texas, and the current cost and procurement lead time information from the VA Hines Medical Center in Hines, Illinois. We also calculated the effects of using different factors and compared the computers' and analysts' decisions and ordering intervals. The review was conducted in accordance with generally accepted government audit standards.

MEDICAL CENTER PRACTICES NEGATE COMPUTER AND EOQ EFFICIENCY

Although the Log I system uses EOQ principles and procedures in calculating orders to replenish stock, the actual ordering practices used by supply analysts override any possible economic advantage of computer-generated orders. These practices include:

--not updating cost constants,

--use of inaccurate leadtimes, and

--scheduled ordering.

These practices may not be the most economical way of ordering and holding inventory and may be costing VA millions of dollars.

Cost constants not updated

The Hines Medical Center uses a cost constant of five on all of its 1,077 stocked items. A listing from the Austin DPC showed that 99 percent of the 118,380 items stocked by all centers had a cost constant of five. No cost studies supporting the cost constant could be located. We do not believe this cost constant of five, recommended in VA procedures over 15 years ago, represents the current cost relationship between ordering and holding costs.

The cost constant is the multiplier used with the square root of the annual demand to produce the EOQ for an item. It is reached by taking the square root of two times the current ordering cost divided by the current carrying cost percentage of the average inventory.

At our request Hines personnel used VA's 1967 procedures to develop current ordering cost data. The Hines-developed cost data showed that line item ordering costs ranged from a low of $12.42 for items obtained from VA depots, to a high of $18.15 for items obtained from commercial contractors under Federal supply schedules.

VA headquarters personnel supplied us with a holding cost rate of 9 percent (8 percent of short term borrowing plus 1 percent for inventory loss) to be used in arriving at a cost constant. This 9 percent added to VA prescribed storage rates of 10, 20, and 30 percent produced holding rates of 19, 29, and 39 percent. As shown in the following table, none of these holding costs, when used with the Hines-developed ordering costs, could result in a cost constant of 5.

Cost Constants Resulting from Varying Ordering and Holding Costs

Varying holding cost percents	VA depots ($12.42)	Contractors ($18.15)
	Cost constants	
9	17	20
19	11	14
29	9	11
39	8	10

Changes in the cost constant from 5 to the high of 20, shown in the previous table, would significantly reduce the computer ordering frequency on the items stocked at Hines and other medical centers. The following table shows the progressive reduction in orders which occurs with increasing cost constants.

Number of orders per year	Number of items ordered under different cost constants of			
	5	10	15	20
less than 6	419	745	916	979
6-12	377	255	127	81
13-24	202	60	25	8
25-36	41	8	-	-
37-48	21	-	-	-
49-61	8	-	-	-
Total items	1,068	1,068	1,068	1,068
Total orders	272	68	25	8

Changes to higher and more accurate cost constants could also reduce total ordering and holding costs. To illustrate, using a cost constant of 17, we compared the differences in total cost for a Hines item using a cost constant of 5 and then one of 17. The change to a cost constant of 17 would reduce the number of orders from 57 to 19, increase the average inventory by $874.00, and save $315.00 in ordering and holding costs. The savings would be lower on other items and in some cases negligible. However, even a small average savings could result in significant center and system savings considering that Hines stocks over 1,000 line items, and the 161 medical centers stock over 118,000 line items.

Established leadtimes not consistent with actual leadtime

Leadtime is the time period from ordering replenishment stock until the item is on the shelf ready for issue. It is calculated using past records of ordering an item from a vendor or depot and averaging the number of days until stock is received. This number times the average daily demand for an item helps determine the order quantity. Overstating leadtime requirements can result in unnecessary inventory investment.

In September 1982 the Austin DPC identified the leadtimes used by the medical centers for 118,380 line items. Although the leadtimes varied from 4 to 380 days, standard VA-recommended leadtimes of 42, 45, 48 and 54 days accounted for 87.5 percent of all leadtimes.

Hines Medical Center uses a 45 day leadtime for all items obtained from the VA depot and a 54 day leadtime for items obtained from commercial sources and GSA depots. Accordong to Hines personnel, since these leadtimes were recommended in early VA guidelines, VA Hines is not calculating actual leadtimes. Based on the Austin DPC data shown above it appears that none of the centers are calculating leadtimes.

We calculated some leadtimes for VA depot, GSA depot, and commercial items obtained by Hines. Our figures showed that the majority of VA depot items had a leadtime of 31 days. The majority of the GSA items and commercial items were delivered within 15 days of the requisition and purchase order date. By adding 25 days administrative time to these orders, which Hines personnel said was adequate, a leadtime of 40 days was obtained.

Comparing our calculated leadtimes, 31 days for VA depot items and 40 days for GSA and commercial sources to VA's standard leadtimes of 45 days for VA depot and 54 days for GSA and commercial source, suggests that the VA standard leadtimes are overstated by about 14 days. By using the 14 days additional leadtime, a 6 month demand history, and the previously established percents, we estimated that VA Hines could have $128,850 of unnecessary inventory. This amount would also have holding costs of $11,600 based on VA headquarters 9 percent holding rate.

VA procedures and records would make the calculation of leadtimes for any significant number of items both confusing and time consuming. VA procedures provide instructions for calculating leadtimes, but encourage analysts to use the same leadtimes for most items obtained from the same sources. VA Hines personnel said that even if procedures are clarified, the volume of reports and transactions would preclude manual calculations of actual leadtime. VA headquarters personnel minimized the procedural problems but acknowledge the merits of exploring the use of an automated system for calculating leadtimes and said they had recorded the need for such a project at least 2 years ago.

VA Hines uses scheduled ordering instead of EOQ

VA Hines supply analysts order stocked items on 30 day intervals in accordance with VA regulations. Analysts at the Hines center request RA 025 reports from DPC each month for each item in groups according to type of supplies (drugs, subsistence, etc.) and/or sources of supply. These monthly requests permit the release of consolidated requisitions to the VA and the GSA depots, and permit once-a-month release of orders for procurement consolidations with commercial sources.

In contrast to the analysts' monthly ordering interval, VA's Log I system generates random orders based on EOQ principles. The automated orders, or RA 026 reports, are generated on the day when an item's stock status reaches the reorder point or the more critical safety or zero stock levels.

Analysts are rejecting most of the computer-generated orders and therefore are negating the benefits of EOQ calculation. Since the costs constants and leadtimes in the computer may not be accurate, the computer-generated EOQ orders may be in error. The supply analysts do not reject the computer orders on this fact but rather because they adhere to VA's once-a-month ordering strategy which is based on the belief that once a month ordering makes more economic sense than more frequent EOQ purchases.

VA's medical centers do not have data to show whether monthly ordering is or is not more economical than the computer-generated EOQ order frequency. VA headquarters personnel said that neither they nor the three depots had compared the economics of monthly, weekly, and other frequencies in depot shipments. The chiefs of the VA Marketing Center and the VA Hines Depot said they had not and could not determine these comparisons without a coordinated study of each center's available storage space and all costs involved. These costs include the center's ordering and holding costs and the depots' transportation, handling and administrative costs. Also, since each of the three VA depots services specific geographical areas and centers, the storage space availability, transportation costs, and supply needs will vary with each center.

We believe that what we observed at the VA Hines Medical Center indicates that the present practice of ordering monthly instead of following EOQ computer-generated orders

may be costing VA many dollars by maintaining unnecessary inventories in the system resulting in additional holding costs. We therefore believe VA should determine which ordering method would be more economical for its supply system.