

## Health Sector Supply Chain Initiatives

### **PROGRESS REPORT**

**November, 2006**

**Project Title:** Supply Chain Metrics and Benchmarking: Establishing the Foundation for Knowledge Sharing and Performance Improvement across the Health Sector Industry

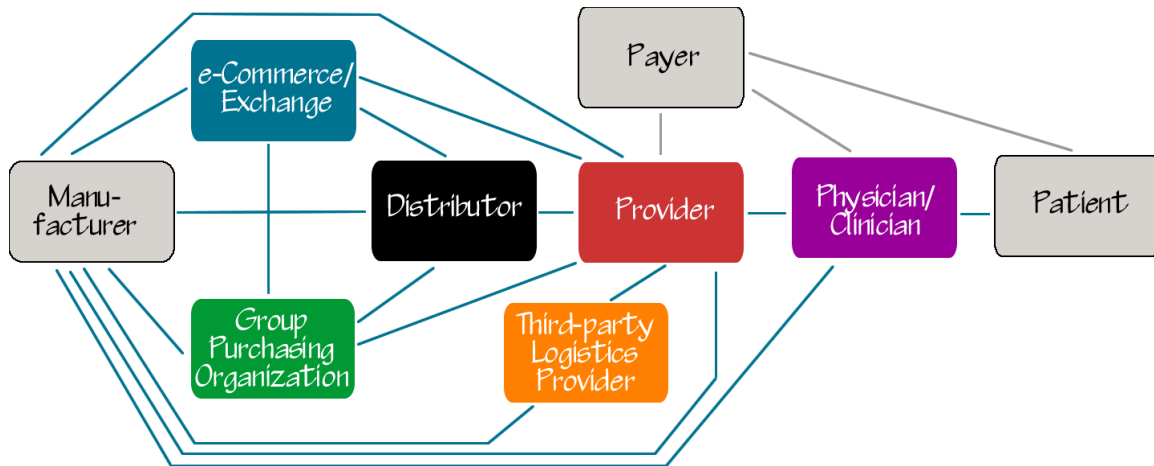
#### **Investigators from the W. P. Carey School of Business**

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#### **Executive Summary:**

Despite the recognized importance of managing the supply chain, considerable improvements need to be made across the health sector. While there are various definitions of supply chain management used in the health sector, this study considers all parties involved in sourcing, contracting, ordering, and delivering products and services including acute care providers, group purchasing organizations (GPOs), distributors, third-party logistics providers (3PL)s, and e-commerce solutions. Figure 1 illustrates the comprehensive nature of this study including the firm-level internal processes as well as inter-firm processes such as order fulfillment, supplier evaluation, and customer service. To keep the study focused, manufacturers, payers, and the patient are excluded as participants with the goal of considering them later in a follow-up study. Collaborative partnerships with manufacturers, however, will be included in the study by having GPOs, distributors, 3PLs, e-commerce solutions, and acute care providers identify the metrics used to evaluate these partnerships, and to identify the collaborative practices that lead to supply chain success.

Figure 1: The Health Sector Supply Chain



Much of the past supply chain focus has been to drive purchase cost reductions through volume purchases, group contracts, and product standardization. Not surprisingly then, acute-care providers have been actively engaged in outcomes benchmarking using industry-accepted financial measures based on supply expense such as average supply expense per discharge and supply expense as a percentage of revenue. Using these data, hospitals have used benchmark gap analyses to identify price improvements and to produce information for improved contract performance. Yet, as many acute care providers are learning, such gap analysis benchmarking practices do not tell the whole story. Not all supply chains are the same. In addition to different patient populations, regional labor rates, and diverse physician practice patterns, many acute care providers have invested considerably more resources into developing their supply chain capabilities. Comparing more progressive supply chain systems against other acute care providers that utilize partners for a large number of their supply chain capabilities may not be a fair comparison. For example, health sector supply chains that have invested more dollars and effort into developing internal capabilities such as regional warehousing, self-managed contracts, and advanced information systems may be better positioned to deliver higher service levels and lower costs. Therefore, these chains should be compared against each other to provide a valid performance comparison. For these reasons, the benchmarking framework developed in this study identifies comparative benchmarking groups based on supply chain practices and capabilities using well-established research methods that have been applied in other industries. Future benchmarking analysis can use these groups as a means of comparing performance on financial measures and other standard supply metrics.

