Out of the Valley of Despair: The Tulare County Public Health Lab's Lean Journey

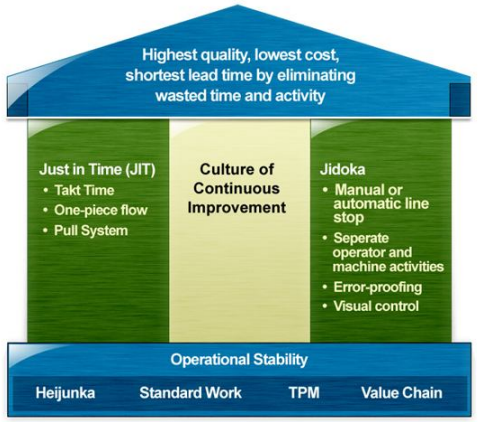
Objectives

- Be able to describe:
  - what Lean is
  - why Lean works in some places and not in others
  - what a team-based culture is and why it is integral to Lean
  - the importance of Voice of the Customer and challenging assumptions
  - how Lean helps to empower workers to drive positive change
  - some examples of how Lean helps an organization to set, measure, achieve, and track immediate improvements in line with long-term vision

LEAN Implementation Team Members

- Consultant from BD: Patrick Maul
- APHL: Cathy Johnson, Pandora Ray, Karen Breckenridge
- LEAN leader colleagues also certified 2013 - 2014
  - Jennifer Eastman-Faulwetter (AK State PHL, Anchorage). Kwadwo Owusu-Ofori (City of Milwaukee PHL, WI), Karen Stephani (NYS Dep. of Ag & Mkts Food Lab, Albany), Leila Filson (Florida PHL, Jacksonville)
- Tulare County, CA:
  - Executive Steering Committee
    - HHSA Director, Dr. Cheryl Duerksen
    - HHSA Public Health Director, Mr. Jason Britt
    - HHSA Deputy Director of Health Operations, Ms. Karen Elliott
    - County Health Officer, Dr. Karen Haught
  - Lab Staff:
    - 3 Milk Technicians
    - 2 Lab Assistants
    - 1 Office Assistant
    - 5 PHMs
    - 1 Lab Manager
  - IT support
- External Partners:
  - 12 Student volunteers

Lean - Toyota Production System



- Taiichi Ohno 1950s
- Widely considered one of the finest manufacturing systems in the world
- Focuses on low-tech improvements and elimination of waste through the systematic changing of practices
- It does this by using the expertise of the people performing the work
- Makes a process easy to do the right way, so that workers are free to spend time and energy on how to improve it, rather than on simply how to do it

Our Application of Lean

- How can manufacturing principles work in a lab?
  - Service contains deliverables that are a product of our processes and systems
  - After these processes and systems are recognized, they can be optimized

- We made Lean work for us, not the other way around
  - We looked at culture, past methods, and results
  - Determined our own approach
  - Stayed flexible and open-minded, but committed

LEAN…

- Isn’t an acronym, prescription, or short-term cost-reducing project
- Is a way of thinking, the way a unit operates, a mindset with accompanying methods and strategies

How to think LEAN

Maximize Customer Value…

- Find out EXACTLY what is valuable to the end user

…While minimizing waste

- Using resources only in areas that maximize value to the customer

The challenge for us was not in the concept, it was in the <u>DOING</u>

Voice of the Customer

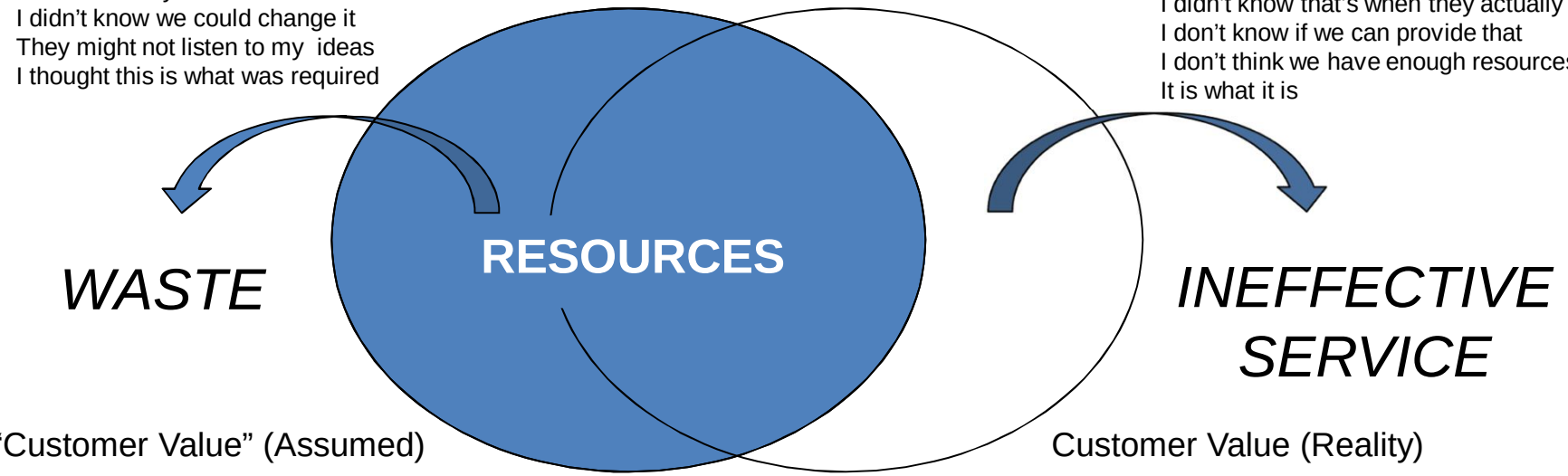
- Who are the customers?
  - External
    - The Public
    - Our Clients
    - Our Partners
  - Internal
    - Other Agency Departments
    - Our bosses
    - Our direct reports
    - Each other!

