

Computerized Maintenance Management Systems: A Review of Available Products

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Regulatory requirements, risk factors and liabilities, and a requirement for better asset management are generating intense interest in computerized maintenance management system (CMMS) software. CMMS programs provide corrective and preventive maintenance scheduling and record keeping. A common database can share information for repair trending, equipment histories, device tracking and contract warranty information. With the proliferation of medical equipment available, CMMS is viewed as a necessity in most healthcare institutions due to Joint Commission for the Accreditation of Healthcare Organization requirements under the Environment of Care Standards. This article will provide selection criteria, evaluation processes and review of available CMMS software.

Index Under: *Computerized Maintenance Management Software, Computerized Maintenance Management Systems (CMMS), Medical Equipment Asset Management, Medical Equipment Management, Medical Equipment Management Plan - JCAHO, Preventive Maintenance Programs, Preventive Maintenance Software, Work Order Systems.*

INTRODUCTION

Technology and the management of technology is an integral part of cost-effective, efficient health care. There has been a steady increase in the number of medical devices introduced and utilized per patient bed throughout the history of modern western medicine.¹ In the author's facility, medical devices per bed in 1991 averaged 4.7; in 1997, that number has evolved to 8.3. With the dynamic advances in microprocessor electronics and biotechnology, this technology explosion has become a trend of expectancy and introduces several challenges for technology management. Bronzino cites three primary motivations for implementing a technology management program: 1) fear of litigation and the desire to provide quality care; 2) potential to save money (cost-effectiveness); and 3) regulatory requirements; Joint Commission for the Accreditation of Healthcare Organizations (JCAHO), Food and Drug Administration (FDA), state and local.² David and Judd identify increased access to care, and improvements in risk management intervention as additional technology management expectations.³

ECRI further defines the requirements of a technology management program as:

- A program to control and monitor equipment performance, including routine performance testing, initial inspection, preventive maintenance, calibration and verification of performance, repair and action on device recalls and hazards.
- A program that accurately and consistently computes and monitors total equipment maintenance costs, including in-house costs as well as manufacturer and third party service contracts.
- Involvement in all aspects of equipment acquisition and replacement decisions, development of new services, and planning of new construction and major renovations.
- Developments of training programs for all users of patient care equipment and for biomedical equipment technicians.
- A quality assurance (QA) program relating to technology use.
- Risk management as it relates to technology.⁴

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The Joint Commission Accreditation Manual — 1996 requires documented proof of evaluation and scheduled maintenance of all medical equipment “prior to its use”, and also demands extensive record keeping for corrective and preventive maintenance under the Environment of Care, Medical Equipment Management Plan.⁴

Due to the possible economic implications of lost federal reimbursement for failure to comply with JCAHO requirements, and the risk and asset management issues mentioned earlier, a method of automated equipment management for all healthcare institutions is now a practical necessity. The task of creating a computerized management system in-house is beyond the capabilities of most hospital information systems departments, and the cost of outsourcing a customized system can run into the hundreds of thousands of dollars. This article will review some of the available computerized maintenance management systems (CMMS) and a selection criteria process for prepurchase evaluation.

CMMS SELECTION CRITERIA

Each healthcare facility will have site-specific criteria to satisfy, but a generic listing can be developed as a baseline from which to work. The criteria baseline can then be expanded as site-specific needs are identified. A systematic approach to criteria selection common to medical technology assessment and medical equipment prepurchase evaluation provide excellent protocols. The first step is the selection of a multidisciplinary committee of CMMS users. The committee from which this article is based had the following representation: Vice President of Support Services (chairperson), Director of Clinical Engineering & Telecommunications, Supervisor of Clinical Engineering, Director of Plant Operations and Maintenance, Energy Systems Manager, Plant Operations and Maintenance Technician, Director of Information Services, and Associate Director of Nursing.

