Planning Factors for Developing an Enterprise-Wide Picture Archiving and Communication System Maintenance Program

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Picture archiving and communication system (PACS) maintenance on an individual site basis has historically been a complex and costly challenge. With the advent of enterprise-wide PACS projects such as the Virtual Radiology Environment (VRE) project, the challenge of a maintenance program with even more complexities has presented itself. The approach of the project management team for the VRE project is not one of reactive maintenance, but one of highly proactive planning and negotiations, in hopes of capitalizing on the economies of scale of an enterprise-wide PACS maintenance program. A proactive maintenance program is one aspect of life-cycle management. As with any capital acquisition, life-cycle management may be used to manage the specific project aspects related to PACS. The purpose of an enterprise-wide warranty and maintenance life-cycle management approach is to maintain PACS at its maximum operational efficiency and utilization levels through a flexible, shared, yet symbiotic relationship between local, regional, and vendor resources. These goals include providing maximum operational performance levels on a local, regional, and enterprise basis, while maintaining acceptable costs and resource utilization levels. This goal must be achieved without negatively impacting point of care activities, regardless of changes to the clinical business environment.

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AN ENTERPRISE-WIDE maintenance program is being established for the Virtual Radiology Environment (VRE) project. The VRE project incorporates 10 individual picture archiving and communication system (PACS) implementations into a single, virtual environment of radiological services for the southwestern region of the United States. The supporting regional, enterprise-wide maintenance program looks to use maintenance resources from all levels, including local sites, regional centers, national depots, and vendor support programs. All maintenance tasks are identified, quantified, priced, and assigned to one of these maintenance resources. These tasks include sched-

uled services, repair operation, system administration, quality-control checks, and administrative record keeping.¹

The terms of the warranty and maintenance agreement between the PACS vendor and the health care enterprise determine the assignment of tasks to maintenance resources. A task allocation chart (Table 1) has been developed to clearly delineate the tasks and associated resources.² Part of the process of establishing an enterprise maintenance plan is to negotiate the terms with the larger scope and additional resources in mind. The task allocation chart is an example of what could result from the negotiations of the enterprise-level maintenance program. Note that there are local, regional, and vendor resources assigned to the tasks in the chart.

The advantage of this method is that each resource contributes the skills and time that are most logical for that resource. A PACS requires daily operational and quality-control functions to be performed, but it is unreasonable to require the vendor to perform those tasks. Additionally, the enterprise or region may well have system administrative and maintenance resources that are not present at each site. These resources can be tasked to support the local PACS systems on an as scheduled or as needed basis, further reducing the reliance on scarce and expensive vendor services. Finally, the vendor should be kept engaged to ensure that the proper skill level performs high-level operations and complex services and to maintain the ongoing relationship with the vendor for system performance and upgrades.

SUMMARY

This enterprise-wide PACS warranty and maintenance management plan unifies the requirements, resources, and management structure, while reducing overall life cycle costs and improving quality of service. This can be achieved through effectively renegotiating warranty and maintenance terms with the PACS vendor, including a larger scale operation that includes local and regional resources. An enterprise-wide approach enables the inherent benefits of collective bargaining and the incorporation of economies of scale into the maintenance opera-

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Table 1. Shared Regional Task Allocation Chart

PACS Component or Subsystem	Operator	QC1	QC2	PM1	PM2	CAL Configuration	1st Call	Minor Maintenance	Major Maintenance
Diagnostic workstations	Radiologist	Rad Tech	Biomed	Biomed	Biomed	Biomed	Biomed	Biomed	Vendor B
Clinical workstations	Clinician	Med Tech	Biomed	Biomed	Biomed	Biomed	Biomed	Biomed	Vendor Biomed
Acquisition gateways	Local SA	Local SA	NA	Local SA	Loc/Reg SA	Loc/Reg SA	Loc/Reg SA	Loc/Reg SA	Vendor Loc/Reg SA
Teleradiology servers	Local SA	Local SA	Local SA	Local SA	Loc/Reg SA	Vendor	Vendor	Loc/Reg SA	Vendor Loc/Reg SA
HIS interface	Local SA	Local SA	NA	Local SA	Loc/Reg SA	Vendor	Loc/Reg SA	Loc/Reg SA	Vendor Loc/Reg SA
Short-term storage	Local SA	Local SA	NA	Local SA	Loc/Reg SA	Vendor	Loc/Reg SA	Loc/Reg SA	Vendor Loc/Reg SA
Intermediate storage	Local SA	Local SA	NA	Local SA	Loc/Reg SA	Vendor	Loc/Reg SA	Loc/Reg SA	Vendor Loc/Reg SA
Long-term archive	Local SA	Local SA	NA	Local SA	Loc/Reg SA	Vendor	Loc/Reg SA	Loc/Reg SA	Vendor Loc/Reg SA
Integrated RIS	Rad Staff	Local SA	NA	Local SA	Loc/Reg SA	Vendor	Loc/Reg SA	Loc/Reg SA	Vendor Loc/Reg SA
Shared database	Local SA	Local SA	NA	Local SA	Loc/Reg SA	Vendor	Loc/Reg SA	Loc/Reg SA	Vendor Loc/Reg SA

Abbreviations: HIS, hospital information system; RIS, radiology information system; QC, quality control; PM, preventive maintenance; CAL, calibration; SA, System Administrator; Rad, radiology; Biomed, Biomedical Equipment Technician; Loc/Reg, local/regional.

tions. Effective implementation and management of this regional/enterprise PACS warranty and maintenance approach can result in reduced costs of imaging and maintenance services in each individual institution, as well as the region overall.

The goal of reducing cost can only be fully appreciated if the clinical utility of a PACS is supported. The transition away from reliance on vendor resources must be met with an equal assignment of tasks to other resources. A combination of in-house service organizations supported by regional assets can be brought together to cover tasks not assigned the vendor. The task allocation chart is meant to be a dynamic reflection of assignments. It can be used to show current and future program structure. Each stakeholder in PACS support processes should provide constructive feedback to keep the chart, the resultant contracts, and

duty assignments in synch with the realities of the PACS maintenance program.

With the anticipated proliferation of PACS throughout the US health care system, an increase in enterprise and regional implementations is inevitable. Enterprise-wide, shared, warranty and maintenance programs such as is being implemented in the VRE, present a systematic means of achieving maintenance service cost reductions, while supporting effective clinical operations.

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