

# **Innovative Approach to Boost Cytology Lab Throughput**

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- **Abington Memorial Hospital 665 bed hospital (central laboratory) & Lansdale 120 bed hospital.**
- **Referral center and teaching hospital.**
- **6 pathologists Abington & 2 pathologists at Lansdale.**
- **3.5 fulltime Cytologists Abington and 1 fulltime Cytologist at Lansdale.**
- **3 fulltime Cytology prep techs at Abington.**
- **Wide range of highly complex cases.**

## Communication of Issue

S- Situation

B- Background

A- Assessment

R- Recommendations

**Where we were ....**

## Situation

- **Several years -turnaround time for Pap smears = 56 days**
- **Abington physicians sent testing to reference laboratories.**
- **Pathology Review Rate was >67%**
- **Staffing challenges**
- **Inefficient workflow processes**
- **Communication barriers /Accountability**

## Background

- **Cytologists -Fine Needle Aspirate Support = average 6 hours per day**
- **Absent workload expectations for Cytology staff**
- **Abington Health Policies vs. Best Practices ?**
- **“Just doing the daily job”- lack of initiative to improve processes**
- **Performance issues not addressed**

## Assessment

- **Brainstorming sessions . Collaborative communication and team meetings to identify , address and resolve workflow issues.**
- **Structured Health System “workout” to improve the initial stages of Pap smear processing ( lab access center , registration , and couriers ) .**
- **HPV results delayed the Pap turnaround time.**
- **Staffing- Cytology & Microbiology**

## Assessment

- **Insufficient Technology**
- **Laboratory layout**
- **Partnered with Hologic to improve laboratory workflow and LEAN processes**
- **AMH and Hologic Identified expert consultation required- ARGENT**

## **Recommendation**

- **Revise the staffing matrix in the Cytology and Microbiology Departments**
- **Implemented additional instrumentation and automation.**
- **Revised the review rate policy for pathologists review.**
- **Increased the testing schedule for HPV testing.**

## **Recommendation**

- **Changed the workflow in Cyto prep department**
- **Acquired additional space to improve operations**
- **Collaborated with ARGENT Global Services & Hologic**
- **Partners with Hologic, implementing new automated laboratory equipment to improve productivity and turn around times.**



## **ARGENT Global Services**

- **Process-engineering firm specializing in the development of cost reduction programs for a variety of industries.**
- **Based in Oklahoma City, Oklahoma (USA)**
- **Areas of expertise include the healthcare environment, diagnostic laboratories, retail and wholesale distribution, manufacturing, transportation and government analysis.**
- **Unique Hands-On Approach: Active involvement and communication**
  - with both the hourly workforce and management.
  - Argent employs diversely educated personnel with expertise in a variety of disciplines.

# ARGENT Global Services

- **Since 1988 Argent has developed a reputation for providing high quality services that have a direct and immediate impact on the bottom line.**
- **Services: wide range of activities with total emphasis on improved quality and reduced costs.**
  - customized to fit each project based on the client's specific needs.
  - needs are identified and prioritized through preliminary audit and subsequent review

# ARGENT Global Services

## Skill Set & Methodology:

- **Argent utilizes several fundamental skills and methodologies for successful project execution.**

•Industrial  
Engineering

•Lean Enterprise

•Performance  
Management

•Implementation  
Support

•Six Sigma

•Management Tools  
& Software

# ARGENT Global Services

- **Project Introduction**

- Argent Global Services conducted a Lean Laboratory Assessment with the laboratory and work areas of Abington Memorial Hospital.
- Lean Principles, Best Practices, Lean Assessment, Opportunities for Improvement and a Layout Assessment.

# ARGENT Global Services

## **Project Scope & Methodology**

- **The goal of the Lean Laboratory Assessment**

- assess the current facility layout, operating procedures and workflow scheduling in order to determine if pursuing a Lean implementation project would provide positive results in the laboratory.

- **Meetings were held with key personnel**

- Provided further detail into current methodology and to determine future needs and goals.



## **ARGENT Global Services**

- **The methodology of the assessment included:**
  - **Limited Time and Motion Study**
  - **Direct Observations**
  - **Lean Analysis**
  - **Interviews**

## **ARGENT Global Services**

- **Argent conducted the on-site visit from September 12 to September 16, 2011.**
- **The processes involved with processing ThinPrep specimens in Cytology and Molecular (HPV) were the focus of attention for Argent.**

## ARGENT Global Services

- Specimens were followed throughout the processes in order to capture data associated with the handling.
- From this information, assumptions can be made as to potential changes to layout, scheduling, staffing and procedures
  - effects of the changes on overall workflow and turnaround times in the future.