Needs assessment and performance criteria are developed by the committee which serve as the baseline for the CMMS selection criteria (Table 1 & 2). The author further categorized the selection criteria as *Critical*, *Important*, and *Nice-to-Have* (Table 3-5). The *Critical* category contains items that must be satisfied for vendors to participate in the initial selection process. The *Important* category contains high priority items that would be used to eliminate vendors in the final selection process. The *Nice-to-Have* category is used as a final selection category that included criteria that was not essential to the operation of the system but provided some “bells and whistles.” A weighted matrix is developed based on the three criteria categories mentioned. Cohen suggests the following set of questions for evaluation of current systems⁶:

- What data do we have now? For example, equipment inventory, personnel records, stock parts inventory, vendor business cards, and scheduled maintenance

procedures in service manuals.

- Where does the data come from, and how does it get to Clinical Engineering? For example, define the data that come from customers, technicians, vendors, and accounting department. How are the data recorded paper, on computer systems? Are the data reliable, or do changes need to be made to assure data reliability? Does the process include handwritten data that are transcribed to a computer, or does the data collector also enter the

TABLE 1

Computerized Maintenance Management System Criteria

- 1) Year 2000 compliant
- 2) Provides capabilities for CE, POM & IS equipment
- 3) Provides PM scheduling
- 4) Provides equipment risk ranking system
- 5) Has database of manufacturers' phone & mailing address
- 6) Bar code capable
- 7) Allows existing system inventory to download files to new system
- 8) Expandable
- 9) Software Upgradeable, enhancements provided
- 10) User friendly, point-and-click menu options
- 11) Interfaces with notebook for information downloads
- 12) Has existing files for typical PM requirements for most equipment including POM, CE and Computer Equipment
- 13) Point-and-click menu options
- 14) Report trending capabilities
- 15) Report graphics Importing
- 16) Data/Graphics interfaces with other MS Office word processors
- 17) Cost accounting features
- 18) Automated parts reordering system
- 19) Equipment history flags (tells users if certain failures are exceeded with pop-up menu)
- 20) Yearly equipment operations expense calculated
- 21) Equipment life expectancy reports (equipment capitalization)
- 22) Tracks employee hours
- 23) User definable fields
- 24) CAD support for existing facility and future additions
- 25) Windows® platform
- 26) User restriction levels
- 27) User training provided
- 28) Initial software and hardware installation assistance
- 29) “1-800” user support line
- 30) Users group and/or Newsletter
- 31) Software “patches” provided at no extra cost

data into the computer?

- What is done with the current data? Are the data used for billing, quality improvement activities, reports to customers, reports to management?
- Are there any special or unique requirements currently in use, such as special reports for special customers or interfaces to mainframe computer systems?
- Should other special or unique requirements be specified in order to meet projected needs? For example, maintenance insurance is seriously being considered in lieu of prepaid service contracts — how will a CMMS handle accounting of maintenance insurance premiums and rebates?
- What is missing from the current system? For example, in the current system, the value of parts and labor for prepaid service contracts is not tracked, making it difficult to evaluate the cost-effectiveness of those contracts.
- What performance is required based on the existing data and projected future requirements? How much data will be collected; where will these data be remotely accessed from; how many users will be using the system simultaneously on the local area network (LAN) or the wide area network (WAN)?

CMMS EVALUATIONS

A vendor search can be accomplished by techniques such as: Internet inquiries, phone calls to sister organizations and peers, library literature search, and existing in-house information. There is also a *CMMS Directory And Comparison Guide* available as a catalog and compact disk from Managing Automation Software Guides⁷. Information about the CMMS catalog can be obtained by calling (212) 629-1114. Table 6 displays the results of the vendor search using a combination of the above methods and the criteria from Tables 1 and 2. Table 6 is not a comprehensive listing of CMMS programs available but it does contain all CMMS programs with specific clinical engineering related functions.

