Time-Motion Study to Evaluate the Impact of Purchasing within Clinical Engineering

Mara Pare' and Alan Gresch

Biomedical equipment technicians and clinical engineers order medical device parts in most hospitals because of the technical nature, knowledge, and expertise associated with medical equipment. But biomedical equipment technicians/clinical engineers can sometimes fail to source high-quality parts at the lowest prices, fill out work orders properly, or follow up when parts are not delivered on time. Moreover, the hours they spend on parts ordering could be better utilized on repairs to increase the uptime of critical equipment. Solutions include hiring specialized buyers within clinical engineering departments or contracting with an online marketplace to simplify the ordering process.

Healthcare organizations (HCOs) have a significant opportunity to reduce the amount of time that biomedical equipment technicians (BMETs) and clinical engineers (CEs) spend on sourcing maintenance device parts. Shifting and consolidating manual effort for parts and service purchasing could free up time to better maintain and repair mission-critical medical equipment. Moreover, greater consistency and efficiency in parts ordering could save cost, improve the quality of parts, and result in devices being clinically available sooner.

There is a national shortage of BMETs and CEs, partly because more of them are retiring than entering the field.[1] The average age of BMETs in a 2020 survey was nearly 50 years; 40% of technicians were 55 years or older, and just 14% were 35 years or younger.[2] Therefore, hospitals are being forced to find ways to use their resources more efficiently. Excessive workloads have caused 31% of technicians to look for other opportunities,[3] so it is crucial to liberate BMETs from as much low-value work as possible.

Among all the time-consuming tasks that BMETs and CEs are required to do, parts ordering can be substantial. According to a time-motion study of 7 large HCOs across the country (PartsSource study, facilitated by Dan Brenner, PMP, Strategic Program Director), CEs and purchasing devote an average of 80.2 minutes a day to procure-to-pay activities.

Specialized Area of Expertise

To an outside observer, it might seem natural for a hospital's or a healthcare system's supply chain team to purchase medical device parts. But there are good reasons why BMETs and CEs order parts in most organizations that have CE departments.

Hospital buyers mainly purchase large capital equipment and a wide range of small items that are regularly used in hospitals, such as bandages, personal protective equipment, and consumables. Most of these items are purchased through group purchasing organizations contracts that provide discounts to member hospitals.

Device parts, in contrast, are often not covered by group purchasing organizations contracts. Purchases are often priced under $500, and they are ordered infrequently, which limits the value of maintaining and listing these products in a hospital enterprise resource planning (ERP) system. They can be purchased from original equipment manufacturers (OEMs) or secondary suppliers, and the prices and quality for a particular item can vary widely. Knowledge of clinical engineering and a familiarity with the replacement parts market are indispensable to ordering device parts.

BMETs and CEs Not Well Suited to System-Wide Ordering

Most hospital buyers have very limited expertise in medical devices and know little about device parts pricing, so they typically leave parts ordering to BMETs, CEs, and other kinds of health management technicians.

Biomedical equipment technicians and CEs can typically identify when a part needs to be replaced, but there are other aspects to the purchasing and approval process. For example, a conscientious CE will carefully evaluate a few different suppliers of a particular part, comparing their prices and reputation for quality. Many others, however, just order the part from whatever vendor they have used before. This results in a great deal of inconsistency across a health system.

Corresponding author: Mara Pare' is vice president of Client Solutions at PartsSource and can be reached at 777 Lena Dr, Aurora, OH 44202 (mpare@partssource.com).

Alan Gresch is vice president of Health Strategy at Accruent.

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According to a PartsSource study, the average health system purchases replacement parts from about 200 different vendors.[4] In many cases, hospitals within a health system pay multiple prices for the same part. To judge by these facts, BMETs and CEs are not necessarily making data-driven buying decisions or using decision support tools that would help them do that. In fairness to CEs, they may not have much time to source parts because they are managing large amounts of complex equipment, some of which may be dispersed across several locations and physical sites.

Biomedical equipment technicians and CEs do not always have the time to add in the work orders information properly, documenting the part, the price, and the piece of equipment it is for. Consequently, service histories often lack key data, which could be a problem in Joint Commission quality audits and in capturing true equipment repair histories and costs (Figure 1).

When BMETs and CEs ask for a purchase order (PO) in an ERP system not integrated with their organization's Computerized Maintenance Management System (CMMS), they have to reenter the data from the work order on the PO form. The duplicate data entry often results in clerical errors. Then they or the hospital buyer has to place the order with the vendor, which has its own method of processing orders.

In placing an order, BMETs and CEs should get a tracking number and find out when the product will be shipped. If the order is nonurgent, however, some BMETs and CEs simply wait for the part to arrive. If it does not come after a while, they call the vendor.

Another problem with putting BMETs and CEs in charge of this process is that they tend to order extra parts in case the same device fails again. They may stockpile them in the hospital, and 2 or 3 years later, parts may be still sitting on the shelf. For hospitals, there is a cost to overordering.

