

CEO SUMMARY: *With sustained pressure on laboratories to cut costs, reduce errors, and raise quality, lab managers need faster access to detailed information about lab work processes. One solution is to use middleware to collect data in real time from the LIS and other sources, then analyze it to identify problems and opportunities for improvement. Three laboratories which implemented a middleware real time decision support system credit it for major gains in productivity and quality.*

GUIDES MANAGEMENT DECISIONS

Middleware Produces Data In Real Time for Lab Managers

GROWING NUMBERS of laboratory-managers and pathologists want detailed data in real time to guide management decisions in their laboratories. One way to accomplish this goal is to use middleware solutions designed specifically to support management decisions.

An early pioneer in the use of middleware solutions to support real-time decisions and management of the laboratory is **Pennant Laboratories**, which is part of the **Wyoming Valley Health Care System**, a two-hospital system of 597 beds located in Wilkes-Barre, Pennsylvania. It was back in 1996 that Gerard Clifford, Pennant's

Administrative Director of Laboratories, began using a middleware product called "MAST" to pull data from the laboratory information system (LIS) in real time. MAST then analyzes and presents that information in pre-designed ways that allow lab managers to swiftly identify situations that require intervention or management action.

Key Management Tool

"MAST has become a key management tool for us," stated Clifford. "Once we gained access to detailed information in real time and saw how it allowed us to respond quickly to all sorts of events unfolding within the laboratory, it moti-

vated us to go further with using middleware to extract all types of information about laboratory processes."

MAST is a product of **Management Decision Systems, Inc. (MDSI)**, based in Holden, Massachusetts. It stands for Management, Accountability, Staffing & Service Tracker. "This system is customized by each laboratory client," explained Richard A. Ouellette, MS, MT(ASCP)H, CHE, who is President and CEO of Management Decision Systems. "The client chooses the performance criteria and MAST extracts the necessary data from the LIS and HIS (hospital information system), as needed.

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Response To Service Issues

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"Once programmed, the system runs itself," noted Ouellette. "It looks at pre-analytical, analytical, and post-analytical trends from an hourly to a monthly basis. It can track work flow that is internal or external to the laboratory department. It enables laboratory staff to focus their time on fixing systemic errors. It also helps them identify opportunities to proactively improve work processes. Trigger Reporting analyzes predefined performance metrics and automatically e-mails the manager about changes & deviations."

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tients and lab outreach program," he added. "Each day, I can compare our turnaround time and see where problems are occurring. MAST reports allow me to identify an issue and determine a legitimate problem from a rare occurrence. This is especially useful when a physician questions a lapse in the system."

"These detailed reports show exceptions and the point of cause. The supervisor addresses the findings with the technologist or phlebotomist. Together, they work on the problem to identify why it occurred," said Clifford. "We also monitor the number of specimens by the hour to check if we are meeting or exceeding

Useful Real-time Information Supports Active Intervention

MANY LAB MANAGERS have an LIS system that produces reams of data, often with month-end reporting. As a result of delayed reporting, systemic problem-solving is reactive and not proactive. Yet, timeliness in problem solving can be the service edge that beats the competition or improves the laboratory's position with the medical staff.

In the middleware solution designed by Management Decision Systems, Inc. (MDSI), there is no human intervention. "A virtual server does all the work to poll data from the LIS and other sources in real time, then use it to produce performance metrics," said MDSI Founder and CEO, Richard E. Ouellette. "Dashboard graphs show the actual performance, variation, trends, consistency, and target goals. Behind each graph is a daily detailed report that is used by supervisors at the bench level or nursing unit."

"Each supervisor and pathologist is provided a 'real-time' desktop connection to the ORF Tracker program," continued Ouellette. "Laboratory occurrence reports are centrally entered and available immediately. These reports are available online to monitor current status, manage follow-up, trending, and analysis."

our turnaround times and productivity for the entire laboratory.

"Most important for us are the daily and monthly reports of every customer. These include specimen volume, insurance contract information, and dollar value of the account," he stated. "This information allows us to track capitated accounts and associated non-capitated work received from each client. By using MAST to closely monitor this work, we have grown our business in one county by 9%."

