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Smoothing Workflow and Reducing Errors in Specimen Processing

An Interview with Albert Dalbello, Jr. and Linda Nesberg

Mayo Medical Laboratories is a global reference lab operating within Mayo Clinic's Department of Laboratory Medicine and Pathology. Counted among the largest clinical labs in the world, the Department of Laboratory Medicine and Pathology is comprised of 61 specialty laboratories organized into eight divisions.

This interview with Albert Dalbello, Jr., operations administrator, and Linda Nesberg, operations manager at Mayo Medical Laboratories, focuses on proper receipt and processing of specimens and their associated test orders. In many clinical labs, this part of the total testing process has become a focus of quality improvement efforts.

Michael Astion, MD, PhD, conducted this interview.

Q: What is your background? Does it help you organize and administer a specimen processing section?
A: Our backgrounds are in manufacturing, with an emphasis on applying Lean as a disciplined problem solving method. Moving specimens through a specimen processing operation is analogous to movement of a product through a manufacturing process. All aspects of specimen logistics, including the specimen processing area, are amenable to application of Lean principles.

Q: Do you tend to hire people with backgrounds in manufacturing?
A: We hire a mix of people, but we like to include people in the mix who come from manufacturing and who understand Lean.

Q: Can you characterize your overall approach to lowering error rates in specimen processing?
A: The key elements of our system are listed in Table 1. We organize the processing employees, which we call lab assistants, into work pods of 7 to 10 people. Lead assistants in the pod organize the work and present it to the lab assistants as the lab assistants call for it. We minimize the number of manual steps in the process and maintain a smooth workflow. The small percent of test requisitions that require significant manual data entry are given to a specialized work pod.

Q: How do you minimize manual steps in the process?
A: Computer interfaces with clients are critical to eliminating manual data entry. More than 95 percent of our specimens are accompanied by test orders received over computer interfaces with the clients.

Q: Lead assistants play a pivotal role in your system. Can you explain in more detail some of their work?

A: The lead assistant is important to the overall quality of the work produced by the pod. We emphasize that the lead assistant should spend a significant amount of time organizing the work. This person sorts the work and assigns it to individual assistants. For example, the lead assistant pulls out exceptions that require special attention. For orders coming over computer interfaces, the lead assistant also sorts the specimens and associated paperwork by client. Lab assistants, who are working in pods that process interfaced test orders, receive work from a limited set of 5 to 10 clients. The other key role of the lead assistant is to pace the work and distribute it appropriately among the lab assistants.

Table 1
Key Elements of a Processing System Designed to Decrease Errors

- Lean principles are applied throughout the department. The overall system is a pull system based on visual cues and feedback.
- Lab assistants, who perform specimen processing, are organized into work pods of 7 to 10 people who take responsibility for the quality of their work.
- Lead assistants in each pod sort and organize specimens into logical groupings.
- Lead assistants pace the work to maintain smooth workflow and distribute the work in a balanced manner among the lab assistants in the pod.
- The number of requisitions requiring manual data entry is minimized.
- The number of test order requisitions arriving via a computer interface is maximized.
- Highly manual work is separated and given to a specialized pod.

Q: Why do you emphasize a smooth workflow?

A: If lab assistants work smoothly, without significant peaks and troughs in productivity, and if they are given enough time to do their work, they make fewer errors. Smooth workflow is also associated with a more predictable workplace and with higher morale.

Q: What information and visual feedback is given to members of the work pod to maintain smooth workflow?

A: The pod is given information regarding the number of accessions for the day. For interfaced work, this is typically about 30 requisitions per hour per lab assistant. We

have plasma screen monitors in the processing area that graphically show the progress the pod is making toward achieving the daily goals. They have goals for particular hours of the day. For example, the goal may be a certain amount of specimens processed by 11 a.m. and a certain amount by 2 p.m. This visual feedback helps them maintain a steady pace so that they do not work too fast or too slow.