- Advocacy / Inquiry – explore assumptions, get to the heart of it
- The lens through which we view our systems and processes

How to think LEAN

It's always been done this way
This is the way I was told to do it
I didn't know we could change it
They might not listen to my ideas
I thought this is what was required

I didn't know that's what they needed
I didn't know that's when they actually needed it
I don't know if we can provide that
I don't think we have enough resources for that
It is what it is

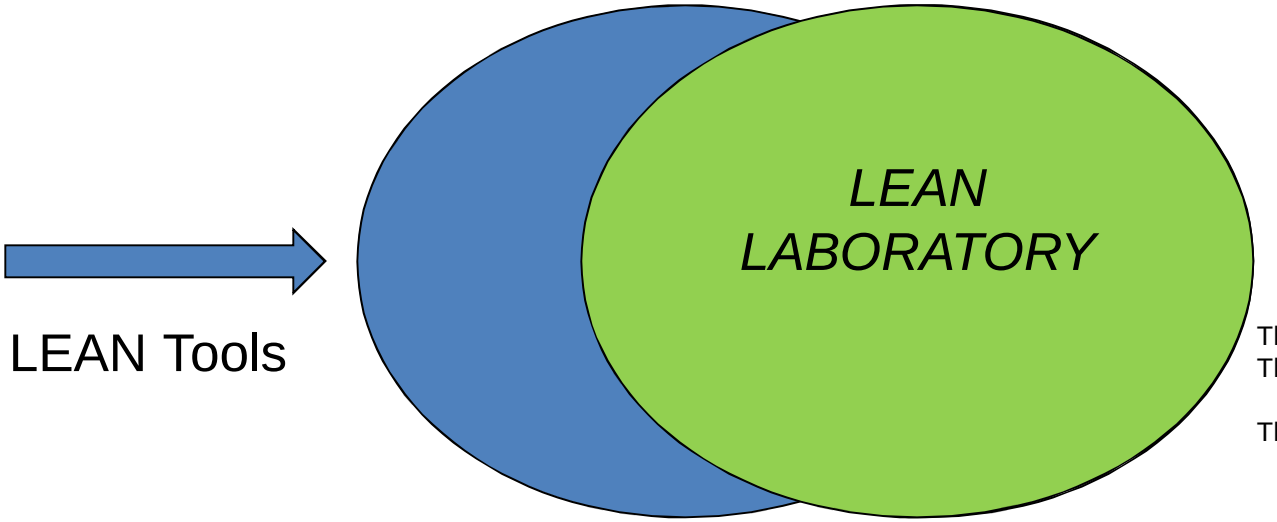


WASTE

INEFFECTIVE SERVICE

"Customer Value" (Assumed)

Customer Value (Reality)



LEAN Tools

This **does** add value
This is **precisely what is required to produce** it
(no more and no less)
This has **proven** to be the most effective way
but **we** are **always looking** for a better way

#1 cause of waste and ineffective service is incorrect assumptions

Creativity before Capital!

8 Wastes

- T – Transport
- I – Inventory
- M – Motion

- W – Waiting
- **O – Over-processing**
- O – Over-production
- D – Defects
- S – Skills Under-utilized

What Drives Waste

- Hand-offs
- Courier schedules
- Incapable processes
- Lack of accurate standard work
- Poor communication
- Incorrect assumptions
- Silos
- Knowledge hoarders
- Focus on individual performance rather than process performance
- When best choices are not made to be the easiest choices

Teams learn to work together to rapidly implement solutions for these barriers and they do not rely on management to make the change for them