TABLE 2

Software Specifications

- 1) Hardware Platform: _____
- 2) Operating System: _____
- 3) Language: _____
- 4) Database: _____
- 5) Network: _____
- 6) Total number of systems operational: _____
- 7) Number of systems installed in 1997: _____
- 8) Total number of systems installed in 1997: _____
- 9) Number of years your company has offered this type of software: _____

The Managing Automation Software Guides catalog mentioned above contains 96 vendor listings. There are seven vendors which appear in Table 6 that do not appear in the Managing Automation Software Guides catalog. The criteria and specifications listed in Table 6 differ from those presented in the Managing Automation Software catalog in that Table 6 is specific for health care and clinical engineering.

TABLE 3

CRITERIA PRIORITY

CRITICAL: (Software must meet these criteria to be considered for purchase)

- 1) Year 2000 compliant
- 2) Interfaceable with programs for clinical engineering, plant operations & maintenance, & information systems support
- 3) Provides PM scheduling
- 4) Provides equipment risk ranking
- 5) Allows existing system inventory to download files into the new system (e.g., from Meditech or Servicemaster "Competence Plus")
- 6) Expandable (hardware & software)
- 7) Upgradeable (hardware & software)
- 8) User friendly (point-and-click menu system)
- 9) Has existing files for typical PM requirements for most equipment including POM and CE equipment
- 10) Data/graphics interfaces with other MS office word processors
- 11) Windows platform
- 12) User restriction levels
- 13) Maintains equipment history
- 14) Software installation assistance provided
- 15) "Patches" provided at no extra cost
- 16) User training provided
- 17) Base price of system \$ _____
- 18) Cost for up to 25 "seats" \$ _____

TABLE 4

CRITERIA PRIORITY
IMPORTANT: (This criteria is strongly desired and will affect vendor selection)
1) Bar code capable
2) Interfaces with PC laptop for downloads into main system
3) Point-and-click menu options
4) Report trending capabilities
5) Report graphics importing capabilities
6) Equipment history flags (pop-up menu tells users if failure level has been exceeded)
7) Provides means to calculate yearly equipment
8) Equipment life expectancy reports (calculates equipment depreciation)
9) User definable fields
10) "1-800" user support line
11) Users group and/or newsletter

Many of the software programs available address plant operations and maintenance specifications but have little to offer specifically for clinical engineering functions. Many of the programs featured in the CMMS catalog, offered by Managing Automation Software Guides, are used by the manufacturing or commercial service industry and are not specific for the healthcare industry. These programs are adaptable to clinical engineering procedures, however, the ability to download current equipment files and preventive maintenance (PM) procedures, specific for your facilities' Clinical Engineering Department, should be addressed prior to purchase. Many vendors answer "YES" to specific selection criteria, but there are vast differences as to how the "YES" is accomplished and how much the process will cost.

In this review, vendors with programs that are well defined for both Clinical Engineering and Plant Operations and Maintenance included ServiceMaster and St. Croix. Vendors with well defined clinical equipment PM procedures available in their standard package include Bio-Tek, Butterfield Systems, DNI Nevada, ECRI, EQ2, ServiceMaster and St. Croix. Equipment specific PM procedures may not be available from vendors without experience in clinical engineering procedures. Most vendors indicate that they can import PM procedure files, but in most cases the files

TABLE 5

CRITERIA PRIORITY
NICE TO HAVE: (Adds to attractiveness of purchase - may determine final vendor selection)
1) Provides database of manufacturers' phone and mailing address
2) Cost accounting features (links several databases to provide asset management reports and trends)
3) Automated parts reordering system
4) Tracks employee hours

will be protected by copyright from another competing vendor. It is important that an agreement is made in writing to accomplish the PM procedure file transfer before purchasing a software package with generic PM procedures. Your clinical engineering department may be able to write some PM procedures specific to your facility in "user defined fields."

A review of the software programs shown in Table 6 shows a variety in the systems available both from a software features stand point and hardware platforms. A vendor with extensive health care experience (at least five years) and facilities available for site visits should be a high priority when selecting a CMMS program.