Other limitations of the traditional BMET and CE ordering method include the following:

- Opportunities being missed for reducing expense via bulk ordering and order bundling
- More POs issued than necessary because the process is not centralized
- Parts delivery urgency not assessed properly, resulting in shipping expenses that can be higher than necessary
- Loss of productive time maintaining equipment
- Preventive maintenance kits not aggregated and ordered in advance, resulting in rush orders or preventive maintenance not being completed on time

Besides the revenue and patient care impacts of having critical medical devices offline, the time that BMETs and CEs spend on parts ordering generates a labor cost to the extent that it replaces "wrench time" that BMETs and CEs could devote to device repair. If a BMET or CE uses an hour or more of each day ordering parts, and a health system has 50 technicians, the cost to the enterprise could be substantial.

According to *24×7 Magazine*'s 2020 salary survey, the median national salary for a CE is $89,700.[2] If an eighth of a CE's time is lost to parts ordering, a healthcare system is paying more than $11,000 per CE per year for a job that frontline technicians should not be doing and that they are not very good at. When multiplied by 50 CEs, that is about $560,000 worth of productivity annually that could be better applied to repairing equipment or other responsibilities. This estimate does not include the revenue reduction that is attributable to equipment downtime.

Time-Motion Study

In a comprehensive time-motion study, PartsSource looked at how 7 large HCOs used CEs in parts ordering. The

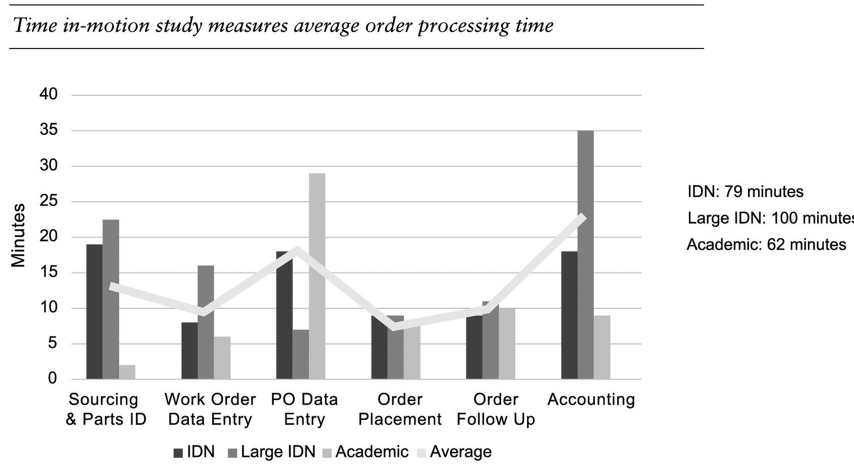

FIGURE 1. Time in-motion study.

2-year study was conducted onsite to measure the elapsed time spent on parts ordering in 6 functional areas. The researchers shadowed BMETs and CEs in each health system to monitor the tasks and timing for each subprocess.

The amount of time devoted to parts ordering ranged from 62 minutes per BMET per day in an academic medical system to 100 minutes in a large integrated delivery system. As mentioned earlier, the average across the institutions was 80.2 minutes (Figure 2).

Differing cultures and management philosophies accounted for some of the variations in the amount of time required to order parts in each of the HCOs. For example, as noted earlier, not all BMETs put the same priority on careful sourcing of replacement parts or order follow-up. The procurement policies of the systems also varied in certain respects. One academic medical center devoted far more time to PO data entry than the other organizations did but tallied up very few minutes on sourcing and parts identification. This suggests that the academic institution used the OEM supplier in nearly every case, rather than sourcing the best part at the lowest price. Partly for this reason, its BMETs spent less time ordering parts than did their counterparts in most of the other HCOs.

Centralized Ordering

One HTM department of a large midwestern integrated delivery network (IDN) did its own time-motion study on parts ordering by BMETs. Eighty BMETs documented the amount of time they spent on every facet of the ordering process, and it added up to about an hour each day per BMET, on average.

One of the pieces that the HCO measured was parts returns, which can be much more time-consuming than appears, even if the supplier has an efficient return process. In the event a new part proves to be defective, the BMET is essentially performing the same repair twice. When the device fails, he or she has to troubleshoot all over again, trace the failure to the defective part, return that part, and order a new one. All of that might cause a day or more of downtime, and it is the CE department, not the vendor, that gets most of the blame.

After reviewing the study results, the IDN decided to switch to centralized ordering to reduce the burden on its BMETs and ensure the consistency of parts quality. But instead of having the health system's supply chain team order the parts, the HTM department hired and trained a pair of buyers dedicated to parts ordering. Besides relieving BMETs of this duty, the new centralized program had the following goals:

- Establish an inventory management process
- Create program policies and procedures
- Develop a delivery system to meet urgency standards
- Integrate the parts ordering process into the HCO's purchasing functions for submitting requests, processing requests and monitoring order status

By creating this central ordering unit, hiring the right people, and supporting them with the right technology, the IDN vastly improved its parts ordering process and made CEs available for more repair work. The results included a savings of $1.3 million in the first year. The number of hours that the BMET and CEs spent on repairing devices increased to 1,500 per year, or roughly 75% of their time, on average.

