



**Lean, Six Sigma, and Culture Change at  
Oklahoma University: Three Steps to a  
“Best Practice” Histology Lab**

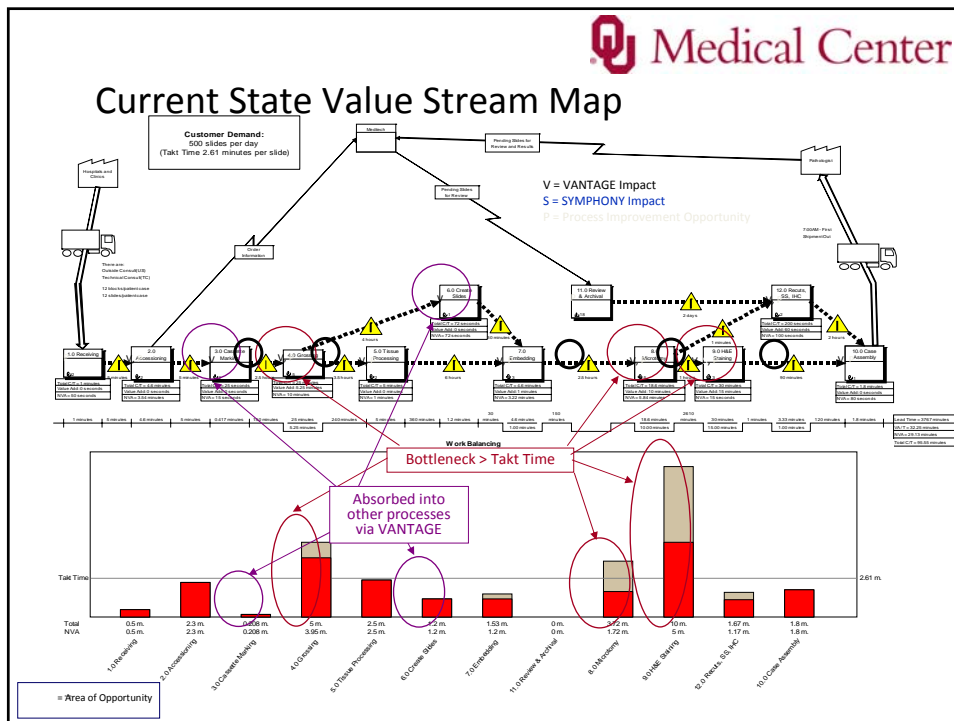


Bigger is not always better



# Three Steps to a Best Practice Histology Lab

- LEAN practices
- Specimen Tracking
  - from point of collection
  - Archival
  - AND every step between
- Automation
  - H&E workcell
  - IHC throughput
  - Continuous processing
  - VR Transcription
  - Document control