MAST and ORF Tracker also help Clifford's laboratory in other ways. "We use the reports to educate senior management and major players as to the value of the outreach business," he commented. "There is continual focus on the lab's inpatient numbers. However, 80% of our work comes from outpatients and outreach. We share specific information with our customers and show them why it is necessary to make policy changes to ensure regulatory compliance. When clients see the documentation and information, they readily agree. This has been a very positive tool to build client loyalty to our laboratory."

There is another useful benefit from real-time data feeds to Clifford's management team. "Our laboratory is ready for unannounced inspections at any time," he observed. "We exceed what is expected, both in the lab and working with other departments."

30 Different Indicators

"CLIA final rule requirements are extensive and quite specific in defining the quality program—more so than CAP or JCAHO," he continued. "To support our quality program, we have 30 different indicators that break down work processes in all sections of the lab. We can look at our errors per 10,000 tests and spot where errors are occurring. We can implement a fix and almost immediately evaluate the change."

MDSI and Ouellette have worked closely with Clifford over the years and made numerous enhancements to the MAST and ORF Tracker reports. Reports are customized to the clients' specific parameters. As enhancements are made for one laboratory client, MDSI will make those same enhancements available to other clients without charge.

Another laboratory using middleware to collect real-time information and

guide management decisions is the laboratory at **Maryland General Hospital** (MGH), a 276-bed facility in Baltimore, Maryland. “MAST is a very powerful tool to monitor our service levels for all of patients,” stated John Braun, M.D., Interim Laboratory Director at MGH. “The MAST dashboard summary is the first thing I look at when I arrive in the lab. It enables me to see the trends of stats and urgents, the stat turnaround time from stat order to receipt, and stat receipt to verified result. In one graphical page, I can see what has happened over the previous 28 days up to the present day. I can spot developing trends from as little as one day’s data.

Detailed Reports

“Before this software solution, we did not have a robust method to capture failures, derive an analysis, and investigate trends,” he added. “Now my supervisors get detailed reports that let them identify and work on the specific outliers for their sections. The detail is granular enough to get down to the level of individual technologists, phlebotomists, and nurses.”

Braun’s lab started using MAST in May 2004, and credits it for substantial gains in operational efficiency and quality, as well as improved turnaround times. Braun explained, “The MAST system is a daily routine. We monitor turnaround time from phlebotomy draw to test completion. We also look at the ordering patterns in the hospital. This allows us to adjust our staffing patterns quickly, so we can maintain our monitors for stats and other service issues. We get a daily understanding of what happens in any section of the lab, with any instrument, and even by individual employee. This enables us to be more proactive in solving issues that affect patient care.”

“Our **Meditech** LIS is not capable of providing this type of report. The

MAST software package provides us with a custom database and analysis tool,” said Braun. “It fits our particular situation for specified indicators which allows us to follow our trends.

“Our quality program is supported by the ORF Tracker system, which allows us to monitor laboratory failures,” he stated. “All failures get ‘ORF’ed,’ as we call it. ORF reports have created a new culture and a new enthusiasm among the laboratory staff. They see that, whenever a plan of action hits my desk, there are immediate steps taken to implement it. We track pre-analytical, analytical and post-analytical issues, down to various sub-categories.”

Inci Hepner, BS, MT(ASCP), the Point of Care and Quality Assurance Supervisor, seconded Dr. Braun, “Both MAST and ORF Tracker systems have made a significant difference in the lab. For example, our turnaround-time has improved greatly. During the first 12 months that the MAST system was used in our laboratory, there was a 167% improvement in a.m. turnaround time, from 30% success to consistently performing at 80% success” stated Hepner. “Staff sees reports on a daily basis and is thus constantly aware of how precisely the lab is meeting its goals.

Dramatic Improvement

“We also used this information to generate dramatic improvement in specimen collection and labeling errors. In the blood bank, use of the ORF Tracker helped us reduce mislabeled errors by 70%,” she continued. “The reports help us provide targeted education sessions internally and external to the lab, as we can easily pin-point where the need lies. We are able to track the problems, implement a fix, and track the change for improvement.