Following the success of manufacturing industries, opportunities for continued improvement are likely to be found by measuring both firm-level and inter-firm supply chain performance. Therefore, this study identifies and develops effective indicators of supply chain performance within an individual firm as well as between organizations.

For example, metrics used to evaluate the effectiveness of processes such as sourcing, distribution, returns, order fulfillment, financial flows, inventory management, product technology evaluation, customer service, relationship management, and revenue management are included in the scope of this study. Additionally, process performance is examined from a trading-partner perspective, recognizing the objectives and processes performed by the supplier and customer in the economic exchange. Since the health sector relies on a number of intermediary organizations for delivery of many supply chain services, metrics evaluating the performance of the service delivery aspects of the health sector will also be included. Finally, to recognize the fact that interdependencies may exist among supply chain metrics and that performance improvement may be directly related to these complex interaction, this study propose methodologies for integrative benchmarking that assesses collectively multiple metrics and determines performance gaps across interacting metrics.

Finally, little attention has been given to identifying best known methods that drive systematic performance improvement. As learned in other industries, benchmarking has greater impact on performance improvement when organizations can determine not only the best performer, but can also identify best known practices and capabilities that have yet to be adopted by the majority of the industry. The final phase of this study investigates whether supply chain performance differs across the comparative benchmarking groups, and if so, what practices and capabilities result in performance differences. Using a proof-of-concept methodology, different benchmarking groups will be evaluated on their supply chain performance using a number of financial supply metrics. Please note that this study does not consider the pharmaceutical supply chain and only acute care delivery will be investigated (i.e. excludes physicians' offices).

### **Principal Questions Addressed:**

1. What metrics are collected about an organization's supply chain operations?
2. What metrics are collected by an organization about their trading partner relationships?
3. What metrics are collected by trading partners about their customer's supply chain performance?
4. Which metrics are perceived by health sector professionals and leading experts to provide the highest utility in advancing performance improvement in the health sector?
5. What health supply chain practices and capabilities have been developed internally? Do these capabilities vary based on product type?

6. How do health sector supply chains differentiate themselves from each other?  
What practices and capabilities define unique groups of health sector supply chains?
7. Do the health sector supply chain comparative groups differ in terms of health care environmental factors such as case mix, size, age, ownership, number of employees, mission, and per capita income of the region/market?

In addressing these questions, Table 1 defines the high-level processes and performance outcomes investigated in this study.

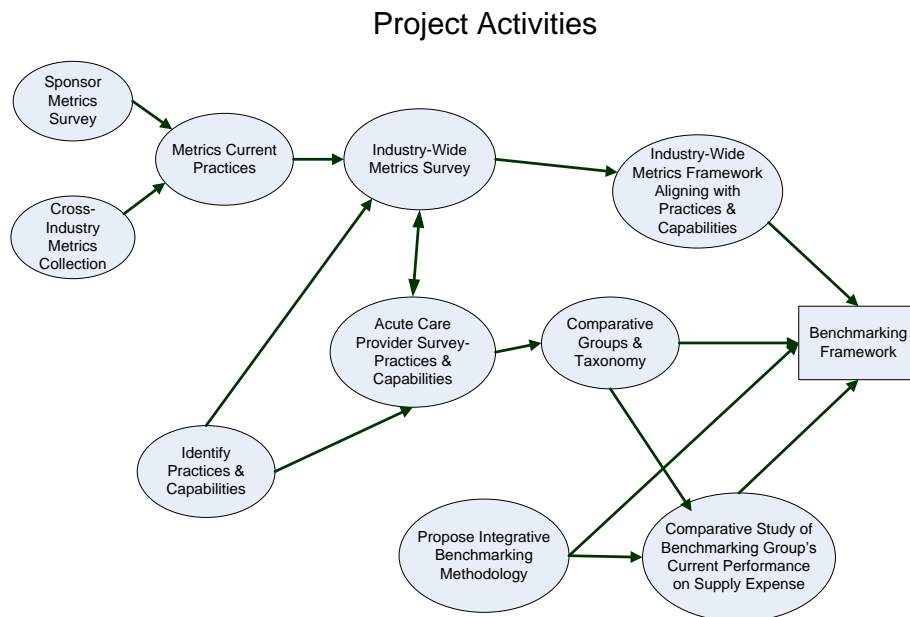
*Table 1: Supply Chain Processes and Outcomes*