## OU Current State Floor Plan



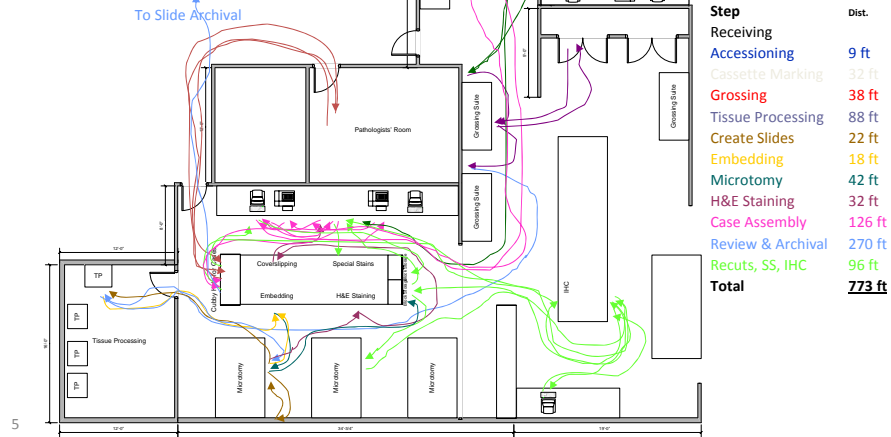
48 Movements

773 ft of movement per case

50 cases per day x 773 ft = 38,000 ft per day

~ 7.9 miles per day

~ 2,000 miles each year



## 5S Opportunities at all workstations



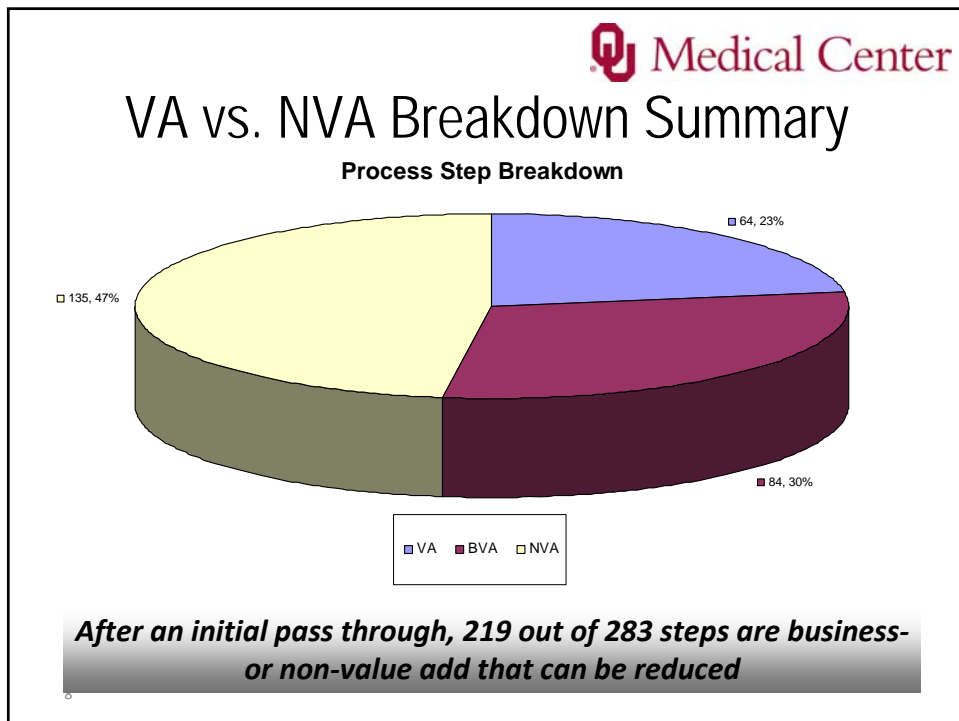
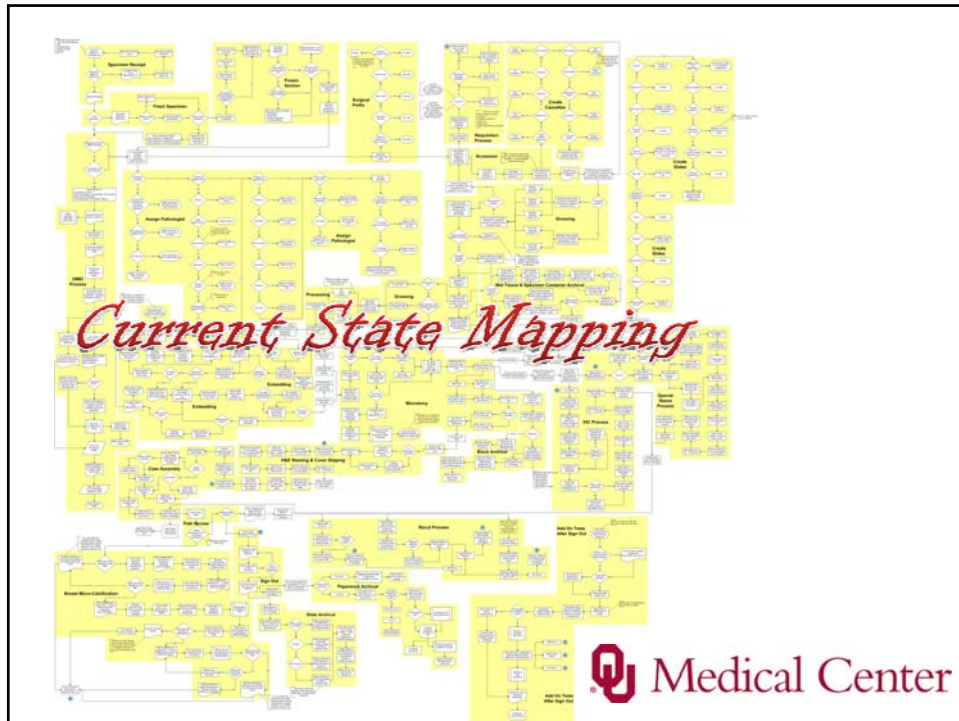
5S Opportunities