Value-Added vs. Non-Value-Added

from a customer's perspective

Value-Added

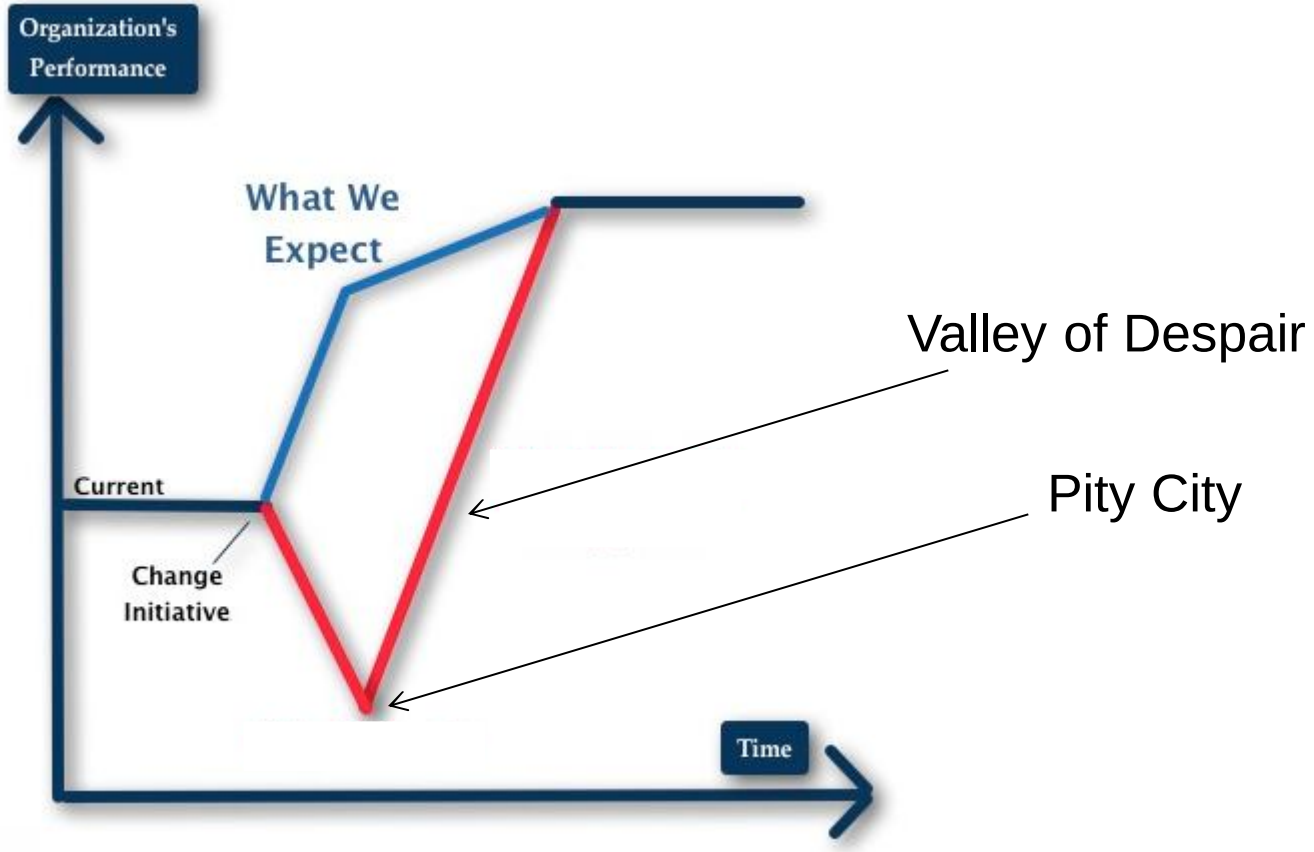
- Customer Cares
- Correct the first time
- Changes the product in a way that meets the customers needs
- Business value added (employee safety, HR)

Non Value-Added

- Anything else
- TIM WOODS

Work constructs that "serve the configuration" (not the customer) are enablers of waste

Managing Change



Match that Quote! Is it…

…something a staff member thought a year ago when they found out we were implementing "some new thing" called Lean

-Or-

…something that was said when a member of the lab staff proposed that we eat some of the REALLY old salsa from the back of the break room refrigerator

"I don't think it's a good idea"

"I'm just going to sit back, wait, and see what happens"

"No thanks, I'm good"

"Do I have to?"

"Eh…I think it'll be alright"

A Culture of Teamwork: Principles and Practices

We each want to be treated with respect…

…so as a team we value treating each other with respect.

We believe that the service we provide is important…

…so we prove that by viewing our efforts through the eyes of the customer.

We acknowledge that our customers expect our decisions to be based on evidence, not on opinions or personal preference…

…so we stay focused on improving our processes, not about “me”.

We appreciate the freedom to choose…

…so we take each turns volunteering for tasks/teams so they do not have to be assigned.

We value each person’s time…

…so we agree to follow meeting standards.

We want the best results as quickly as possible…

…so we thank those with the courage to voice different opinions so we can evaluate the evidence from their perspective.

We want to be heard…

…so we encourage those that express concerns one-on-one, to have the courage to share with the team instead

…in case others have the same concern.

…so they can be addressed.

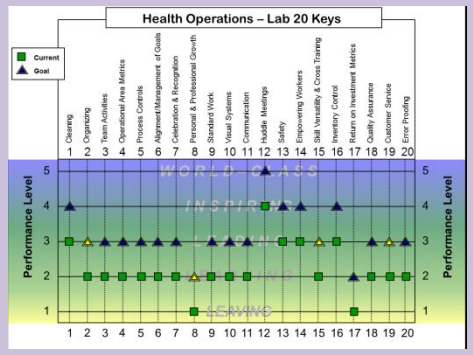
…because they will be thanked by the team if they do so.

A Culture of Teamwork: Daily 10 min Huddle Meetings

- Get used to discussing ideas together on a daily basis
  - The frequency and consistency of the interaction breaks down silos
- Firm ground rules:
  - As a group, we discuss The Customer, processes and systems, never individuals (except to say thank you)
  - **Maintains our collectively agreed-upon principles and practices**
- Equal opportunity
  - All improvement ideas are discussed
  - Anyone can volunteer to be on a Kaizen team
    - Even if they have no experience with the process (they often ask the best questions)
  - **Achieves buy-in, preempts empty complaints**
- Value Diversity
  - Dissention is encouraged and appreciated
  - Dissension must be (or have the potential to be) evidence-based
    - Dissenter gathers info (in the meantime, team moves forward with available info)
    - New information is evaluated by the team when it becomes available
  - **Not about homogeneity or false harmony, its about vigorously vetting and trying new ideas in a safe environment to get to the best results as fast as possible**

LDMS

20 KEYS



Volunteer team leads on current action plans (thank you!)
Judy: Customer Service
Peggy: Skill & Versatility Matrix
Denise: Personal & Prof. Growth
Lisa: Organizing

SAFETY

- *Air handling system down – NO BSL-3*
  - *Visual reminder already in place*
- *Safety September kick-off in 3 days!*
- *Submit your safety slogans for consideration (prizes!)*
  - *"Hands to Face? Not in this space!"*
  - *"Be a PPE Hero! (not Patient Zero)""*

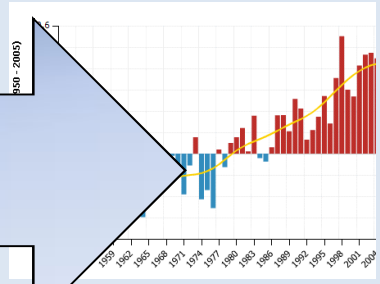
INSPECTIONS (AND PARTIES)!