<b>Processes</b>	<b>Outcomes</b>
Supply & Demand Mgt.	Cost
Contract Mgt.	Value
Order Fulfillment & Service Delivery	Satisfaction
Returns/Recall Mgt.	Flexibility
Customer Service	Responsiveness
Stakeholder Relationship Mgt.	Reliability
	Accuracy
	Efficiency
	Throughput
	Revenue
	Standardization
	Compliance
	Utilization
	Safety
	Clinical
	Assets
	Social Responsibility

The unit of analysis will be a service line as well as the inter-firm collaborative partnerships for that service line. For example, metrics collected by service line, to measure internal processes and performance will be collected for each firm including acute care providers, group purchasing organizations (GPOs), distributors, third-party logistics providers (3PL)s, and e-commerce solutions. This study will also collected metrics, practices, and capabilities about and for trading partners. For example, metrics for acute care providers will examine backward-facing trading partner relationships (i.e. suppliers) such as metrics collected to evaluate GPO performance, as well as metrics collected by the GPO for the acute care provider. Forward-facing partners (i.e. customers) such as physician involvement in supply chain initiatives will also be evaluated. Similar trading partner relationships will be examined for the GPO, 3PL, Distributor and e-business services.

## Methodology:

The initial summary of the project's activities are shown in Figure 2 and described in some detail below. As the project has progressed over the past year, our research team came to understand the importance of capturing the detailed process level interactions in the supply chain, particularly between trading partners who deliver critically important services to the successful execution of supply chain operations. At the same time, we observed that substantial changes were occurring in the industry and have worked over the past two months to capture these important dimensions into our study.



### Metrics Current Practices

As an organizing framework for collecting metrics current practices, the first activity was the identification of common supply chain processes across the health sector supply chain enterprise. After examining numerous supply chain frameworks from professional associations, consulting firms and academic articles, it was decided to combine academic frameworks with an adaptation of the process maps from the Supply Chain Council SCOR and CCOR models ([www.supply-chain.org](http://www.supply-chain.org)). The framework was used to identify and document the processes performed within a firm and between it and its trading partners. This process structure was refined to reflect the common tasks

within the Source, Deliver, Return, Contract, Assist, and Relate processes in the health sector. It was further refined to reflect the specific nature of Manufacturers, GPO's, Exchanges, and Acute Care Providers. This framework was presented at the AHRRM conference and at the last board meeting of the consortium.

The next activity in the initial phase was to survey Board member firms for the measures they collect to measure their own performance or that of their trading partners. These measures were categorized based upon the process step they assessed, and the type of outcome they could measure. Initially, supply chain outcomes included Cost, as has been the focus of much of the benchmarking in this industry, but also included Assets, Responsiveness, Reliability, Sustainability, Safety, and Customer Satisfaction with the processes. These categorization activities highlighted one weakness with the current performance measurement activities in many firms in the health sector: the metrics being captured focus on a very limited subset of the supply chain tasks being performed, and they measure very limited dimensions of the outcomes of those tasks. The research team also reviewed the academic supply chain literature and public sector data sources to collect measures which have been used in other industries to develop a robust health sector performance measurement system. Over 600 metrics were identified; many of them measuring similar characteristics of the supply chain. A summary of these metrics are reported in the document "*Current Practices in Supply Chain Metrics.*"