Sort, Shine, Standardize, Simplify, Store

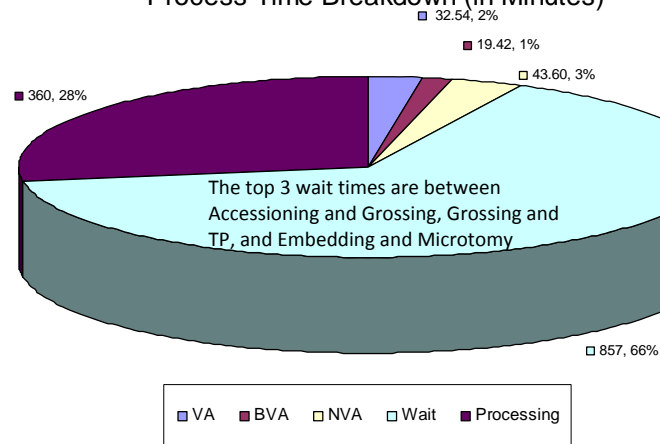






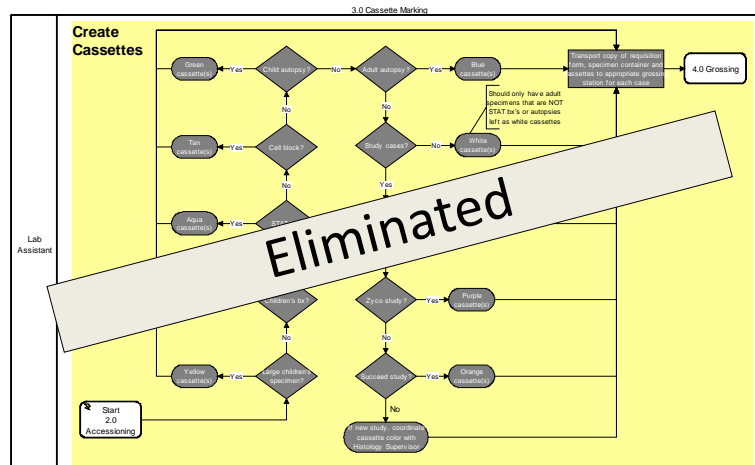


### Process Time Breakdown (in Minutes)



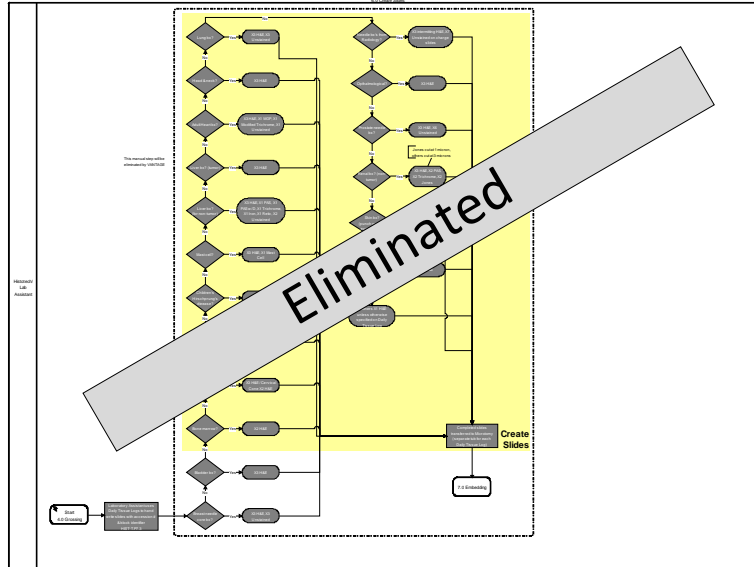
**94% of the Lead Time is Attributed to Inventory Wait Time - The Low-Hanging Fruit**