Several of the vendors listed in Table 6 were unfamiliar with the term "risk ranking" as it pertains to medical equipment maintenance. Software vendors with clearly defined "risk ranking" procedures include: Bio-Tek, Butterfield Systems, Caisson, DNI Nevada, ECRI, and ServiceMaster.

Some vendors provide equipment manuals on compact disk or floppy disk. It is a definite advantage to purchase a CMMS program capable of importing this information. The National Fire Protection Association (NFPA) codes and standards for health care facilities (NFPA 99), requires "...operator's, maintenance, and repair manuals with all units." Importing this information into your CMMS program provides an efficient means to review schematics during corrective or preventive maintenance and eliminates massive space requirement for service manuals.

Many of the vendors listed in Table 6 offer computer assisted design (CAD) file importing capabilities. This capability is important if your facility under goes extensive renovation or additions. A revised floor plan can be stored in the CMMS system and printed out on-demand for various projects. If you have a large facility and assign new technicians to PM tasks, an easily assessable CAD drawing can assist them in locating the equipment and thereby save time in performing PMs.

CONCLUSIONS

Recent advances in consumer software have provided a more user friendly (pop-up menus, point-and-click orientation) version of health care CMMS programs. The ability to interface with common word processing and spreadsheet software allows data to be compiled and reported more efficiently for asset management purposes.

Each healthcare facility will have unique requirements for certain aspects of the clinical engineering function. A thorough review of available programs on a committee basis is the best approach to obtain a CMMS program to fit the needs of your facility. Almost all vendors provide a demonstration version or "demo" of their CMMS product. Reviewing "demo" versions of the software is a necessity. Hands-on "demo" review will expose subtle differences in "user friendliness" and strengths and weaknesses of each program. After "demo" reviews, a "live vendor demo" may be in order for those programs that receive a favorable critique. The "live vendor demo" is provided on-site or on-line by customer support representatives, which allows users to ask questions directly to the vendor and also to allow the vendor to exploit features which may have been overlooked during the previous hands-on "demo." Vendors may be able to customize some areas of the program to meet site-specific or departmental requirements.

If your facility has multiple sites, web-based technology should be considered. Web-based technology allows connectivity and data base sharing among several disparate systems.

It's difficult to anticipate all of the variables in a dynamic system prior to purchase. A service rarely considered in the initial purchase of software is the availability of a "users' network" and a "users' news letter." Sharing of information concerning common problems and common problem solving can be invaluable after your system has been in operation for several months. Many "users' networks" provide feedback to the vendor to prioritize added features for upgrades and enhancements. This allows users to have commonly desired features added at a lower price than a "customized" version of the software.

Hardware and software advances are inevitable. Partnering with a vendor that has an active R&D program and provides a flexible platform to implement change will contribute cost-effective technology for the future of your healthcare facility.

The goal of all clinical engineering departments should

be to purchase hardware with common interface systems and CMMS software with open standards. The computer industry is five to ten years away from providing this panacea, but the demands of the healthcare consumer are being met by niche players with middleware applications that allow dissimilar systems to exchange information.⁹

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BIOGRAPHY

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Address all correspondence and reprint requests to the author via E-mail: ngram@mail.st-joseph.org.