### Structured Interviews

As the research team learned more about the dynamic changes in the health sector, we decided to seize the opportunity to once again leverage the unique knowledge base of the Consortium by undertaking structured interviews. To validate the supply chain structure, process maps, and outcomes definitions, Consortium members were approached to participate in structured interviews with the goal of identifying any portions of the documents that were unclear, inaccurate, or omitted. During September and October, 2006, structured interviews were conducted with 19 senior supply chain leaders in health sector organizations. Ten members of Acute Care Provider firms were interviewed; four from Alliances (UHA and VHA); three members of GPO firms participated (one of those participated in three interviews – one with another GPO representative, and two others with service providers); one member of an Exchange participated, as did one from an IT Consulting firm.

Each of the interviews was conducted in a similar fashion. When an interview was scheduled, the participants were e-mailed three documents: an introduction to the project, the appropriate process map, and a summary of outcome dimensions. The participants were asked to review these documents and highlight any areas for discussion. The interviews began with a request for the participants to describe their firm's supply chain configuration choices (what activities they insourced or outsourced, what types of trading partners they used; product, information and financial flows, etc.). Then we discussed each of the documents. These interviews were recorded, and summaries were written and distributed back to the participants.

There were several major findings from the structured interviews:

- The original conceptualization of the supply chain, which had driven the process map specification, was revised significantly. Based upon the interviews, it became clear that many firms in the supply chain can delivery several services, and that there was significant overlap of service offering types between firms, even firms of different types. Therefore, the supply chain was re-conceptualized as a set of product and service flows, with the sourcing decisions resulting in different supply chain configurations.
- The process maps were also restructured by service. In this way, firms can document their portfolio of supply chain processes by completing each of the process maps, one for each service they perform. For example, a provider that self-manages its contracts would complete the Provider and Contracting Services map to document its supply chain processes. This will enable them to benchmark their hospital supply chain processes and their contracting performance.
- The process maps were modified to incorporate health care terminology. Additionally, each of the process maps was further individualized by illustrating process step definitions with example activities appropriate to the product or service being delivered.
- The list of outcomes was expanded, based upon sample metrics that were provided during the interviews. This has resulted in several more outcome dimensions, new definitions, and additional metrics that can be categorized by process, activity, and outcome dimension.

While this additional process somewhat slowed our progress, we felt it was important to validate the processes and outcomes of our performance measurement and benchmarking framework before proceeding to distribute the survey to health sector industry. From our perspective, these interviews have substantially changed our conceptual model of the health sector supply chain, and the framework for our survey. We look forward to additional input on the process maps at the upcoming November dissemination work. Your input on the report “Key Elements of the Health Sector Benchmarking Framework: Developing Process Maps and Outcome Definitions,” is encouraged and welcomed; as it is not too late to provide your valuable insight and unique perspective before our efforts move to a much larger scale. If you would like to provide written input on the document or participate in a structured interview, please feel free to contact Julie Smith David at [Julie.smith.david@asu.edu](mailto:Julie.smith.david@asu.edu) to initiate these discussions.

Immediately after we receive input on the structured interview feedback at the November workshop, we plan to combine this information and the current metrics report into a white paper for dissemination. The broader scope of the white paper to include new conceptual framework and process maps should enhance the value of our product



and assist in recruiting organizations to participate in the survey and future benchmarking opportunities.

### *Industry-Wide Metrics and Practices and Capabilities Survey*

The next phase of the project will be completed through a large survey to be distributed to acute care providers, GPOs, Distributors, 3 PLs, and e-business services. Appendix A provides a summary of targeted organizations and survey respondents. In addition to collecting organization-wide metrics, the survey will examine metrics and supply chain practices and capabilities at the service line category level. Current plans are to seek advice from the Board at the Nov. 9<sup>th</sup> workshop on the services lines to be included in the survey and benchmarking analysis. Based on the structured interviews, our initial plan is to target orthopedics, cardiac and med/surg services lines, laboratory and radiology departments, and commodities.

