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Operational Strategies for Hospital Central Sterile Supply Department from a Cost Management Perspective: Postprint

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Abstract

Objective: To improve cost accounting methods for hospital sterilization supply centers, explore operational decision-making from a cost management perspective, and investigate cost accounting approaches aligned with actual hospital conditions. **Methods:** Based on activity-based costing (ABC) theory, this study further examines cost accounting for hospital sterilization supply services. By segmenting and measuring business process costs, it accurately calculates unit costs for sterilization pack recovery and distribution, receiving/sorting cleaning and disinfection, inspection/maintenance and packaging, and high/low temperature sterilization, thereby standardizing and refining the calculation methodology for each sterilization pack's unit cost. **Results:** Calculation formulas for sterilization packs were designed within the information traceability management system to enable monthly cost calculation, statistical analysis, and summarization. Labor costs accounted for the highest proportion across all processes. **Conclusion:** Scientific cost management, particularly internal transfer pricing and external service pricing strategies for sterilization supply services, provides an important basis for managers to scientifically develop cost plans and implement refined management in sterilization supply centers.

Full Text

Research on Operation Strategy of the Central Sterile Supply Department from the Perspective of Cost Management

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Abstract

Objective: To improve cost accounting methods for hospital Central Sterile Supply Departments (CSSD), explore operational decision-making for CSSD from a cost management perspective, and develop a cost accounting approach for disinfection supply services that aligns with actual hospital conditions.

Methods: Based on activity-based costing theory, we conducted further research on hospital disinfection supply service cost accounting methods. By dividing and measuring business process costs, we precisely calculated unit costs for recycling and distribution of disinfection sterilization packages, sorting and cleaning/disinfection, inspection/maintenance/packaging, and high/low-temperature sterilization, thereby standardizing and refining the calculation method for each sterilization package unit cost.

Results: Calculation formulas for disinfection sterilization packages were designed within the information traceability management system to perform monthly cost calculations, statistics, and aggregation. Labor costs accounted for the highest proportion in each process.

Conclusion: Scientific cost management provides an important basis for managers to scientifically plan CSSD costs and implement refined management, and is beneficial for developing internal transfer pricing and external service pricing strategies for disinfection supply services.

Keywords: Central Sterile Supply Department; cost management; operation strategy; nursing management

With the gradual implementation of China's "Healthy China" development strategy, cost management has become an important tool for refined hospital management. As the role of the Central Sterile Supply Department (CSSD) becomes increasingly prominent in hospital development, adopting effective methods for cost accounting of disinfection and sterilization products is an urgent issue currently faced. To improve the hospital cost accounting system and prepare for full department costs, medical service project costs, disease-specific costs, and DRG costs, our hospital has taken cost accounting, management accounting, and financial management as theoretical foundations, with the hospital CSSD as the research object. From a cost management perspective, we studied a cost accounting method for disinfection supply services that aligns with actual hospital conditions and explored CSSD operation strategies.

1. Clinical Data

The CSSD is located on the first floor of the First Inpatient Building. The department has a floor area of [m²] and staff members: [number] permanent staff, [number] contract nurses, and [number] contract workers. The department is equipped with fixed assets and facilities, including pressure steam ster-

ilizers, multi-chamber washer-disinfectors, ethylene oxide sterilizers, and low-temperature plasma sterilizers. In [year], the CSSD completed approximately [number] cleaning, disinfection, and sterilization procedures for reusable medical instruments, devices, and items within the hospital, and provided services to external clients [number] times.

1.1 Formation of Management Team

A management team was established comprising members from the CSSD, Finance Department, Audit Department, and Operations Management Department. Through literature review, field investigation, and expert interviews, the team collected cost-related data including human resources costs, building depreciation, equipment depreciation, medical consumables, electricity, water, and pharmaceutical expenses.

1.2 Division of Workflow Processes

The CSSD's work processes were divided into five operational stages: recycling/distribution, sorting/cleaning/disinfection/drying, inspection/maintenance/packaging, and sterilization. Since recycling and distribution are performed by the same personnel with consistent timing, they were combined as a single recycling/distribution process. The inspection/packaging process was further divided into instrument inspection/packaging and dressing inspection/packaging sub-processes. The sterilization process was divided into high-temperature sterilization, low-temperature plasma sterilization, and ethylene oxide sterilization sub-processes. Instrument packages involve all five processes, while dressings are cleaned and disinfected by the laundry center and therefore do not include the cleaning/disinfection process.

1.3 Establishment of CSSD Cost Calculation Model

The CSSD package cost calculation model is shown in [Figure 1: see original paper]. Each sterilization package cost = direct materials for each package + allocated process costs. Direct material costs refer to consumables that can be directly attributed to each package, including items placed inside the package and consumables used in each process. Public materials mainly include gloves, shoe covers, etc., which are allocated according to the number of employees in each process. Items placed inside packages are disposable consumables or low-value consumables placed directly in the disinfection packages. Low-value consumables unit costs are calculated based on purchase price and amortization frequency, with amortization frequency estimated based on CSSD experience.

1.3.1 Process Cost Measurement Human Resources Costs: In [year], personnel costs allocated to the CSSD totaled RMB [amount] Yuan. Since some staff rotate across different positions and working hours in each process are difficult to track, these personnel costs are allocated according to standard

working hours for each process. Management personnel costs are allocated based on the number of personnel in each process.