- *September 30th – ELAP Inspection*
  - *Checklist in progress*
- *October 10th – Safety September debrief/party*

SUCCESS

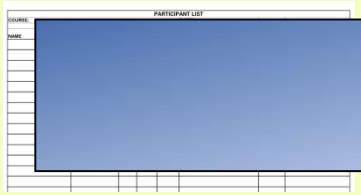
August high-impact projects:

- *$2,000 hard savings annually in inventory (team lead Cynthia; also: PC, MS, HL, VC - thank you!)*
- *$3,000 waste removed QFT procedure (team lead Ha; also: CB & JE - thank you!)*

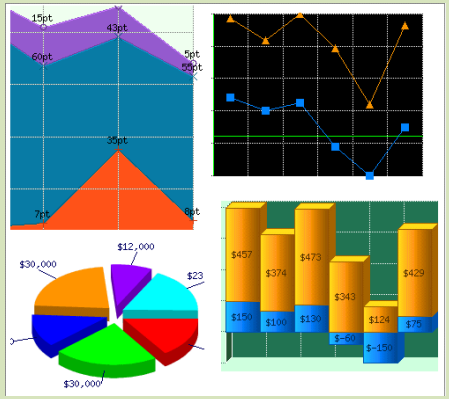


VOC / HOT-BUTTON LIST

- *Define effective*
- *Question assumptions*
- *Is there a better way?*



IN-PROGRESS (KAIZEN / PILOTS / BLITZES)



OPERATIONAL UDATES

- *DI Water out; Tech in at 11am to repair; Flasks in Media Prep room – conserve please!*
- *Check that contract is current before calling for on-site service (RH updates shared drive at G:TCPHL/2014Contracts-thanks Roxanne!)*
- *Please have e-time done by 4pm*

Local/Regional/Nat'l/Int'l Updates

- *A. aegytpi confirmed in Tulare Co*
  Other south valley counties
- *Ebola Prep*
  - *Local hospital labs calling for consult*
    - *Lisa volunteered to standardize flow/quality of info (thank you Lisa!)*
    - *Packaging & shipping logistics*

"I Don't Have Enough Time"

- I have made a commitment to staff that they will never be asked to perform tasks that they do not have the time and/or tools to do successfully
  - *Therefore this statement is taken very seriously*

- They are given the opportunity to try out the new task in their schedule for a set period of time:
  - If it ends up in over-time
  - If they appear stressed
  - Or if they say they are stressed
  - then I will perform a Day Shadow to try and assist them
- Day Shadow:
  - I schedule a day to spend with them
    - on their busiest day and on their least busy day
  - We arrive at the same time, take breaks and lunch at the same time
  - They work while I take notes on items that may need
    - To be reassigned to someone else
    - To be performed differently or less frequently
  - We work together to determine a strategy for ensuring they have the time and tools to be successful

Specimen Accessioning

Specimen Accessioning (Background)

Examples of WASTE:

- Under-utilization of Skills:
  - Duplicate work at the lab = wasted lab staff time
- Over-processing:
  - Variable criteria for triggering follow-up for information = wasted due to unnecessary follow-up
- Defects:
  - Data transfer errors by lab staff = wasted time x 2 (up to 5) / reduced quality of data
  - Missing fields = wasted time x 2 / reduced quality of data

Examples of INEFFECTIVE SERVICE:

- Variable criteria for triggering follow-up for information = reduced quality of data due to lack of necessary follow-up

Specimen Accessioning Project Overview

- Customers Impacted: Clinics, Public Health, Hospitals, PHMs, Front Office
- Process scope:
  - Process starts at: the point where the submitting facility has successfully ordered the test, collected the specimens, and affixed the labels
  - Process ends at: the point where the specimen is at the lab and ready for testing

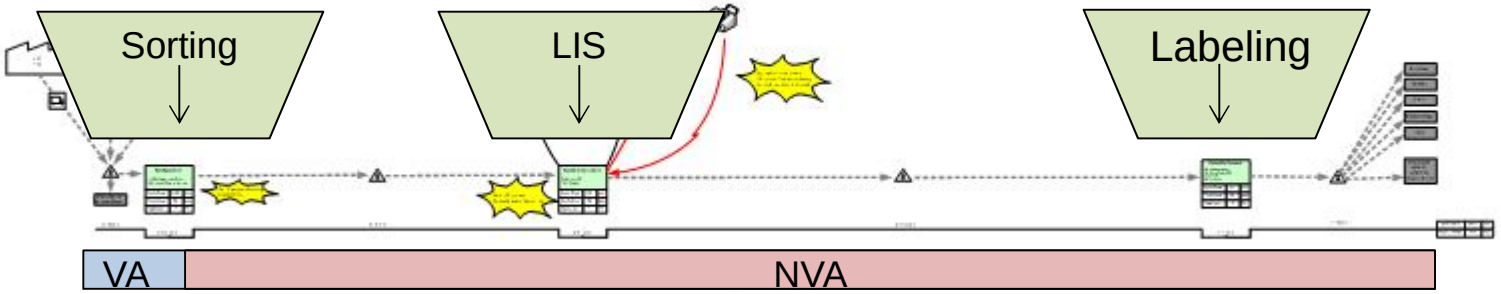
- Project Plan:
  - Fully understand the customers' needs for to this process
  - Fully understand the process in its current state
  - Identify differences (Value-added vs. Non-value-added)
  - Identify waste
  - Identify opportunities to add value
  - Identify strategies to eliminate waste and add value
  - Implement these strategies effectively
  - Ensure clear communication throughout
  - Set up a process to ensure on-going, continuous improvement