TABLE 6

Review of Available Programs

Company Product Address	Acutate Software Acutate 999 Baker Way, Ste. 330 San Mateo, CA 94404	Bio-Tek Instruments Profile/Otis Highland Park, Box 998 Winooski, VT 05404	Butterfield Systems DVM 11223 W. Bernardo Ct. San Diego, CA 92127	Caisson Enterprises TMA Systems 400 Cole Dr. Guthrie, OK 73044	Champs Software Champs POB 2600, 1255 N. Vantage Pt. Dr. Crystal River, FL 34420
Phone	(415) 638-2000	(800) 451-5172	(800) 443-0495	(405) 260-7648	(352) 795-2362
Fax	(415) 638-2020	(802) 527-2218	(619) 451-3901	(405) 260-7648	(352) 795-9100
E-mail	www.acutate.com	sales@biotek.com	tiscor@tiscor.com	tedbrogan@aol.com	www.champsinc.com
Year 2000 Compliant	yes	yes	yes	yes	yes
PM Scheduling	yes	yes	yes	yes	yes
User customizable risk ranking	no	yes	yes	yes	yes
Allows existing system to download Files into new system	no	yes	yes	yes	yes
Expandable	yes	yes	yes	yes	yes
Enhancement products current and in development	yes	yes	yes	yes	yes
Upgradeable	yes	yes	yes	yes	yes
Point-and-click GUI	yes	yes	yes	yes	yes
Existing files for PM procedures, both Clinical Eng. and POM	no	Extensive CE	Extensive CE	Limited	Limited
Interface with MS Office or other word processor spreadsheet program	no	yes	yes	yes	yes
Windows platform	yes	yes	yes	yes	yes
User restriction levels	yes	yes	yes	yes	yes
Maintains equipment history	yes	yes	yes	yes	yes
Software installation support	yes	yes	yes	yes	yes
Patches provided at no extra cost	1st 90 days	yes	yes	yes	yes
User training	Spec. request	yes	yes	yes	yes
Base price	\$750	\$7,100 - multi-user	\$10,590 (5 seats)	\$6,995-Powerbase +\$17,775	\$7,500
Cost for up to 25 user "seats"	\$250/seat	\$7980	\$795/seat added	\$37,500	
Hardware platform	IBM PC compat.	486.DX4 or better	PC (Pentium)	IBM PC compat	Hardware Indep.
Operating System	Windows* 3.1, 95	DOS 6.22,	Windows* 95	Win* 3.1, 95, NT, OS/2,MAC C++	Windows* 95, NT, UNIX
Language	Visual Basic*	C+	VFP 5.0	C++	Powerbuilder*
Database	Custom	C-Tree+*, Profile* Visual BASIC*, Otis*	FoxPro*	OMNIS 7*	all ODBC compliant
Network	Single user only	Novell 3.11 or newer	Windows* NT, Novell*	Windows* NT, Novell*	Network Indep.
# systems operational	350(DOS), 16(Windows*)	300 (approx.)	151	253	350+
# in hospitals	7	280	150	65	10
# installed in 1997	11	35-40	10	54	7
# years offer this type product	15	7	15	9	17

TABLE 6

Review of Available Programs

Company	CK Systems	Datastream Systems	Data-Trak	DFM Systems
Product	Maintimizer+	MP2	Atlas Equipment Manager	Mapcon
Address	722 Airport Blvd. Ann Arbor, MI 48108	50 Datastream Plaza Greenville, SC 29605	135 Oyster Creek Dr., Ste. N Lake Jackson, TX 77566	119 High St. Des Moines, IA 50329
Phone	(313) 665-1780	(800) 955-6775	(800) 453-3972	(515) 244-6114
Fax	(313) 665-6074	(864) 422-5000	(409) 297-7725	(515) 244-4918
E-mail	cks@mindspring.com	www.dstm.com	atlas@data-trak.com	www.mapcon.com
Year 2000 Compliant	yes	yes	yes	yes
PM Scheduling	yes	yes	yes	yes
User customizable risk ranking	yes	yes	yes	yes
Allows existing system to download Files into new system	yes	yes	yes	yes, with custom programming
Expandable	yes	yes	yes	yes
Enhancement products current and in development	yes	yes	yes	yes
Upgradeable	yes	yes	yes	yes
Point-and-click GUI	yes	yes	yes	yes
Existing files for PM procedures, both Clinical Eng. and POM	yes/added cost	yes	yes/added cost	no - info. can be imported
Interface with MS Office or other word processor spreadsheet program	yes	yes	yes	no
Windows platform	yes	yes	yes	yes
User restriction levels	yes	yes	yes	yes
Maintains equipment history	yes	yes	yes	yes
Software installation support	yes/added cost	yes	yes/added cost	yes
Patches provided at no extra cost	yes	yes	yes	yes - incl. with support
User training	yes	yes	yes	yes
Base price	\$3,650	\$14,995	\$3,650	\$3,900
Cost for up to 25 user "seats"	\$9750/facility	\$1,995 per seat	\$9,750/facility	\$9,000
Hardware platform	IBM PC compat.	SQL*, Oracle*	IBM PC compat.	PC based networks
Operating system	Windows*	Windows* 95, NT	Windows*	Windows* 95, NT
Language	SQL Windows*		SQL Windows*	Open Insight*
Database	SQL Windows*	SQL* v. 6.5, Oracle* v. 7.1	SQL Windows*	Open Insight*
Network	Netware*, Windows 95*, NT	Windows 95*, NT, P120 and up	Netware*, Windows* 95, NT,	Novell* Win.* NT
# systems operational	114	30,000+	114	Win.* 30+, DOS 350+
# in hospitals	114	1,000+	114	Win.* 0, DOS 20
# installed in 1997	80	10,000+	80	
# years offer this type of product	10+	11	10+	10