## Post LEAN Process Flow (create cassettes)



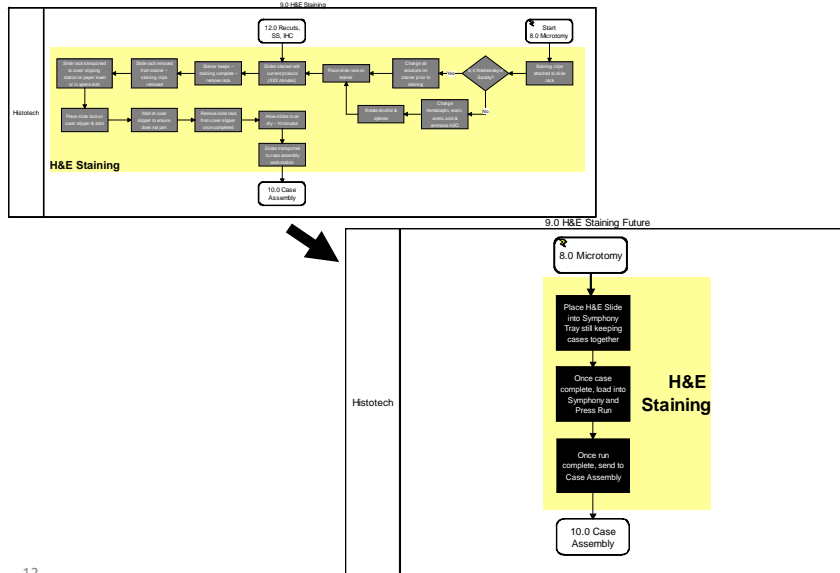


## Post LEAN Process Flow



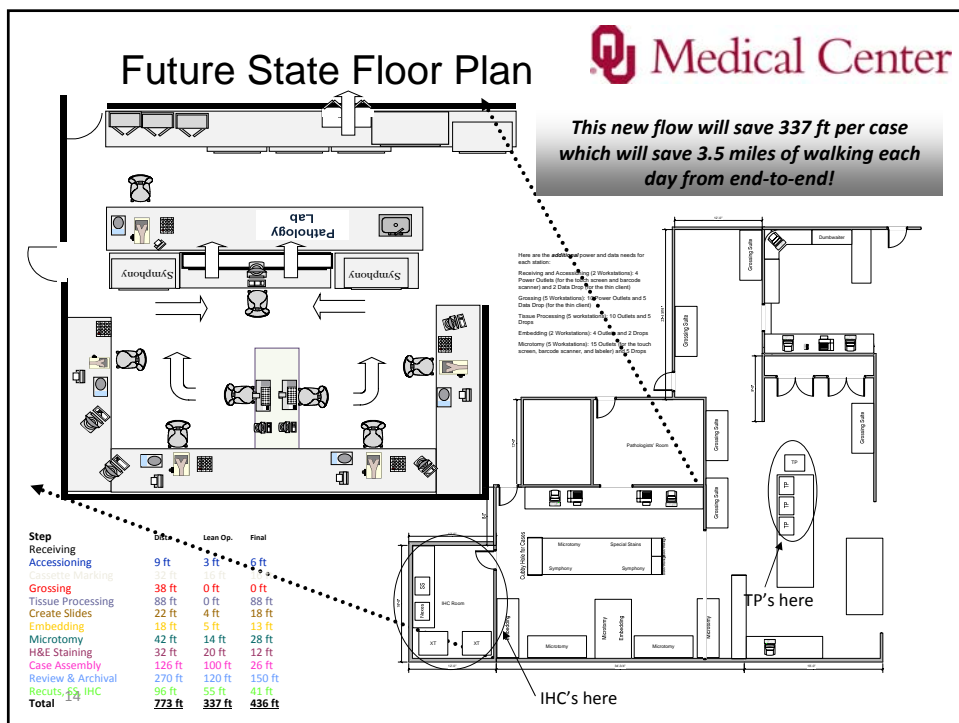
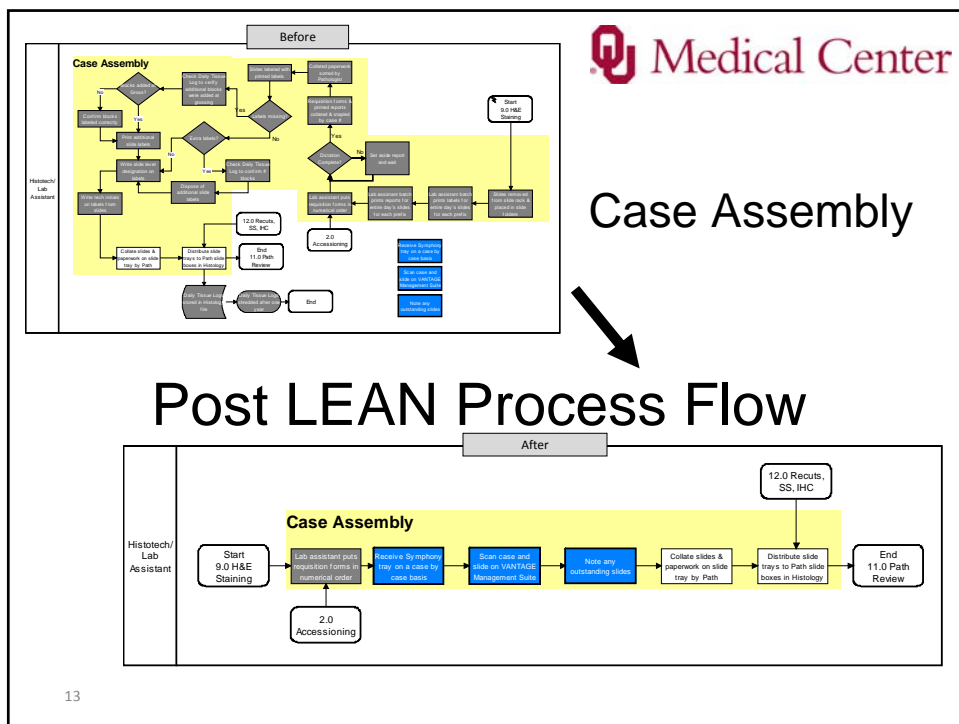
11

## H & E Post LEAN Process Flow



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## Future State Floor Plan



Step	Dist.	Lean Op.	Final
Receiving			
Accessioning	9 ft	3 ft	6 ft
Cassette Marking	32 ft	16 ft	16 ft
Grossing	38 ft	0 ft	0 ft
Tissue Processing	88 ft	0 ft	88 ft
Create Slides	22 ft	4 ft	18 ft
Embedding	18 ft	5 ft	13 ft
Microtomy	42 ft	14 ft	28 ft
H&E Staining	32 ft	20 ft	12 ft
Case Assembly	126 ft	100 ft	26 ft
Review & Archival	270 ft	120 ft	150 ft
Recuts, SS, IHC	96 ft	55 ft	41 ft
<b>Total</b>	<b>773 ft</b>	<b>337 ft</b>	<b>436 ft</b>

Here are the **additional** power and data needs for each station:

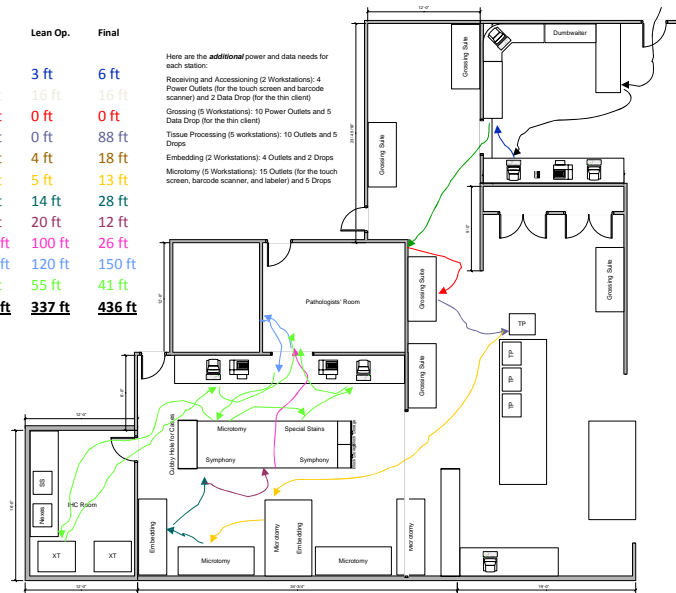
Receiving and Accessioning (2 Workstations): 4 Power Outlets (for the touch screen and barcode scanner) and 2 Data Drop (for the thin client)