## ARGENT Global Services

- **The departments that were studied included:**
  - Receiving & Registration
  - Cytotechnologists
  - Accessioning
  - Molecular HPV
  - Cytology Prep (GYN)
  - Filing & Storage
  - Cytology Prep (Non-GYN)

# ARGENT Global Services

- **The goal of Lean is to identify non-value added activities and process improvement opportunities to help make the laboratory operation more efficient**
- **The Argent study methodology is to view the lab from a non-clinician point-of-view, considering the workload from an industrial engineering, or Lean, perspective.**
- **Argent contributes best practice experience as well as logistical expertise seen in other industries where quality and turnaround time are paramount.**

# LEAN

- **Definition: A systematic approach to identifying and eliminating waste (non-value added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection.**
- **7 Wastes of Lean:**
  - Waiting
  - Travel
  - Excess Motion
  - Overproduction
  - Unnecessary Processing
  - Excess Inventory
  - Defects

## **Characteristics of a LEAN Facility**

- **Active involvement by employees**
  - identifying and solving issues, improving quality and eliminating waste with support and commitment from management.
- **Facility layout and organization**
  - promotes efficient work with minimal waste (non-value activities).
- **Integrated, right sized production with minimal inventories.**
  - continuous flow of work with the appropriate batch size

## **Characteristics of a LEAN Facility**

- **Defect prevention rather than inspection**
  - rework/retest by building quality in the process
  - implementing real time quality feedback procedures.
- **Team-based work organizations**
  - multi-skilled employees empowered to make decisions and improve operations with few indirect staff.
- **Close integration of the whole clinical value stream from start to finish**
  - through partnership-oriented relations with healthcare providers and patients.

# 5S

## Workplace Organization and Standardization

- **5S is an organization and standardization technique of Lean.**
- **5S philosophy:** simplifies the work environment, reduces waste and non-value activity while improving quality, efficiency and safety

# 5S

## Workplace Organization and Standardization

- **Sort** – “Sort through and sort out”
  - Use common sense! Keep only the tools, materials and supplies that are required to perform the work. excessive tools and unnecessary materials are to be removed from work area.
- **Set in Order** – Create a place for everything that remains.
  - Use boxes, bins, trays, shadow boards and signs to dedicate specific locations for tools so less time is spend searching for items.
- **Shine** – Clean everything inside and out.
  - A clean environment improves performance and morale.
- **Standardize** – Extend and standardize the 5S efforts throughout the organization.
  - Create rules to enforce the first three S’s.
- **Sustain** – Ensure long-term success
  - through education, training and communication.

## Visual Controls

- **Visual controls are simple, affordable and effective ways to communicate proper instructions.**
- **Visual controls can also prevent mistakes.**
- **Examples of visual controls include:**
  - color-coding
  - informational and warning signs
  - Kanban cards and labels

## Layout & Work Cells

- **A properly designed layout can have the greatest impact on laboratory efficiency and processes.**
- **Special care should be taken**
  - ensures that the laboratory layout facilitates the processing of specimens,
  - enhances communication
  - does not hinder the workflow or add excess travel
- **Work Cells are created when workstations that process similar or same type work are brought together and arranged in an open-plan configuration.**
  - The configuration: allows operators to see and move quickly between stations
  - Work Cells reduce travel/motion while providing flexibility to process low to high volumes
  - Work Cells reduce resource and floor space requirements

## Point of Use Storage

- **Excess inventory of consumables, documents and tools can create clutter and inefficient workstations.**
- **Keep the right amount of inventory at the workstation and nothing more.**
- **What is the right amount?**
  - Depends on the size of the material
  - Depends on the cost of the material
  - Try to avoid the need to restock during the shift
- **Back-up or primary inventory should be stored in bulk near the work area**
- **It is best to keep necessary supplies in small bins near the workstation.**
  - Make sure to separate frequently used supplies from less frequently used supplies. Organize them in accordance with attention to proper ergonomics.