For example, we use these reports with nursing whenever they are

involved in the process,” Hepner explained. “I can resolve issues in seconds instead of days. This makes a big difference in our relationships with the medical staff and nursing.”

“Benefits are seen daily,” added Braun. “We know the specific delay areas, volumes of tests by time and area of the hospital, and errors by person. I can dissect any group of occurrences, from system errors to random people errors. I can track any item, by day, week, or month. My reports to the Quality Improvement Council, the Medical Executive Committee and the Board of Directors are far more efficient, accurate and timely. They have been well received.”

In Use At Swedish Hospital

Nine months ago, 1,200-bed **Swedish Medical Center** of Seattle, Washington began using the MAST system. MAST dashboard reports, using data from the **Antrim** LIS, enable Brian Kuske, Vice President of Ambulatory and Ancillary Services at Swedish, to see lab activities from a 30,000 ft. level, while giving him the confidence that laboratory staff can work on issues at ground level.

“We have a contract with **Laboratory Corporation of America** to provide laboratory services. This middleware solution allows me to work with LabCorp managers to track and measure success and failures in the pre-analytic, analytic and post-analytic phases of lab testing.” Kuske explained. “We decided to implement the MAST system because we wanted more specific and timely information.

“We were concerned that turnaround time standards were not being met,” he said. “We also wanted to develop a full range of consistent measurements made in real time. The goal was to make management and the laboratory more accountable and timely.

“After installation of this middleware and because of data issues with the LIS, it took us about six months to fine tune the reports,” continued Kuske. “Now there is much greater confidence in the data. Dashboard reports are easy to read and timely. They allow us to make strategic decisions and share data with lab staff, nursing units, quality and clinical effectiveness councils, the medical staff, and the various quality committees. We track productivity and turnaround time closely.

“Initially the laboratory staff was a bit anxious about such detailed data and accountability, but overall they are pleased with the accuracy of data, and improvement from the past. One of our goals was to speed up the pre-analytic time from the time of test order to phlebotomy draw and sample time to the lab. MAST report information was used to make changes. These changes were monitored with the reports, allowing us to measure our success in real time, without having to wait one to two months for confirming data.

“In less than nine months we have seen a significant improvement in our 15 performance metrics, including a 40% improvement in test turnaround time,” he added. “We have a 95% success rate for our morning work to be reported by 8:00 a.m. This is business intelligence where and when you need it.

Start-Up Costs

“There is an initial investment for the start-up costs, which include consulting time in deciding on the performance metrics, building the interface, and refining the product,” stated Kuske. “After that, it’s only the subscription cost. There’s better accountability between Swedish and LabCorp. All parties agree on the metrics and work on our successes together.”

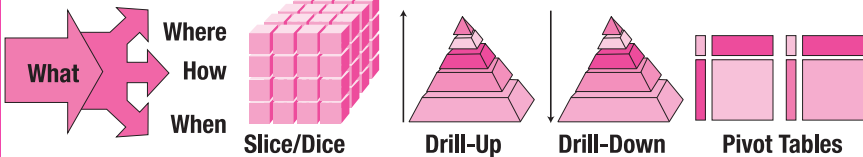
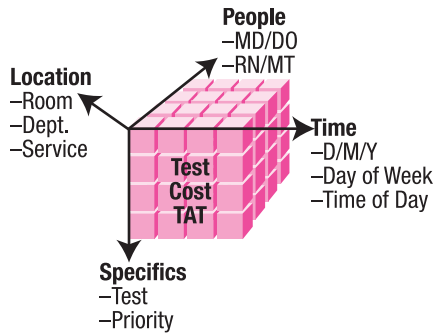
Using Middleware to Guide Real-Time Problem-Solving in All Areas of the Lab

REAL TIME DECISION SUPPORT SYSTEMS SHOULD BE PART OF EVERY LIS. However, available LIS products lag in their ability to supply the laboratory manager with easy solutions. Business intelligence tools are becoming necessary to help labs meet expectations for tighter turnaround time, to improve the timeliness of diagnosis, and to contribute in reducing length of stay. Business intelligence tools also allow hospital lab outreach programs to monitor new and old client activity and assess sales force commissions and productivity.