Grossing (5 Workstations): 10 Power Outlets and 5 Data Drop (for the thin client)

Tissue Processing (5 workstations): 10 Outlets and 5 Drops

Embedding (2 Workstations): 4 Outlets and 2 Drops

Microtomy (5 Workstations): 15 Outlets (for the touch screen, barcode scanner, and labeler) and 5 Drops



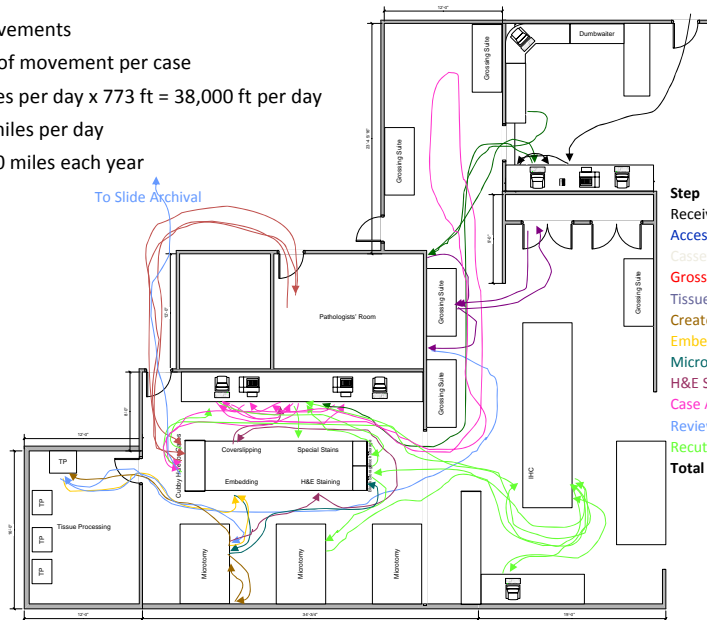
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## Let's re-visit the Original Floor Plan



48 Movements  
 773 ft of movement per case  
 50 cases per day x 773 ft = 38,000 ft per day  
 ~ 7.9 miles per day  
 ~ 2,000 miles each year

To Slide Archival

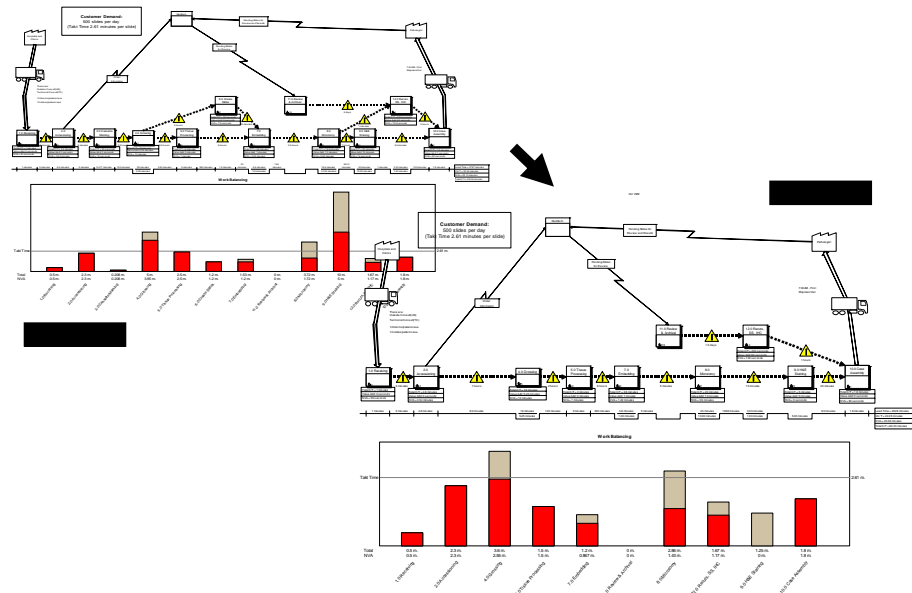


Step	Dist.
Receiving	
Accessioning	9 ft
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Review & Archival	270 ft
Recuts, SS, IHC	96 ft
<b>Total</b>	<b>773 ft</b>

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## OU Post LEAN Value Stream Map Medical Center



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## Benefits of Lean Six Sigma Medical Center

Measurement	Pre-Lean	Post-Lean	Gains/ Savings	Percent Improvement
Total Lead Time (in Minutes)	3767	2628	1139	30.24%
Turnaround Time (in Minutes)	1217	685	532	43.71%
Total Cycle Time (in Minutes)	95.55	60.33	35.22	36.86%
Total Number of NVA and BVA Steps	219	140	79	36.07%
Total Distance Traveled (in Feet)	773	337	436	56.40%

### What's Next?

- A lot of the opportunity lies reducing the tremendous wait times between steps
  - Cassette Marking to Grossing (2.5 hours)
  - Grossing to Tissue Processing (3.5 hours)
  - Embedding to Microtomy (2.5 hours)
  - Microtomy to H&E Staining (1 hour)
  - H&E Staining to Case Assembly (1.5 hours)

**Simply by cutting these wait times in half, we will save 5.5 hours from the TAT!**



# Specimen Tracking

It's like keeping up with children...