## Standardization

- **Standardization is a key principle of efficiency. Moreover, standardization can reduce training time and improve efficiency and quality.**
- **What can be standardized?**
  - Workstation Set-up
  - Procedures
  - Training
  - Documents
  - Layouts
  - Equipment
  - Tools
  - Supplies

## **Right-Size Work**

- **Operators must decide between batches vs. single-piece flow.**
- **When utilizing batches, the right size should be determined.**
- **How do you chose between batch and single-piece flow?**
  - You should use single-piece flow when it reduces motion and reduces mistakes.
  - You should process in batches when it reduces travel or reduces instrument-operating costs.
- **Workload (specimen arrival and volume) and turnaround requirements will be the primary factor with determining actual batch sizes.**
- **Batch sizes can change throughout the workday.**

## **Abington Memorial Hospital**

- **Best Practices**
  - **Positive activities found within the workflow and the facility.**
  - **Management and staff are proactively addressing quality, safety and efficiency in the lab.**



## **Abington Memorial Hospital Best Practices**

- **The staff functions with an excellent attitude and the staff appears competent in all aspects of the operation.**
- **The lab focuses on what is best for the customer and providing excellent service and quality to the client.**
- **Organization is actively pursuing improvement to include learning more about Lean.**
- **The staff understands that changes need to be implemented to accept the volume increases planned for the upcoming months.**

## **Abington Memorial Hospital Best Practices**

- **Kanban cards are used for the re-ordering of supplies.**
- **There are several planned layout changes that could improve efficiency,**
- **Abington is adding new automation to cytology and HPV that should improve efficiency and quality of testing.**
- **New automation can be a catalyst for improved processes and layouts.**

# **How it was...**

## **LEAN ASSESSMENT**

### **Facility Layout**

- **The lab is spread across multiple rooms and prep areas. This layout creates excess travel and over processing of specimens.**
- **Cytology is most negatively affected by layout.**
  - Slide making takes place in two rooms, both of which have layout problems.
  - Accessioning of specimens and processing on the T2000 occur in the same workspace.
  - This area does not provide adequate space and causes processing problems.

## Facility Layout

- **Staining, cover slipping and imaging occur in a separate room from accessioning and slide making. This causes excess travel and waiting in the process.**
- **This arrangement impedes management oversight of the operations.**
- **Cytotech review is conducted in two distinct rooms.**
  - Review scopes are located in a room near Cytology prep and the manual scopes are located in an area near Pathology.
  - Operations and supervision of this process is negatively affected by this arrangement.

## Facility Layout

- **Argent feels that there are some significant improvements that can be made to the blueprint in order to improve processing times and workflow.**
- **Lean initiatives within the current system will be a great tool in order to introduce key concepts, implement new Lean processes and create processing on a solid and improved footing.**

## Receiving/Registration

- **Current layout: personnel responsible for receiving can incur excessive travel when the move from their LIS workstations to the specimen staging bench.**
- **As PAP volumes increase: the space that is currently allocated for the staging of specimens will not be sufficient.**
- **A 5S of the work area is recommended.**
  - This will help to alleviate clutter and provide a more efficient work area.
- **Registration is responsible for patient registration and billing information and actual test ordering for cytology is accomplished in the LAC (laboratory access center).**

## Cytology Prep GYN

- **Accessioning of specimens requires the staff to hand write a “blue form” requisition. The form is filled out by hand using information from the computer generated e-clinical requisitions provided by the clients.**
  - This process averages 4 minutes per requisition. As volumes increase, it is estimated that this process will take nearly 12 hours to complete.
- **Prep staff is distracted by other tasks during the slide making process.**
  - The distraction of the techs causes processing time to be extended.

## Cytology Prep GYN

- **The T2000 has a capacity of 25 slides per hour.**
  - Has potential to process 50 slides per hour with two T2000.
  - Using the current methods: realizing 30 slides processed per hour.
  - This is due to the techs stepping away from the instruments
  - Potential errors could occur as the techs load both machines at the same time when the techs return to the workbench.
- **Specimen vials are maintained for three months. This will not be sustainable as volumes increase.**
  - Standard of practice is 21 Days.

## Cytology Prep GYN

- **Following the T2000 processing, slides are held and not loaded directly into the stainer.**
  - The delay is often as much as 90 minutes.
  - As a batch of 20 is completed, load into the stainer to establish a continuous flow towards the imager.
- **As slides are finished staining, immediate loading into the cover slipper and imager should be practiced.**
  - This will help maintain continuous flow.
- **The layout of the T2000, stainer, cover slipper and imager should be addressed. (make more like an assembly line)**
- **During processing on the T2000, the alcohol cup is replaced for each slide.**
  - A single cup of alcohol for each T2000 is sufficient to process all of the specimens.

## **Cytology Prep**

### **Non-GYN**

- **Supplies are not centrally located. Many storage areas could be consolidated to facilitate better travel and inventory management.**
- **Techs are distracted by other tasks during processing. Techs answer phones, refill stains, wash glassware, etc.**
  - This causes delays in processing and could become an issue as volumes in non-GYN and Cytology increase.