Data from “Four Dimensions” Guides Lab Decisions

The example at right shows how the middleware solution provided by Management Decision Systems, Inc. (MDSI) builds a database to view the measures of laboratory tests, costs, and turnaround time. This database approach creates multiple dimensions that relate to, and explain, “measure” activities and behaviors. Data is found wherever the dimensions intersect.

Below is a diagram which shows how the OLAP database allows information to be evaluated in a variety of ways.



Laboratories with the business intelligence middleware tools from MDSI are using the systems in these ways:

- Dashboard reports evaluate overall laboratory activity on predetermined performance metrics on a 28-day rolling report, or a high-level daily analysis. Includes the ability to drill down and “slice and dice” the information.
- Captures accurate turn-around-time data in real time for each laboratory. Because every lab is unique, comparison data is useless due to the complexity of steps involved.
- Reports provide better accountability at all levels of the lab.
- Easier to focus on issues at a specific point in the analytical process, make changes, and monitor the results of the implementation.
- Productivity reports educate senior management, determine staffing schedules, and identify areas of need by the hour.
- System tracks specific data needed to meet CLIA guidelines for quality programs.
- Easy to dissect occurrence reports to determine system errors or random people errors, then provide focused education whenever appropriate.
- Tracks outreach clients, along with associated commissions for sales reps.
- Tracks clients involved with capitated accounts and associated non-capitated work.

LabCorp has also decided to bring in ORF Tracker at Swedish to help monitor quality issues. According to Kuske, Lab Corp representatives are impressed with the MAST system and intend to implement it at other laboratory locations.

Decision Support In Labs

THE DARK REPORT observes that the middleware applications now in use by the laboratories of Pennant, Maryland General Hospital, and Swedish Medical Center provide real-world examples of sophisticated decision support in the management of clinical laboratories. Because the middleware solution gathers data in real time, it allows lab managers to spot problems or negative trends almost instantly—and fix them just as quickly.

This middleware enables lab administrators and pathologists to monitor the smallest details in their lab operations in real time. It is consistent with the quality management requirements of Lean, Six Sigma, ISO-9000 and other quality programs. These all require managers and staff to collect accurate and timely data. This data is used to identify problems and opportunities for improvement. The better the data, the better the decision which is based on the data.

Real-Time Monitoring

Use of middleware to enable trouble shooting and process improvement in real time is the future of laboratory operations. The three laboratories profiled here are first-movers and provide powerful evidence that the standard of performance in laboratory management is moving to higher levels.

It is important for laboratory administrators and pathologists to recognize this development. Today's laboratories are under sustained pressure to improve productivity, reduce errors and mistakes, and raise the quality of both lab test results and the service provided to patients, physicians, and payers.

Middleware's Analytical Tool Identifies Multiple Solutions

AT THE HEART of the MAST and ORF Tracker middleware systems is an online analytical processing tool (OLAP), which incorporates a Lazarus Data Pump.

Data is loaded into OLAP in real time from LIS, HIS, or several different database management systems. It then takes as little as five to 20 seconds for the MAST and ORF Tracker systems to produce answers to such questions as "what if we...?"

"OLAP's use of pivot tables enables multidimensional problem solving," explained Richard Ouellette, CEO of Management Decision Systems, Inc. (MDSI). "Lab managers can drill up and down and 'slice and dice' the data in almost unlimited ways. It just takes a click of the mouse. Data and the resulting analysis can be easily formatted and charted for discussion and further action. These OLAP-based tools enable lab managers to evaluate how productivity is changing, model different ways to solve a problem, and see which changes will have the greatest financial benefit to the laboratory."

Simply stated, the healthcare system expects laboratories to deliver more. To meet these higher expectations, laboratory management must become more sophisticated. That is why real time decision support middleware, such as currently used at the laboratories of Pennant, Maryland General Hospital, and Swedish Medical Center, will become widespread.

TDR

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—By June Smart, Ph.D.