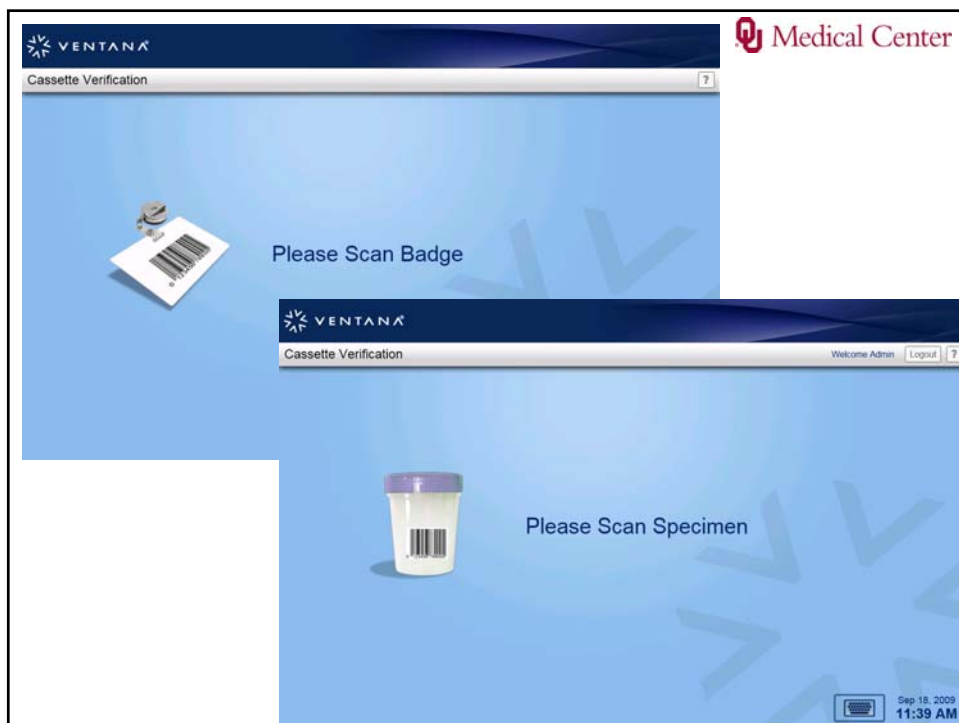
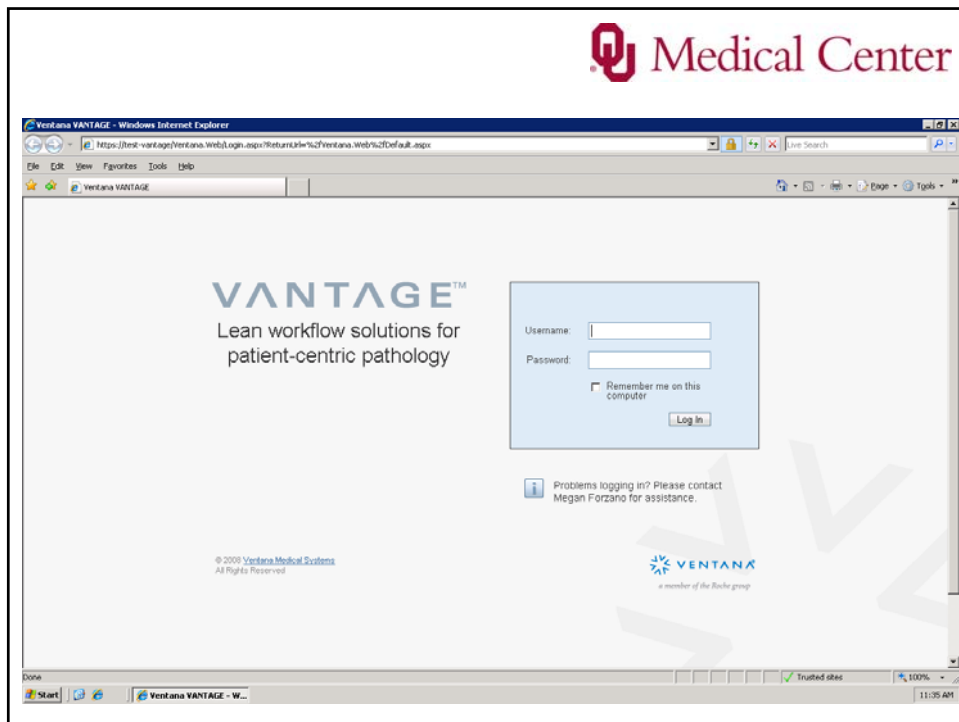


## Tracking from the point of Collection

- Is this possible?
  - Electronic order entry
  - Barcoded requisitions with associated stickers for specimen containers.









# Grossing Station



**VENTANA**

Cassette Verification Welcome Admin Logout ?

Accession Number  
**S09-949 5**

Cassette(s): 1 | Verified: 0

Tissue Description  
**Prostate, needle biopsy**

Patient Name  
**Hill, Donald**

Date of Birth  
**10/4/1950**

Gender  
**M**

Tissue Type  
**Prostate, needle biopsy**

Block ID

**1 Fragment**  
Verified 7 pieces ▶ ▲

Quality Issues  
**None** ▶

Cassette Verification Work List History

⌨ Sep 18, 2009 11:44 AM

**VENTANA**

Embedding Welcome Admin Logout ?