TABLE 6

Review of Available Programs

Company	DNI Nevada	Eagle Technology	EQ2, Inc.	ECRI*
Product	Sentinel 32	Proteus	HEMS 2000	HECS 4
Address	2000 Arrowhead Dr. Carson City, NE 89706	10500 N. Port Washington Rd. Mequon, WI 53092	209 Battery St. Burlington, VT 05401	5200 Butler Pike. Plymouth Meeting, PA 19462
Phone	(702) 883-3400	(414) 241-3845	(802) 865-0920	(610) 825-6000
Fax	(702) 883--9541	(414) 241-5248	(802) 865-0298	(610) 835-1275
E-mail	sales@dninevada.com	eagle@execpc.com	eq2jws@worldnet.att.net	ecri@hslc.org
Year 2000 Compliant	yes	yes	yes	yes
PM Scheduling	yes	yes	yes	yes
User customizable risk ranking	yes	yes	yes	yes
Allows existing system to download Files into new system	yes — ASCII files		yes - may require assistance	yes yes
Expandable	yes	yes	yes	yes
Enhancement products current and in development	yes	yes	yes	yes
Upgradeable	yes	yes	yes	yes
Point-and-click GUI	yes	yes	yes	yes
Existing files for PM procedures, both Clinical Eng. and POM	yes - MedPak	limited	yes/\$250	yes/can be added
Interface with MS Office or other word processor spreadsheet program	yes	yes	yes	no
Windows platform	yes	yes - Win* 95 & up	yes	yes
User restriction levels	yes	yes	yes/to module level	yes
Maintains equipment history	yes	yes	yes	yes
Software installation support	yes	yes	yes	yes/add. cost
Patches provided at no extra cost	yes	yes	yes/with support agreement	yes
User training	yes	yes@\$900/day, on site	yes/ 2 days	yes
Base price	\$11,995 - 10 users	\$12,500	\$8,895 - 5 users	\$3,650
Cost for up to 25 user "seats"	\$19,480	@ \$500 per seat (neg.)	\$29,795	\$9,750/facility
Hardware platform	486/Pentium or better	PC	P100/16M	IBM PC compat.
Operating system	Windows*, 95 NT	Win.* 95	Windows* 3.1, 95, NT	Windows*
Language	NA	Delphi	FoxPro* v. 2.6	SQL Windows*
Database	Visual FoxPro*	MS SQL* Oracle*	FoxPro*	SQL Windows*
Network	Novell®, Windows 95®, NT	Windows®, NT,Novell®	Novell®, Windows® NT,	Netware® v.3.x & 4.x, Win® 95
# systems operational	0 (due 12/97) DOS 600+	15 (this type), 1500 (overall)	625	114
# in hospitals	0 (due 12/97)	40	625	114
# installed in 1997	0 (due 12/97)	100	3 (new), 40 (conversions)	80
# years offer this type of product	15	12+	12	1 (for HECS 4), >10 (for HECS)

* ECRI now offers a Windows version of its software.