- Project Objectives:
  - Eliminate waste
  - Improve customer value
  - Improve communication and accountability
  - Increase capacity at the TCPHL

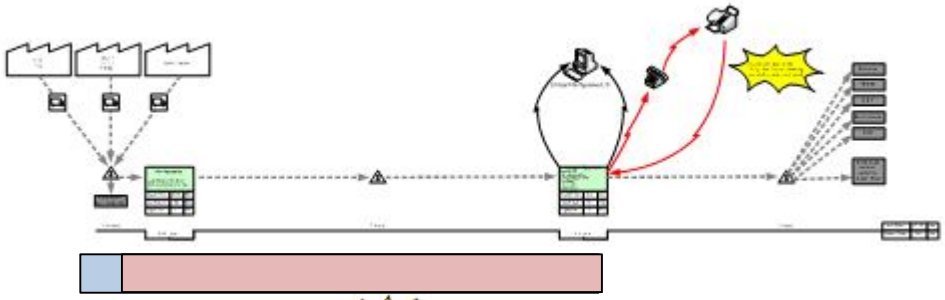
Specimen Accessioning (Lean Tools Utilized)

Executive Steering Committee	Blitz
Lean Daily Management System	RACI Chart
Huddle Meetings	Pilot
Primary Visual Display Board	Brown Paper
Plan, Do, Check, Adjust (PDCA)	Standard Work
Hot Button List / Voice of the Customer	Visible Process Controls (Poke Yoke)
20 Keys	Single Piece Flow/Batch Control
Kaizen	Materials Management (KanBan)
Project Charter	Spaghetti Diagram
Value Stream Mapping (CS / FS)	5S

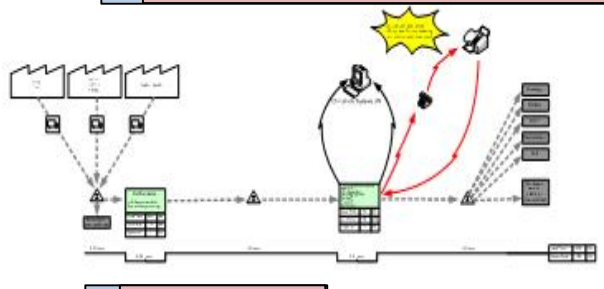
Specimen Accessioning



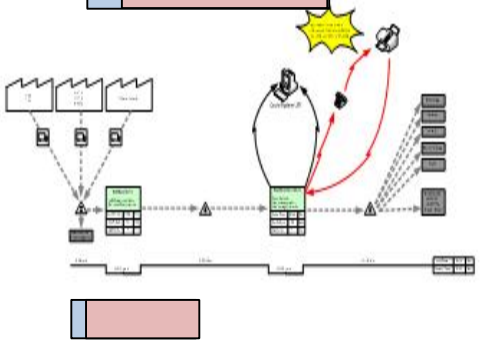
Old Way
LT=46 min
PT=3.4 min ps
Total = 49.4 [15]
= 1hr39 [30]
= 2hr28 [45]



Best Practices/SW
LT=17.8 min **61%** less
PT=1.5 min ps **56%** less
Total = 19.3 [15]
= 38.6 [30]
= 57.9 [45]



Pilot (with BP and reduced sorting)
LT=7.60 min **83%** less
PT=1.33 min ps **61%** less
Total = 8.93 [15]
= 17.7 [30]
= 26.8 [45]



New LIS
LT=4.15 min **91%** less
PT=0.46 min ps **86%** less
Total = 4.6 [15]
= 9.2 [30]
= 13.8 [45]

Need to use Lean to make the most of capital investments

STANDARD WORK SHEET -Combined

Area/Department Specimen Receiving		Process Name Receiving Specimens		Comments
Step No.	Operation Name/Process Description			
1	Receive Bag from courier			
2	Open Bag			
3	Pull out the specimens and sort them according to testing also look for any La salle to be sent back with the courier. The testing is depending on the day and what the Micro's are working on for the day. There is a schedule on the wall above the computer that will show you what is being tested for the day.			
4	Make sure the Ice Packs are still good zip up bag and give back to the courier.			
5	Login to CIS using lab (lowercase) press return twice. Enter your password (CAPS) press enter.			
6	When you are in the Main Menu screen press shift F2 to take you to the next menu "Requisition Log-In Menu" here you will input the specimens information. ***Note the mouse does not work in this system you will need to use tab, return, arrows to navigate through the CIS System. Also use Caps at all times.**			
7	Take out the requisition for the specimen you are wo requisition with the name on the specimen. Be sure Patient Name and an ID Number/DOB. And minimu the requisition Patient Name, DOB, Specimen Type			
8	If there is missing information from the requisition re information worksheet at the bottom of the page. If y and it is a specimen the Micro's do not need right a this problem specimen aside and come back to it a			
9	Site number-According to where the specimen is co site file list" for this site number.			
10	Nothing will be entered for the Ticket# or for the Acc these two fields.			