## **Cytology Prep**

### **Non-GYN**

- **By stepping away from processing, the staggered processing of the two T2000s is not maintained.**
  - Potential errors could occur as the techs load both machines at the same time when the techs return to the workbench.
- **Techs use a manual log sheet to document and record all specimens in case a specimen and/or patient is not able to be located in Co-Path.**
  - The techs use two different color inks to record different pieces of information. This is an example of over-processing and a redundant procedure that should be further investigated.

## **Cytology Prep**

### **Non-GYN**

- **During processing on the T2000, the alcohol cup is replaced for each slide.**
  - This is an unnecessary step and adds time and wasted processing to the process. A single cup of alcohol for each T2000 is sufficient to process all of the specimens.
- **Many hand written requisitions are completed during the accessioning process. This process should be looked at to determine if this step is required.**

## **Cytotechnologist Screening Room**

- **Cytotechnologists are used for FNA administration.**
  - This causes CTs to leave their work area numerous times per day. This causes distraction and delays in screening.
  - A detailed schedule should be developed to ensure that slides are screened and that FNAs are able to be conducted as well. This would alleviate confusion and allow for the planning of work by the CTs.
- **The Cytotech screening room needs a 5S project and more organized filing system for requisitions.**

## **Cytotechnologist Screening Room**

- **The review scopes should be located with the manual scopes in order to provide more supervision of screening and better management of staff.**
- **The storage of the FNA kits should be re-organized.**

## **Impact of Volume Increases**

- **Abington will experience significant volume increases for Cytology and HPV testing. There are functions associated with the cytology vial that will be stressed when volumes increase. Without changes, the following areas will not be able to maintain current production.**
  - **Vial staging in Central Receiving:** the process of receiving and registration should be able to absorb the extra work but the actual storage location of vials may not be large enough.
  - **PAP Accessioning:** the current process of completing requisitions and the general order of the area will not be able to handle additional volume.



## Impact of Volume Increases

- **Continued...**
  - **T2000 area – PAP:** the layout of the work cell and the current procedures may not be able to handle the extra work. In addition, personnel working the T2000 processors should be focused on that function.
  - **Non-GYN Processing:** the room shared by PAP and Non-GYNs is congested and additional PAP work may interfere with Non-GYN processing. The overall process may be affected but the pinch point may be the shared T2000s.

## Impact of Volume Increases

- **Continued...**
  - **Vial storage:** the increase in vials will overload the current number of storage locations with the duration of storage (typically three months).
  - **Folder breakdown and slide filing:** the current space and processes may be impacted by the volume increases.
  - **Slide filing cabinets:** there appears to be more capacity than the vial storage locations, but increased number of slides could create issues in the near future.
  - **Requisition storage and transfer:** the increase in requisitions will require more frequent transfers to Iron Mountain.

## **ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES**

- **The recommendations are provided as a framework for a more detailed Lean implementation program and are not meant to be inclusive of all of the areas that require attention and further study. Many of the departmental recommendations are included earlier in this summary.**

## **ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES**

- **Training of the staff will be a key element for successful transition and implementation.**
  - Argent recommends Lean 101 with Value Stream Mapping-Kaizen for key personnel and Lean 101 for all personnel.
- **The management and ownership group of Abington Memorial Hospital must be the leaders of change and focus the staff on making process improvements.**
  - Without buy-in from the top of the organization, the program will not be successful.

## **ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES**

- **Lean will enable the laboratory streamline processes and improve turnaround times that will enhance the ability of Abington Memorial Hospital to accept additional business and to continue to grow.**
- **The current footprint can be improved upon and enable the better management and throughput of specimens.**
- **Many current processes like the handwriting of requisitions will need to be addressed if the volumes increases are to be processed in a timely manner.**

## **ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES**

- **Lean can create a more rewarding place for employees to work.**
  - Employee participation and endorsement of improvements.
  - Communication between staff and management and between departments.
  - A more organized and efficient workplace will improve employee morale and motivation.
- **The staff of Abington Memorial Hospital is very competent and skilled in their knowledge and profession.**
  - Lean will improve processing times and enhance the staff's ability to see obstacles and to improve on practices presently used.

## **ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES**

- **Argent has prepared three timelines:**
  - First timeline shows current Cytology processing at Abington Memorial Hospital,
  - Second timeline indicates how turnaround times will be impacted if the volumes increase and the procedures remain unchanged,
  - Third timeline shows the increased volume using recommended and accepted Lean principles.
- **This good visual aid highlights the improvements that are common following a Lean program being implemented by a laboratory.**

## **ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES**

- **Outcome Example: Current Cytology Timeline**
- The Current Cytology Timeline is designed to show the processing as it is completed using the existing schedule and methods. This includes the hands-on processing and the periods of waiting in which no productive activity takes place. Periods of waiting are shown in yellow and the individual processing steps are shown using other colors.