TABLE 6

Review of Available Programs

Company Product Address Phone Fax E-mail	Four Rivers Software TMS 2400 Ardmore Blvd. Pittsburgh, PA 15221 (412) 273-6422 (412) 273-6420 phearle@frsoft.com	Meditech Materials Mang. Module Meditech Circle Westwood, MA 02090 (617) 821-3000 (617) 329-9977 www.medtech.com	Phoenix Data Systems AIMS for Windows 24293 Telegraph Rd. Ste. 202 Southfield, MI 48034 (800) 541-2467 (248) 358-3166 aimscrms@aol.com	PSDI Maximo Advantage 2 Ravinia Dr., Ste. 1205 Atlanta, GA 30346 (770) 481-3070 (770) 481-3071 www.psd.com
Year 2000 Compliant	yes	yes	yes	yes
PM Scheduling	yes	yes	yes	yes
User customizable risk ranking	yes	no	yes	yes
Allows existing system to download files into new system	yes	ASCII Files	yes	yes
Expandable	yes	yes	yes	yes
Enhancement products current and in development	yes	yes	yes	yes
Upgradeable	yes	yes	yes	yes
Point-and-click GUI	yes	no	yes	yes
Existing files for PM procedures, both Clinical Eng. and POM	no/unless GSA tasks	no	no, can be imported	no, can be imported
Interface with MS Office or other word processor spreadsheet program	yes	yes	yes	yes
Windows platform	yes	no	yes	yes
User restriction levels	yes	no	yes	yes
Maintains equipment history	yes	yes	yes	yes
Software installation support	yes	yes	yes	yes
Patches provided at no extra cost	yes, part of support.	yes	yes	
User training	yes	yes	yes	yes
Base price	\$8,995 - 10 users.	{1}	\$3,995 - 5 users \$8,995 - multisite/5 users	\$2,995
Cost for up to 25 user "seats"	\$500/add. user	{1}	\$3,000 + \$750 for 5 add. users	\$6,000y
Hardware platform	Pentium.	DEC	IBM PC compat.	IBM compat.
Operating system	Windows* 31, 3.11, 95, NT	MAGIC*, Windows* NT	Windows* 95, NT	Win.* 3.1, 95, NT
Language	Visual Basic*.	MAGIC*, MAGIC CS*	C++	Visual Basic*
Database	Access* 2.0, Oracle*, SQL*	Microsoft SQL*	Oracle* v.7.3, MS SQL	Microsoft* ACCESS
Network	Novell*, Windows* NT	NA	Novell*, Windows* NT	Novell* 3.x & 4.x
# systems operational	>300	NA	250+	2,000+
# in hospitals	50	NA	250+	450+
# installed in 1997	100.	NA	15	400+
# years offer this type of product	7.	NA	13	16

{1} The Materials Management Module is not available for purchase as a separate program but appears as a part of the MEDITECH system