Standard Work:

Lowers the threshold of time and energy required to cross-train staff, breaks down silos, Makes knowledge accessible

- Will only work if easy to maintain
- Make the best choice the easiest choice

RACI Charts:

Clarify roles & responsibilities
Improve accountability
Improve communication

Specimen Accessioning RACI Chart	Assigned Lab Assistant	Lab Assistant assigned to cover	Lab Staff actually performing the accessioning	PHM	Front Office	Lab Manager
Determine who will be accessioning each day when assigned Lab Assistant is here	**A**			**I**		**C**
Determine who will be accessioning each day when assigned Lab Assistant is not here		**A**		**I**		**C**
Receiving and Accessioning Specimens according to current written standard work			**R**	**I**		**C**
Checking the quality of each specimen (correct labeling, tubes not expired, specimen not too old, specimen appropriate for test, etc)			**A/R**	**I**		**C**
Adding the PM-160 ICD-9 code for blood leads			**A/R**		**C**	**I**

Responsible	The person assigned to perform the task
Accountable	The person responsible for ensuring the task was actually performed
Consulted	The person to consult with issues because they have the knowledge and authority to assist
Informed	The person to inform if something goes wrong because it affects their work

Initials/Date:

Accumulating Impact

(because waste doesn't root itself out on it's own)

- Approximately 15,000 samples / year

FROM: $0.80/sample = $12,000 annually in NVA

TO: $0.035/sample = $525 annually in NVA

Savings / Re-direct:

- $11,475 labor annually to VA tasks

OR:

- 95% increase in capacity

Can accession *100,000* samples in the same amount of time it used to take to accession *15,000*

Inventory Management

Inventory Management (Background)

Waste due to poor Inventory Control:

- Space:
  - More than we need = tied up storage space / wasted energy (refrigerators and freezers)
- Expiration Dates:
  - More than we need = wasted money due to expired reagents
- Accessibility:
  - More than we need = wasted time looking for things
- Communication:
  - Miscommunications due to a highly variable inventory = duplicate orders / we would run out of something we needed

Inventory Management Project Overview

- Customers Impacted: Lab assistants, public health microbiologists, front office
- Process scope:
  - Process starts at: the decision to order or re-order something the TCPHL
  - Process ends at: the point where the item is used up or discarded

- Project Plan:
  - Understand our current inventory management plan
  - Fully understand the use and value for each item in our inventory
  - Eliminate items that no longer have use or value
  - Reduce stock of overstocked items by ordering amounts appropriate to usage
  - Eliminate waste due to items that are being discarded due to expiration
  - Identify ways to consolidate storage of items
  - Identify ways to improve accessibility of items
  - Identify strategies to streamline communication pertaining to inventory management
  - Implement these strategies effectively
  - Ensure clear communication throughout
  - Set up a process to ensure on-going, continuous improvement

- Project Objectives:
  - Eliminate waste
  - Improve storage capacity
  - Improve accessibility
  - Improve communication
  - Improve accountability

Inventory Management (Lean Tools Utilized)

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Lean Daily Management System	RACI Chart
Huddle Meetings	Pilot
Primary Visual Display Board	Brown Paper
Plan, Do, Check, Adjust (PDCA)	Standard Work
Hot Button List / Voice of the Customer	Visible Process Controls (Poke Yoke)
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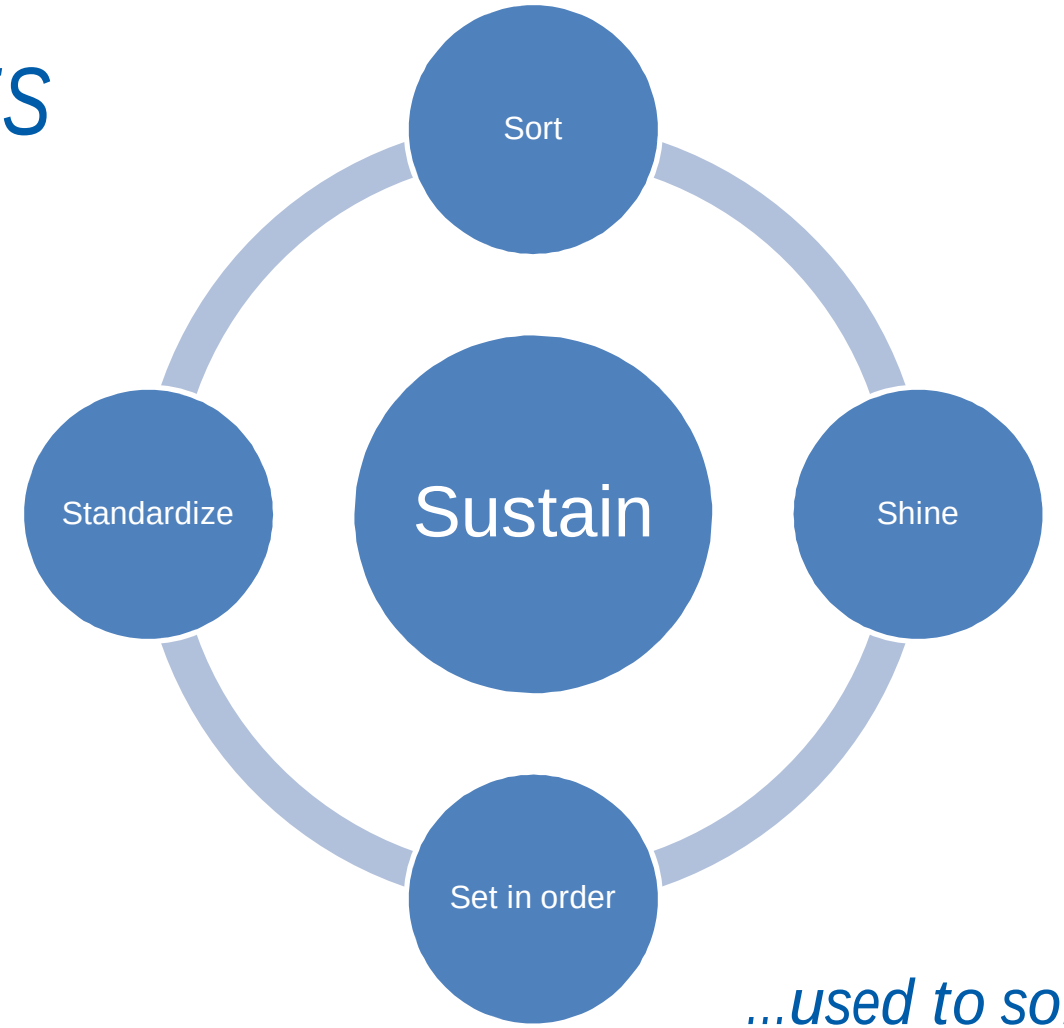
5S