To be successful, the research team will need support from the Board members to identify survey participants, especially those in distributor firms. Additionally, this study's success will hinge on receiving data from several different parties within each organization. Any help in collecting complete survey responses will significantly improve the study results.

### *Comparative Benchmarking Groups and Supply Chain Taxonomy*

The practices and capabilities survey data will be analyzed using cluster analysis to identify groups of acute care providers that are similar, and the characteristics which uniquely identify each group. This portion of the study is critical to ensure success of the benchmarking efforts. Whereas early benchmarking work assumed all firms in an industry would benefit equally from identical business practices, research has shown that firms face different environmental factors, and, thus, require different processes and practices to optimize their operations. Thus, firms participating in this study will be informed of the factors that differentiate their supply chains, and they will be able to benchmark their operations against others in their cluster, or benchmarking group, gaining better insights into opportunities for improvement.

### *Industry-Wide Metrics Framework Aligned with Health Sector Processes*

In the metrics section of the survey, respondents will be asked to identify on a six-point scale the implementation of specific metrics in their organizations. Respondents will be asked to consider how helpful a metric has been or could be to improving performance of their supply chain. The extent to which other organizations provide metrics and the various uses of the metrics to improve performance will also be collected with this survey.

The results of the survey will be aligned with the health sector supply chain processes – Source, Deliver, Return, Contract, Assist, and Relate. It will then be possible for organizations and their trading partners to decide on which metrics should be collected based on a detailed analysis of their internal and collaborative processes, practices, and capabilities.

Comparative Study of Supply Chain Performance

Using financial supply expense data collected from acute care providers in the survey, this proof-of-concept demonstration will investigate whether specific supply chain benchmarking groups outperform other groups in supply chain performance. By knowing which if any comparative benchmarking groups outperform others, health sector executives can estimate their target performance improvement with their existing capabilities or if they desire to substantially improve their performance, this analysis will identify the needed practices and capabilities to achieve that level of performance.

Benchmarking Framework

The final outcome of this project will be the foundation for a performance measurement system that will encourage and enable continuous improvement in health sector supply chain operations. Ideally, this study will demonstrate the key supply chain practices and capabilities that differentiate health sector organizations and superior performance from measurement systems that “fit” with the firm’s characteristics.

**Future Milestones and Anticipated Completion Dates:**

<b>Due Date</b>	<b>Activity</b>
12/7/06	Complete Final Round of Structured Interviews
12/15/06	Incorporate Last Round of Structured Interview Data into White Paper “Supply Chain Metrics and Benchmarking: Lessons for the Health Sector Industry.”
1/19/07	Complete Survey Validation and Pre-Test
1/19/07	Contact Information for Survey Participants Collected
1/26/07	Survey Participation Invitation Sent Out
3/30/07	Data Collection Completed
5/27/07	Data Analysis and Preliminary Report Distributed to Consortium
7/31/07	Final Report Completed

**Products to Date (e.g., presentations, papers, etc.):**

- AHRRM Presentation, March, 2006, Chicago
- White Paper “Supply Chain Metrics and Benchmarking: Lessons for the Health Sector Industry,” to be distributed in December 2007.

**Anticipated Products:**

### *Benchmarking and Process Improvement Analysis Tool*

- Based on the process analysis and survey results, the health sector supply chain will have a suite of tools to process improvement.

### *Comparative Metrics, Practices and Capabilities Report*

- Each participating organization will receive a personalized report that compares their supply chain practices and capabilities to others in the study. The report will also provide a comparative analysis of the types of metrics used in the participating provider organization against others in the study.