Q: Can you give us more detail about handling the exceptions?
A: We do not want specimens requiring special attention to slow down the ordinary work performed by the pod. The ordinary work—for example, an interfaced order with specimens properly collected, labeled and stored—can be viewed as being in the fast lane. We do not want exceptions that can be viewed as occupying a slower lane to block the fast lane. Examples of exceptions include: specimens with labeling problems; orders with missing information such as gender when required; specimens received in the wrong tube type; specimens accompanied by special requests; and specimens not associated with a complete electronic order. A specialty lab assistant in the work group, who is at a higher rank than the lab assistants, handles these exceptions.

Q: Why does the lead assistant sort test requisitions by client when these requests are already being received over a computer interface?
A: The reason for sorting by client for interfaced requisitions is that it allows individual lab assistants to gain expertise regarding the specific habits and needs of a set of 5 to 10 clients. Clients vary regarding the complexity of their orders and their ability to adhere to specimen requirements. We try to give the lab assistants that same set of clients each day.
Over time, this reduces errors and also helps the lab assistant gain knowledge that can guide client-specific quality improvement. Sorting by client is also an acknowledgement that there are limits to how much you can train a lab assistant regarding the variety of test requests and specimen types received. We believe quality is enhanced by optimizing the scope of the lab assistant's work.

Q: Is it difficult to separate the clients from each other?
A: It is not difficult, since we do this early in the process. The specimens, whether they arrive via our couriers or by overnight shipping, are already separated by client when they arrive on our loading dock. Within a transport container, each bag already has a client designation.

Q: Can you tell us more about the manual work?
A: One pod is dedicated to doing the manual work. They manually enter the information on the 5 percent of requisitions that are not associated with tests ordered over a computer interface with the client.

Q: What are the key elements to reducing errors in this pod?
A: The key elements are removing time constraints, sorting the specimens before presenting them to the lab assistants, and error checking within the group.

Q: What do you mean by taking the time constraint away?
A: Manual work is more error prone, and so we want to remove the pressure on the people who perform the work as it exacerbates errors.

Q: Tell us about the specimen sort in the manual pod.
A: In the manual pod, one commonly used technique is to sort the specimens by requisition type. One lab assistant might be processing genetics requistions mostly, another virology requisitions, etc. In the manual pod, sorting by client is not as important.

Q: What is the advantage of sorting by type of requisition?
A: The lab assistants gain expertise regarding that type of requisition form and make fewer errors. They can also help improve that form. It is worthwhile to subject the requisition forms to continuous quality improvement.

Q: You have described your system as a pull system. What are some elements of the pull system?
A: A lab assistant in the pod pulls the specimens by visually indicating using a flag to the lead assistant that he or she is ready to receive another small batch of work. The lead then gives them the work. The lead assistant has already pulled the work and sorted it so it is the correct work for that lab assistant.

Q: Why is small batch size important?
A: People tend to work too fast when large batches are placed in front of them.

Q: How is error checking performed in the pod that handles the manual requisitions?
A: In general, double-checking is not anybody's favorite method for error detection, but in the case of manual requisitions, it is the most pragmatic option. The difficulty is finding the best way to perform double-checking, and we leave that up to the lab assistants in the pod, so that they own the process. Usually, they will pair off. After each lab assistant enters manual requisitions for a period of time, typically about an hour, they exchange requisitions and check each other's data entry by comparing the manual requisition to what was entered into the computer. This takes a few minutes. The double checks are performed frequently enough to allow errors to be corrected before testing occurs.

Q: Why don't you have error checking performed by a separate person who is outside the pod?
A: We find that it is best for the pod to own the entire process for handling manual requisitions. This can be done if they are given enough time to process and double-check. The use of an outside group to detect manual data entry errors tends to be viewed as punitive.

Q: What error rates can be achieved in manual processing using these methods?
A: You can achieve error rates on the order of 1 in 1,000 for the manual requisitions, and most of those errors will be minor. The error rates for interfaced requisitions are less than 1 in 10,000.

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