Electricity and Water Costs: CSSD electricity consumption primarily involves large equipment: automatic washer-disinfectors in the cleaning/disinfection process; high-temperature sterilizers, ethylene oxide sterilizers, and low-temperature sterilizers in the sterilization process. These devices' power consumption and electricity costs are calculated based on rated power, with remaining electricity costs allocated by building area occupied by each process. Water consumption primarily occurs in the cleaning/disinfection process. The automatic washer-disinfector uses recirculated water, with specific water consumption: [X] tons per cycle, costing RMB [Y] Yuan per cycle. Daily water consumption is calculated based on per capita standards.

Building Depreciation: The CSSD' s annual building depreciation is RMB [amount] Yuan, allocated to each process based on floor area. Public building areas are allocated based on personnel numbers in each process.

Equipment Depreciation: In [year], equipment depreciation totaled RMB [amount] Yuan, including public equipment such as computers and carts, which are allocated based on working hours of each process.

Medical Consumables: In [year], the CSSD' s medical consumables expenses from the disinfection supply and medical consumables warehouses totaled RMB [amount] Yuan. All materials were categorized into 20 types based on usage: disposable consumables and low-value consumables. The final cost allocation results are shown in .

1.3.2 Sterilization Package Unit Cost Calculation Recycling/Distribution

Process: Since workers can deliver limited quantities per trip, and the quantity correlates most strongly with package volume, this process cost is allocated using a volume coefficient.

Sorting/Cleaning/Disinfection/Drying Process: The quantity of instruments processed is the most important factor affecting cleaning/disinfection costs. Therefore, this process cost is calculated based on instrument quantity. The monthly average cost for cleaning/disinfection/drying is RMB [amount] Yuan, with [number] instruments processed monthly, resulting in a unit cost of RMB [amount] Yuan per instrument.

Inspection/Packaging Process: Instrument inspection/packaging process costs are also calculated based on instrument quantity. The monthly average cost for instrument inspection/packaging is RMB [amount] Yuan, with [number] instruments processed monthly, resulting in a unit cost of RMB [amount] Yuan per instrument. Dressing package volume is the most important factor for dressing inspection/packaging, so this process cost is calculated using dressing package volume equivalents.

Sterilization Process: Package volume is the most important factor for high-temperature sterilization costs, so this process is calculated using package volume coefficients. Low-temperature plasma sterilization is calculated based on sterilization volume and packaging material type. Ethylene oxide sterilization primarily produces paper-plastic packages, with a monthly average cost of RMB [amount] Yuan and monthly workload of [number] packages, resulting in a unit sterilization cost of RMB [amount] Yuan per package.

The unit process costs for sterilization packages are shown in .

Sterilization Package Unit Cost Calculation Method: Instrument sterilization package unit cost = direct materials in package + dressing laundry cost + unit recycling/distribution cost + unit cleaning/disinfection cost + unit instrument inspection/packaging cost + unit high-temperature sterilization cost (or unit low-temperature sterilization cost/unit ethylene oxide cost). Dressing sterilization package unit cost = direct materials in package + laundry cost + unit recycling/distribution cost + unit dressing inspection/packaging cost + unit high-temperature sterilization cost. Dressing package laundry costs are priced through internal service pricing with the laundry center.

2. Results

Using the above method, calculation formulas for sterilization packages were designed within the information traceability management system to perform monthly cost calculations, statistics, and aggregation. Across all processes, labor costs accounted for the highest proportion. In the instrument inspection/packaging process, labor costs even reached [X]% of total costs. The CSSD employs [number] staff for disinfection and cleaning services, including [number] permanent staff. The average annual cost per permanent staff member is significantly higher than that of contract nurses and technicians and contract workers.

3. Discussion

Public hospitals have traditionally focused cost accounting on clinical and medical technology departments, while cost management of medical auxiliary departments remains a blank area, with some hospitals not even conducting cost accounting and management for these departments. As the most important auxiliary department, CSSD is the primary consumer of non-chargeable medical consumables and instruments, significantly impacting medical quality and infection control. However, it is common for public hospitals to neglect CSSD cost management, with many hospitals having limited understanding of CSSD cost information, lacking dedicated cost units, and largely ignoring this cost component.

Improving cost accounting methods for public hospital CSSDs and exploring operation strategies from a cost management perspective can fully leverage cost management functions, enhance refined management levels, and effectively

achieve efficiency through management. Establishing internal transfer prices for hospital auxiliary departments helps reasonably divide cost responsibilities among different types of responsibility centers and more objectively evaluate cost efficiency of both service-providing and service-receiving departments. Developing a complete and feasible management model for CSSD can reduce medical consumable usage and waste, thereby alleviating patients' economic burden. Through scientific calculation of specific prices for all reusable sterile item production, the relationship between item quantity and price becomes apparent, prompting instrument-using departments to streamline package contents based on clinical needs to improve instrument utilization and reduce usage costs. Cost analysis reveals that labor costs account for the highest proportion and represent the most expensive component of instrument production; therefore, adjusting personnel structure can significantly reduce production costs. Applying CSSD cost accounting results can improve staff motivation.

The State Council' s "13th Five-Year Plan for Deepening Medical and Health System Reform" encourages social capital to establish disinfection supply institutions, and the "Hospital Central Sterile Supply Department Management Standards" clearly state that qualified hospitals are encouraged to provide disinfection supply services to nearby medical institutions. Consequently, CSSD service functions have fundamentally changed, and disinfection supply service pricing should include both internal service transfer pricing and external service pricing levels. Exploring external service pricing strategies based on actual disinfection supply service costs while fully considering market conditions and internal capacity utilization can not only increase external service market share but also establish acceptable pricing for medical institutions at all levels during regional centralized CSSD management.

Conflict of Interest Statement

The authors declare no conflict of interest.

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