Criteria for Success

A centralized ordering system for device parts should improve consistency, meaning that the hospital should usually get high-quality parts at the best prices. Presumably, if the institution has a specialized ordering team, they should be able to improve sourcing and order consistently from the vendors that offer superior deals. Sourcing from OEM or secondary suppliers that have consistently high quality should ideally reduce parts returns to near zero.

Centralized parts ordering can also make other parts of the operation more efficient. There should be fewer orders marked urgent that are not really urgent, and there should be no delay in following up on parts that are not received on time. And parts ordering should be just in time rather than just in case, leading to fewer unused parts in hospital stockpiles.

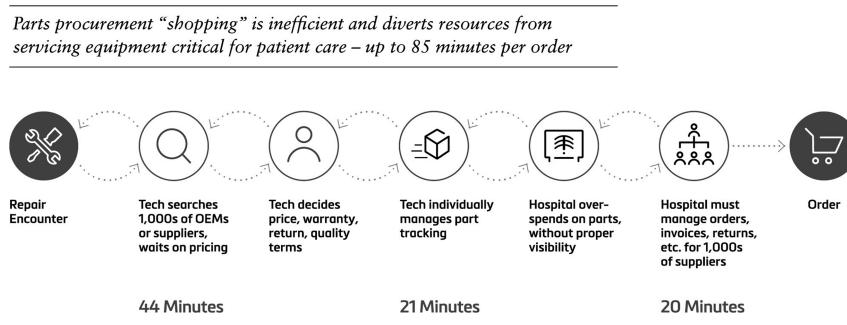

FIGURE 2. Parts procurement workflow.

There are some drawbacks to centralized ordering. First, it does not eliminate any of the manual aspects of ordering parts; it just transfers them from the BMETs to the specialized buyers. Second, the amount of time required to order a part can be reduced, but not eliminated. The BMETs still have to communicate with the buyers, and they have to convey their wishes accurately, which does not always happen. Partly because of this challenge, the 2 health systems in the PartsSource study that used centralized buying devoted the most time to parts ordering.

Whether an organization has centralized parts ordering or not, it is imperative to integrate its CMMS, ERP, and electronic data interchange systems. One reason is that if the CMMS is integrated with the ERP, the information that a CE enters when he or she fills out a work order can be automatically populated in the ERP to get a PO issued. As a result, many data entry errors can be eliminated.

In addition, system integration can create a closed loop in electronic data interchange transactions with ecommerce sites and digital marketplaces. The CMMS can launch the ordering system on the vendor's branded website or marketplace site. When the order has been placed, it automatically comes back to the hospital's ERP and the purchase can be processed as part of the regular ERP workflow.

Few vendors' ecommerce sites, however, are integrated with hospitals' purchasing and invoicing systems. In contrast, a marketplace can be integrated with the HCO's CMMS and ERP systems and can connect them even if the organization has not interfaced the systems.

Evidence-Based Marketplace Alternative

If an HCO lacks the resources to hire buyers dedicated to procuring device parts, or if it simply wants to increase the efficiency of parts ordering, it should consider contracting with an online marketplace that uses data and evidence to provide some back-office services and simplify the ordering process. Because its internal systems can be integrated through the marketplace, this method provides a high level of integration that reduces the time and labor involved in parts ordering. When the hospital places an order in the marketplace, the information gets fed into the work order system, and it is a seamless process to get the PO issued and the invoice received and paid.

In addition, the marketplace confirms that the order was received by the vendor, provides a tracking number, notifies the customer when the order ships, and handles any returns.

The marketplace also offers automated sourcing. All a CE has to do is indicate which part he or she wants to order. The marketplace software then leverages its evidence-based decision making to search its centralized catalog of OEM and secondary suppliers to find the highest-quality product at the lowest price automatically.

Integration with the marketplace platform also increases efficiency in dealing with vendors that do not have integrations with a particular HCO's CMMS and ERP. Once the marketplace integrates with an HCO's systems, the integration works for all of the vendors that participate in the marketplace.

The time-motion study of the 7 HCOs showed that when they switched from CEs ordering parts on their own to an automated system that took full advantage of an online marketplace, they saved an average of 73 minutes per order. That represented an 85% time savings—and some HCOs have whittled down their parts ordering time even more.

Conclusion

The traditional method of having CEs order parts individually is seriously flawed from a number of perspectives. Although CEs understand the equipment and can source the replacement parts, the amount of time to compare prices, assess quality, and perform all of the administrative tasks involved in processing the order is significant. Of greater concern, the time spent on parts ordering could be better applied to repairing medical devices so they can be quickly brought back online and made available to patient care.

The bulk of the work that CEs do in this area could be more efficiently and appropriately performed by dedicated parts order specialists and with online, evidence-based marketplaces that can perform the nuts and bolts of part ordering in a seamless, automated process. In either case, CEs should be freed to do what they do best: proactively maintain medical devices that are vital to patient outcomes.

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