### **Value to members:**

- After statistical validation of the benchmarking tools, organizations will be able to use to develop their own score cards to evaluate their success in operational efficiency and effectiveness, to diagnose opportunities for improvement, and to identify corrective actions.
- Partners in the supply chain will be able to identify collaborative areas for improvement including (a) GPOs and acute care providers, (b) distributors and acute care providers, (c) 3PLs and acute care providers, and (d) e-commerce/consulting organizations and acute care providers.
- To position the W.P. Carey Health Sector Supply Chain Research Consortium as a “think tank” for industry-wide benchmarking studies in the health sector.

### **Dissemination plans to members:**

- ASU Dissemination Workshop, Fall, 2006
- Final Report, Winter, 2007

### **Dissemination plans to the field:**

- To the broader health sector community, articles will be written for publications such as *Healthcare Financial Management* and *Healthcare Purchasing News*.
- Managerial insights from the study are particularly aligned with the journal mission of industry-oriented academic journals such as *Health Care Management Review*, *Harvard Business Review*, *Hospitals and Health Services Administration*, *Benchmarking*, and *Supply Chain Management*.
- To the academic community, articles will be submitted to the leading business publications including *Management Science*, *MIS Quarterly*, *Health Services Research*, *Journal of Operations Management*, and *Information Systems Research*, *Accounting*, *Organizations*, and *Society*.

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**Appendix A: Target Survey Organizations**

Organization	Target Participants
<b>Acute Care Providers</b>	<ul style="list-style-type: none"> <li>• All AHA hospitals, with particular focus on the following organizations</li> <li>• Catholic Health</li> <li>• Cleveland Clinic Health System</li> <li>• HCA</li> <li>• Intermountain Health Care</li> <li>• Scottsdale Health Care</li> <li>• Swedish Health</li> <li>• Trinity Health</li> <li>• University Hospital Consortium</li> <li>• University of Nebraska Systems</li> <li>• Veterans Hospital Administration</li> </ul>
<b>Group Purchasing Organizations</b>	<ul style="list-style-type: none"> <li>• Amerinet</li> <li>• Broadlane</li> <li>• Consorta</li> <li>• Innovatix</li> <li>• MedAssets</li> <li>• Novation</li> <li>• Premier</li> <li>• Resource Optimization &amp; Innovation</li> <li>• Synernet</li> <li>• Several Regional GPOs</li> </ul>
<b>Exchanges/E-Business Solutions</b>	<ul style="list-style-type: none"> <li>• All-Health - AuctionMart.com</li> <li>• Baxter Healthcare</li> <li>• Cardinal Health</li> <li>• GHX</li> <li>• Neoforma</li> <li>• Owens &amp; Minor - OMDirect</li> <li>• Premier</li> </ul>
<b>Distributors</b>	<ul style="list-style-type: none"> <li>• Baxter Healthcare</li> <li>• Cardinal Health</li> <li>• Johnson &amp; Johnson Health Care Systems-Memphis Logistics Center</li> <li>• McKesson Medical-Surgical</li> <li>• McKesson Provider Technologies</li> <li>• Owens &amp; Minor</li> <li>• Regional Distributors</li> </ul>
<b>Third-Party Logistics Providers</b>	<ul style="list-style-type: none"> <li>• UPS Supply Chain Solutions</li> <li>• FedEx Kinkos</li> <li>• GATX Logistics</li> <li>• DHL</li> <li>• Penske Logistics</li> <li>• Rx Crossroads</li> </ul>