# Current Cytology Timeline



## ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES

- **Outcome Example: Future Timeline with Current Methods**
- The timeline indicates the future processing and turnaround time associated with using the current procedures and growing the business from 25 specimens per day to 180 specimens per day.

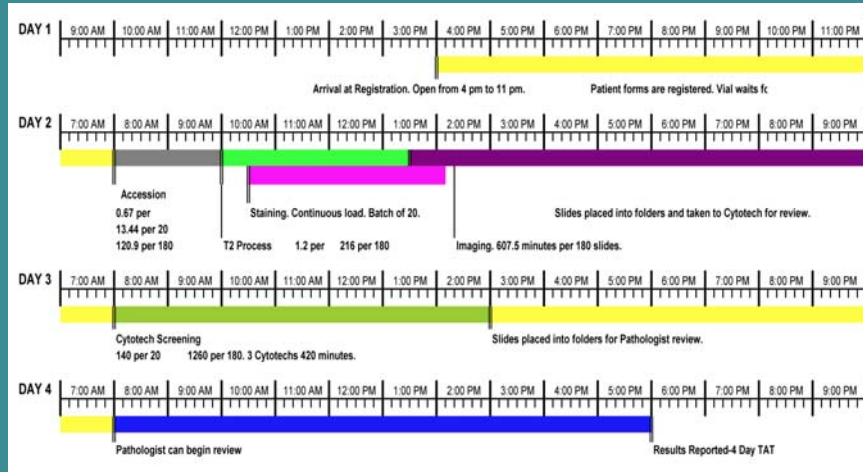
## Future Timeline with Current Methods



## ABINGTON MEMORIAL HOSPITAL RECOMMENDATIONS AND OUTCOMES

- **Outcome Example: Potential Cytology Timeline**
- The Potential Cytology Timeline is provided in order to show the possibilities of future turnaround times. This timeline is based upon certain assumptions and likely changes that can be made using Lean as a workflow improvement tool.

# Potential Cytology Timeline



## ARGENT Global Services

- **With the recommendations from the lean assessment, Abington Health System laboratories, can implement a number of things to improve turn around times and throughput in their cytology lab.**

# **Where We Are Now and Where We Are Going....**



## **Situation**

- **Abington Memorial Hospital is looking to increase their Pap Smear Volume in the near future. With the new business a turn around time of 5 days must be achieved. (as mentioned above the turn around time for pap smears was 56 days) With current processes this could not be done. A lean consultant, provided by Hologic, Argent Global Services, was brought in.**



## Background

- **The turn around time for Paps was 56 days.**
- **The current process was looked at by an internal kaizen team and Hologic.**
- **The current process was looked at by an outside consultant. (ARGENT)**
- **Lean initiatives were implemented.**
- **A lot of waste was seen with walking, waiting, distractions etc.**

## Assessment

- **By educating the staff about lean initiatives and process changes, this allowed for buy-in from the whole department (including the Pathologists) to implement the changes needed to accept the new increase in volume.**
- **By addressing staffing issues and staggering start times in the prep area, allowed us to maintain a continuous workflow and output.**
- **By printing the accession log from CoPath, instead of writing it out, this eliminated 20 minutes a day of unnecessary work.**

## Assessment

- **By moving the ThinPrep Imaging microscopes up to the screening room, this eliminated walking back and forth to the opposite end of the lab to screen paps.**
- **Having a rotating schedule for the bench the cytotechnologists ensures the workflow.**
  - Designating some techs for screening paps all day and some techs to screen non-gyns and assist with the Fine Needle Aspirations.

## Assessment

- **Implemented automation for HPV testing.**
  - Automated DNA Extractor and Sample Transfer System from Hologic.
  - Allows for HPV testing to be done more than one day a week and allows for a quicker TAT for the Paps.
- **Expectations set to ensure daily workloads are being met.**

## Assessment

- **To date with the changes made within the Cytology department we are at an average TAT time of 6 days from collection.**
  - This will only continue to decrease as we implement more LEAN processes.

## Recommendations

- **Layout Changes in the Cyto Prep area will facilitate a more continuous streamline workflow.**
- **An electronic ordering system is being looked at to cater to the AMH requirements.**
  - This will eliminate the hand-writing of the blue requisitions

## Recommendations

- **Continuous implementation of LEAN processes will improve the workflow of the cytology laboratory.**
  - Everyday our processes and progress is looked at and brainstormed on how to improve even more.
  - Taking it one step at a time. Implementing one process at a time: not to overwhelm the staff.

**Any Questions?**