Please Scan Cassette

**VENTANA**

Embedding Welcome Admin Logout ?

Accession Number  
**S09-949 3A**

Cassette: 3 of 12 | Slide(s): 10

Tissue Description  
**Prostate, needle biopsy**

Patient Name  
**Hill, Donald**

Date of Birth  
**10/4/1950**

Gender  
**M**

Tissue Type  
**Prostate, needle biopsy**

Special Instruction  
**1 Fragment**

Description  
**1 Fragment in Cassette**

Pieces

Quality Issues  
**None** ▶

Embedding Work List History

⌨ Sep 18, 2009 11:53 AM





 **Microtomy** Welcome Admin Logout ?

Accession Number  
**S09-949 3A**  
Block: 3 of 12 | Slide(s): 10

Tissue Description  
**Prostate, needle biopsy**

Patient Name  
**Hill, Donald**

Date of Birth  
**10/4/1950**

Gender  
**M**

Tissue Type  
**Prostate, needle biopsy**

Special Instructions  
**1 Fragment**

Quality Issues  
**None**

Microtomy Work List History

Slide	Stain	Count
1/10	H&E	1/10
2/10	H&E L3	2/10
3/10	H&E L5	3/10
4/10	H&E	4/10

Sep 18, 2009 11:55 AM



# Management Reports and Accountability



## Management reports

Ventana VANTAGE - Windows Internet Explorer

https://vent-vantage/ventana.web/Informatics/

File Edit View Favorites Tools Help

Ventana VANTAGE

VENTANA VANTAGE™

Home | Workflow | Informatics | Support | Admin | Welcome Admin | Sign out | Help

Process Quality People **Reports** Enter Case ID

Reports

All Reports Enter Start Date: 4/15/2009 Enter End Date: 4/30/2009 View Report

CV to Embedding Variance  
Histologist Throughput  
Histology Tracking  
Quality Issues  
Specimen Archive

Current Page 4 Find | Next Select a format Export This

**Ventana Pathology**  
1910 E. Innovation Park Dr  
Tucson, Arizona 85755  
United States  
2009.04.15 to 2009.04.30

**HISTOLOGIST THROUGHPUT**  
Histologist Detail  
User ID: JustinFriedly

Time Interval	Cassettes Scanned at Embedding	% of objects scanned at this hour by user	Blocks Scanned at Microscopy	% of objects scanned at this hour by user
12:00 - 1:00 AM	--	--	--	--
1:00 - 2:00 AM	--	--	--	--
2:00 - 3:00 AM	--	--	--	--

Done

Start Ventana VANTAGE - W... 12:05 PM





## Must Haves in Specimen Tracking

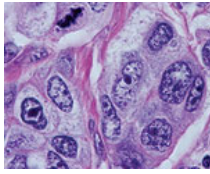
- Interface with the LIS
- Allow for single piece throughput
- Have an archiving function
- Allow for flexibility (addition and subtraction of slide and blocks)
- Have managements reports for accountability

## Nice but not necessary in Lab Tracking systems

- On time and late flags (constantly competing with self)
- Staff has access to their own data (NOT BIG BROTHER)
- Hardware purchasing power from your own vendors







# Automation

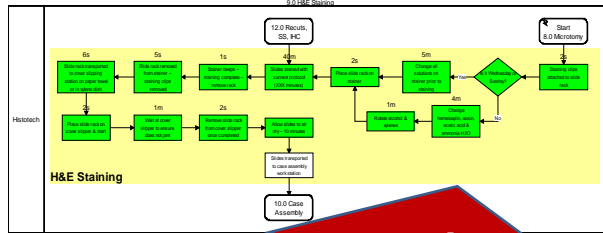


If you are going to LEAN a lab, doesn't it make sense to also automate where automation is possible?

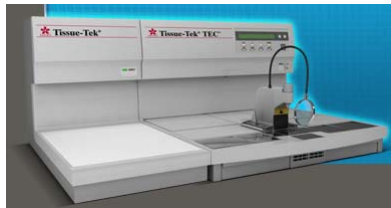
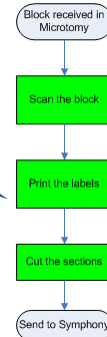




## Automation of the H & E workcell



**Reduce  
79% of  
Steps**



Automation at Embedding?  
Not for OU....not YET





## Increase throughput wherever possible BenchMark ULTRA

- 35 reagent carousel compatible with all Ventana dispensers
- 30 independent slide drawers
- intra-run bulk reagent handling and monitoring
- automated waste capture and monitoring system



Dual Chambers and increased surface  
area allow for rapid conventional  
processing.

*Leica*

The **Leica PELORIS** cuts processing time, streamlines laboratory **workflow**, and support **better patient care** through same-day diagnosis.