## Targeted Respondents: Acute Care Providers

Survey Section	Type of Data	Respondents
Hospital Background Data	Data from financial reports and AHA descriptors of hospital size, market concentration, service lines, acute care beds in service, hospital case mix index, Medicare case mix index, acute care patient days,	CFO
Hospital Financial Purchase Data for the year 2005	Supply Expense as a percentage of net revenue, supply expense as a percentage of total expense, supply experience per adjusted patient day and supply expense per adjusted discharge	CFO
Supply Chain Strategy and Structure	Perceptual organizational-level data; defined strategy and priorities; develop internal capabilities vs. purchase services outside organization	(1) CFO, (2) COO or VP/Director of SCM/Mtls Mgt
Organization-Wide Supply Chain Metrics	Perceptual organizational-level data; Identify metrics collected at organizational level; sources of use of metrics; internal and external; organizational learning outcomes	(1) CFO, (2) COO or VP/Director of SCM/Mtls Mgmt, (3) highest facility IS manager
Information Technology Capabilities	Perceptual organizational-level data of IT capabilities including internal capabilities; i.e. MMIS, RFID, etc. Also evaluate GPO and distributor IT capabilities at facility-level.	(1) Highest facility IS manager; CIO/Director/Manager of IT (facility level), (2) VP Director of SCM/Mtls Mgt
Orthopedics	Supply expense data and supply chain structure, i.e. number of contracts, no. of suppliers, etc. Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Service Line Manager and (2) SCM Manager assigned to this service line
Cardiac	Supply expense data and supply chain structure, i.e. number of contracts, no. of suppliers, etc. Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Service Line Manager and (2) SCM Manager assigned to this service line
Med/Surg	Supply expense data and supply chain structure, i.e. number of contracts, no. of suppliers, etc. Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Service Line Manager and (2) SCM Manager assigned to this service line
Laboratory Supplies	Supply expense data and supply chain structure, i.e. number of contracts, no. of suppliers, etc. Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Service Line Manager and (2) SCM Manager assigned to this service line
Radiology Supplies	Supply expense data and supply chain structure, i.e. number of contracts, no. of suppliers, etc. Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Service Line Manager and (2) SCM Manager assigned to this service line
Commodities	Supply expense data and supply chain structure, i.e. number of contracts, no. of suppliers, etc. Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	1) Service Line Manager and (2) SCM Manager assigned to this service line

## GPOs

<b>Survey Section</b>	<b>Type of Data</b>	<b>Respondents</b>
Background Data	Number of members, number of products under contracts, number of suppliers, ownership model	CFO
Services Provided	Supplier evaluation, new and niche technology evaluation, group contracting, customer contracting, diversity programs, revenue cycle services, etc.	CFO
Organization-Wide Supply Chain Metrics	Perceptual organizational-level data; Identify metrics collected at organizational level; sources of use of metrics; internal and external; organizational learning outcomes; include metrics captured for manufacturers and acute care providers.	(1) CFO and (2) VP Bus. Dev./Mktg/Sales
Information Technology Capabilities	Perceptual organizational-level data of IT capabilities for internal operations and customer services.	(1) Highest facility IS manager;CIO/Director/Manager of IT (facility level), (2) VP of Business Development
Orthopedic	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	Contract Manager
Cardiac	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	Contract Manager
Med/Surg	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	Contract Manager
Laboratory Supplies	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	Contract Manager
Radiology Supplies	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	Contract Manager
Commodities	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	Contract Manager

## Distributors, 3PLs, and Exchanges

Survey Section	Type of Data	Respondents
Background Data	TBD	CFO
Services Provided	TBD	CFO
Organization-Wide Supply Chain Metrics	Perceptual organizational-level data; Identify metrics collected at organizational level; sources of use of metrics; internal and external; organizational learning outcomes; include metrics captured for manufacturers and acute care providers.	(1) CFO and (2) VP Bus. Dev./Mktg/Sales
Information Technology Capabilities	Perceptual organizational-level data of IT capabilities for internal operations and customer services.	(1) Highest facility IS manager;CIO/Director/Manager of IT (facility level), (2) CFO
Orthopedic,	Combine together all physician preference items; Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Logistics Manager; (2) Sales Manager
General Med/ Surgi Supplies	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Logistics Manager; (2) Sales manager
Laboratory Supplies	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Logistics Manager; (2) Sales manager
Radiology Supplies	Perceptual data on supply chain metrics, capabilities, organizational learning, etc.	(1) Logistics Manager; (2) Sales manager