TABLE 6

Review of Available Programs

Company	ServiceMaster, Ltd.	Softek	Somax, Inc.	Specific Designs
Product	ISIS	PM Soft		EM/DBs
Address	One Servicemaster Way Downers Grove, IL 60515	107 E. Main St. Lebanon, TN 37087	P.O. Box 1449 Roswell, GA	21062 Brookhurst St., Ste. 103 Huntington Beach, CA 92646
Phone	(630) 271-2677	(615) 443-1174	(770) 518-1514	(800) 262-8988
Fax	(630) 271-5531	(615) 443-7939	(770) 518-8214	(714) 965-8987
E-mail	phearle@frsoft.com	support@softeknet.net	www.somax.com	103664.1565 @compuserve.com
Year 2000 Compliant	yes	yes	yes	yes
PM Scheduling	yes	yes	yes	yes
User customizable risk ranking	yes	yes	yes	yes
Allows existing system to download files into new system	yes	yes-extra	yes	yes-assist
Expandable	yes	yes	yes	yes
Enhancement products current and in development,	yes	yes	yes	yes
Upgradeable	yes	yes	yes	yes
Point-and-click GUI	yes	yes	yes	yes
Existing files for PM procedures, both Clinical Eng. and POM	yes-Extensive	yes	yes	yes
Interface with MS Office or other word processor spreadsheet program	yes	no	yes	no
Windows platform	yes	yes	yes	no/can run under Win* 3.11, 95, NT
User restriction levels	yes	yes	yes	yes
Maintains equipment history	yes	yes	yes	yes
Software installation support	yes	yes	yes	yes
Patches provided at no extra cost	yes	yes - up to 12 months	yes	yes/annual contract
User training	yes	yes - extra	yes	yes/with client support data
Base price	{2}	\$3,975	\$20,000	\$3,295/unlimited capacity, single user
Cost for up to 25 user "seats"	{2}	\$5,975 - client server database	\$45,000	\$5,795/unlimited capacity
Hardware platform	Pentium	Pentium - or greater	Pentium	IBM PC compat., 386 or higher
Operating system	Windows* 95, NT	Windows* 3.x, 95	Windows* 3.1, 95, NT	Windows* 3.1, 95, NTMS-DOS 33 or higher
Language	NA	Visual Objects*	CA - Visual Objects*	Clipper 5.0
Database	NA	Fox Pro*	FoxPro*, SQL*	FoxPro*/dBASE
Network	NA	Windows* NT 4.0, Novell*	Novell*, Windows* NT	Netware*, Windows* 3.11, 95, NT
# systems operational	NA	150	200+	375
# in hospitals	NA	120	5	230
# installed in 1997	NA.	7	30	NA
# years offer this type of product	15+.	7.5	10	7

{2} At the time of this writing, ServiceMaster does not offer ISIS as a separate product, but it is available as part of the facility service contract.

TABLE 6
Review of Available Programs

Company	St. Croix Systems, Inc.	Wintercross
Product	WOSYST for Windows	Maintenance Director
Address	P.O. Box 831 St. Croix Falls, WI 54024	451 SW 10th St Renton, WA 98055
Phone	(715) 483-1070	(800) 569-0635
Fax	(715) 483-9294	(425) 277-1656
E-mail	wosyst@wind.bright.net	jmort@wintercross.com
Year 2000 Compliant	yes	yes
PM Scheduling	yes	yes
User customizable risk ranking	yes	no - external only
Allows existing system to download files into new system	yes	yes
Expandable	yes	yes
Enhancement products current and in development	yes	yes
Upgradeable	yes	yes
Point-and-click GUI	yes	yes
Existing files for PM procedures, both Clinical Eng. and POM	yes	no - can be imported
Interface with MS Office or other word processor spreadsheet program	yes - but not directly	yes
Windows platform	yes	yes
Maintains equipment history	yes	yes
Software installation support	yes	yes
Patches provided at no extra cost	yes	yes
User training	yes	yes - 2 days
Base price	\$3,500	\$14,000
Cost for up to 25 user "seats"	\$7,500	\$14,000
Hardware platform	Pentium	PC compatible
Operating system	Windows* 3.1, 3.11 or 95	Windows* 3.1, 95, NT
Language	Clarion*	C, C++
Database	Clarion*, Topspeed*	Raima Database Manager
Network	Windows* NT, Novell*, OS/2*	Novell*, Windows* NT, Peer to Peer*
# systems operational	28	125
# in hospitals	22	22
# installed in 1997	17	35
# years offer this type of product	4+	7