**Providing speed**, flexibility and high-quality results the Leica Peloris is the cornerstone of Lean Histology.





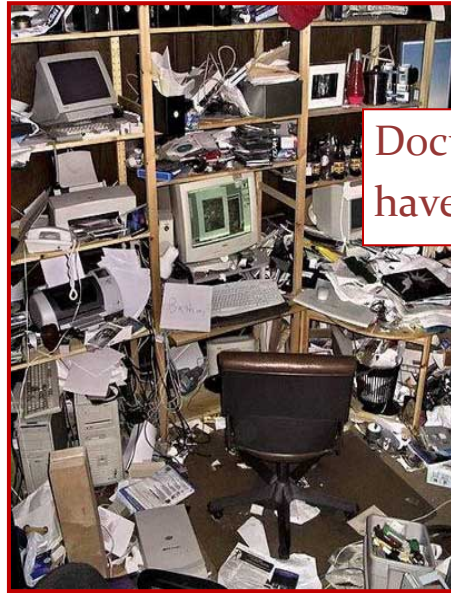
## Voice Recognition Transcription

Automation in Transcription???




- Is it possible to have true document control?
- What if we could automate document control?





Document control doesn't have to be a misnomer.

 Medical Center





Search Advanced Search Catalog

**Policy Catalog**




















Policy Manual(s)

- SP EM P&P
- SP General
- SP Gross
- SP Histology P&P
- SP Immunohist. P&P
- SP Necropsy P&P

**Legend**

-  - Revised in the last 30 days
-  - Revised in the last 60 days
-  - Revised in the last 90 days
-  - Revised more than 90 days ago

**Policy Manuals**

-   SP EM P&P
-   SP Histology P&P
  -  Histology
    -   HIST-T.P1.0 rev 1 - Acid Fast Bacteria Stain
    -   HIST-T.P1.1 rev 1 - AFB Stain Alternate Method - NexEs Automatic Stainer
    -   HIST-T.P1.2 rev 1 - Alcian Blue Method for Acid Mucopolysaccharides
    -   HIST-T.P1.3 rev 1 - Alcian Blue for Acid Mucopolysaccharides Alternate Method - NexEs Automatic Stainer
    -   HIST-T.P1.4 rev 1 - Alcian Blue for Mast Cells
    -   HIST-T.P1.5 rev 1 - Alcian Blue - PAS
    -   HIST-T.P1.6 rev 1 - Amyloid Stain - Congo Red

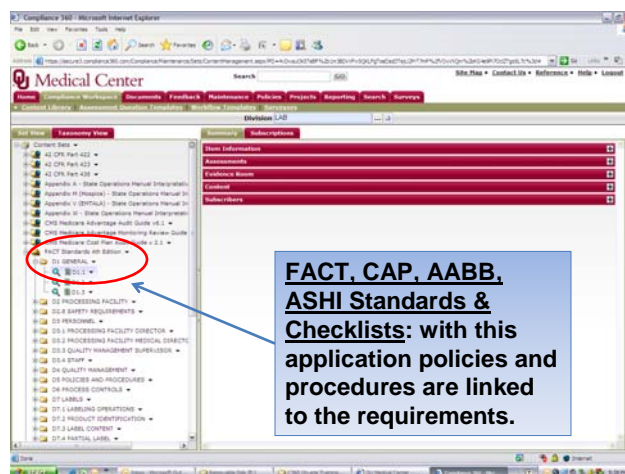




#### Benefits of Compliance 360°

- Central location for storing policies/procedures/documents and regulations
- Powerful search tool
- Timely Review
- Consistent process to revise, review and approve
- Audit trail of all actions including revisions, edits and archiving
- Policy linkage to Compliance Regulations and Standards
- Gap Analysis Capabilities

## Compliance 360° Compliance Workspace





## Compliance 360<sup>o</sup>

### C360 Home Page (configurable)

1. **Policy Search:** this will allow you to search polices and procedures.

2. **To Do List:** this will give you a list of surveys, policies to approve, etc.



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## OUMC Results to date

- ▶ Manual Step Elimination in H&E workcell
  - 37 steps eliminated as a result of the Lean initiatives with improvements that have been made
  - 40 steps will be eliminated upon Go-Live of VANTAGE
  - 24 steps eliminated specifically from the lab redesign and Symphony install
- ▶ Travel distance in H&E decreased 42%



## OUMC Results con't.

- ▶ Quality and safety metrics show progress
- ▶ TAT to sign-out improved; delay outliers especially decreased
- ▶ Resident review time increased- 17% of cases available for review at 5 pm the night before sign-out, additional 40% by 7 am the following am
- ▶ Productivity- improved  
slides/case reduced



## Things we did right!

- DO complete a current state analysis
- DO get buy in from process engineers in the hospital
- DO LEAN where possible before you automate
- DO find a tracking system tailored for Histology
- DO explore opportunities up stream from the lab
- DO Purchase auxiliary equipment that is  
ALREADY interfaced
- DO have the stars aligned.





## Can I request a RE-DO?

- DON'T try to do this without a TAT  
(transition assessment team)
- DON'T buy hardware that is not  
interfaced
- DON'T assume anything  
(involve IT, facilities, safety)
- DON'T give up



Histology, We **can** have our cake  
and eat it too!





Questions? Comments!  
Confusion? Bewilderment??????



 Medical Center

## Acknowledgements

This is only possible because of:

- ▶ Michael Talbert, MD
- ▶ Lewis Hassell, MD
- ▶ Donna Wilson, CT
- ▶ Patricia Eneff, PA, MBA
- ▶ Clinton Yip, and Craig Carter
- Ventana Medical
- ▶ Histotechnologists at OU