...used to solve a problem

5S

Before

After

KanBan

On this date: 5/9/14

I notified this person: Roxanne

to re-order this amount: 2 cases

of this item. My initials DL

- Improve communication
- Save time
- Prevent duplicate orders
- Alert to the need for follow-up

Kaizen ("mini-projects")

- 7 separate Kaizen aimed at:
  - Reducing unnecessary inventory
  - Reducing waste due to expired reagents
  - Employing "just-in-time" delivery for targeted items

Running total of "hard" savings annually:

7% of the overall supply budget

already have more on the hot-button list

20 Keys

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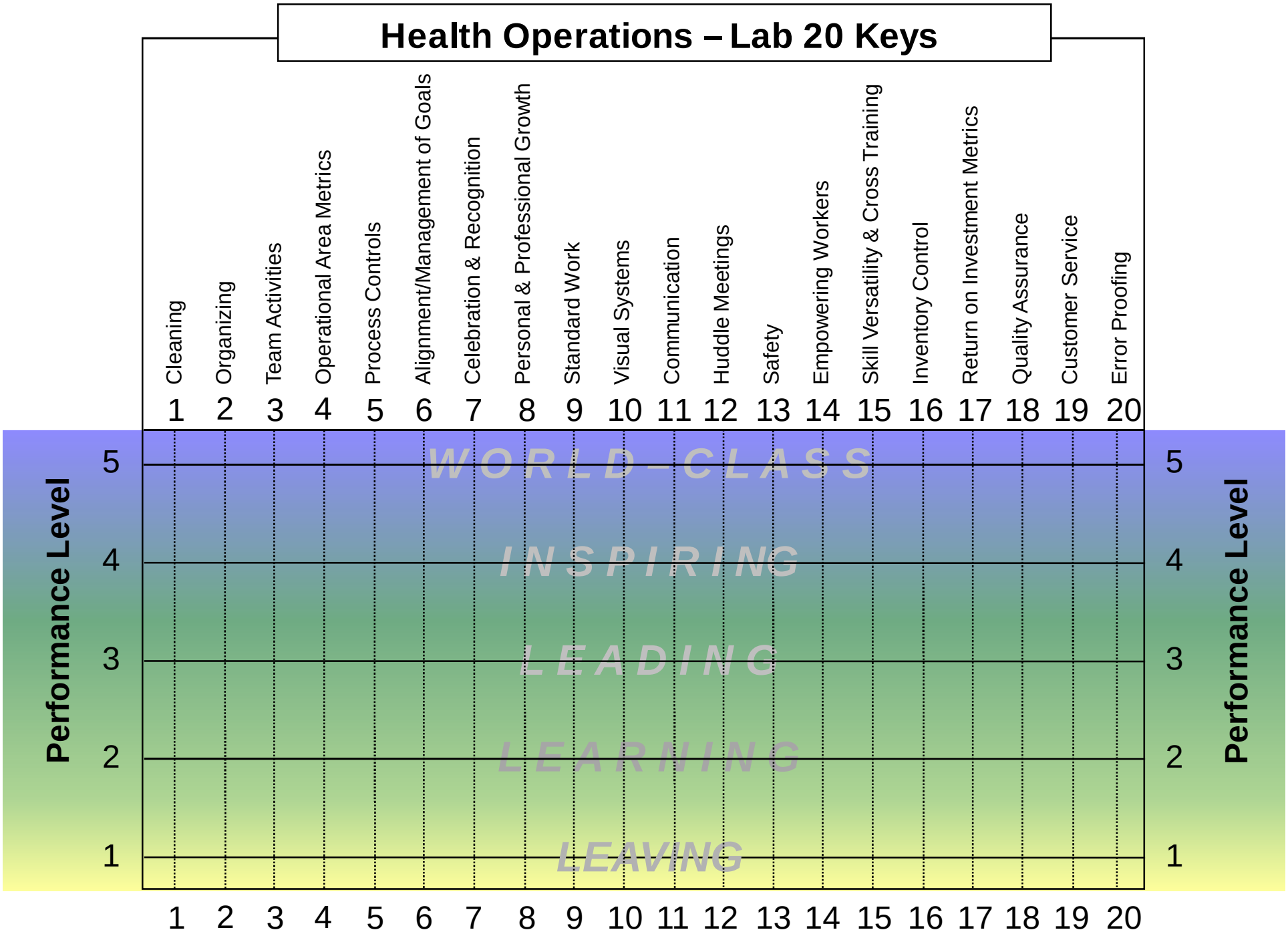
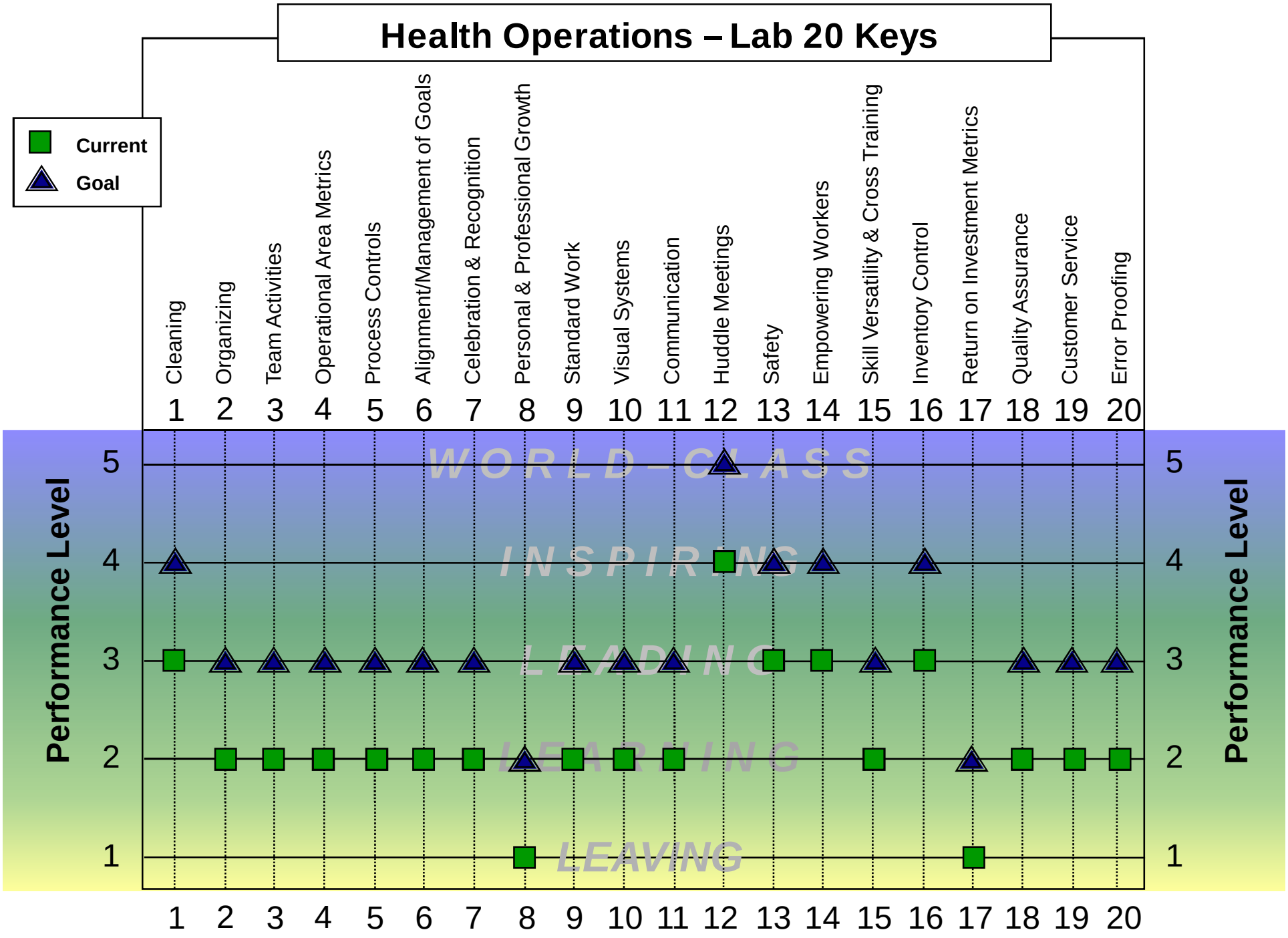

Health Operations – Lab 20 Keys
1 Cleaning
2 Organizing
3 Team Activities
4 Operational Area Metrics
5 Process Controls
6 Alignment/Management of Goals
7 Celebration & Recognition
8 Personal & Professional Growth
9 Standard Work
10 Visual Systems
11 Communication
12 Huddle Meetings
13 Safety
14 Empowering Workers
15 Skill Versatility & Cross Training
16 Inventory Control
17 Return on Investment Metrics
18 Quality Assurance
19 Customer Service
20 Error Proofing
WORLD – CLASS
INSPIRING
LEADING
LEARNING
LEAVING
Performance Level
5
4
3
2
1

20 Keys

Key	No.	Leaving	Learning	Leading	Inspiring	World-Class
Team Activities	3	Employees are not generally formed into teams to address specific issues. Individuals do work how they each think is best, rather than by collectively determining the best solution and letting the process drive the decisions. Supervisor manages areas by directing individuals. Individuals bring problems to the supervisor for solving.	Structured efforts begin to focus staff into work groups (WG) to address common issues. There is at least 3 improvements implemented and completed per month (IICPM) by each work group. Staff never bring problems to the supervisor without at least 2 recommended solutions. WGs begin identifying team building exercises to perform on a regular basis.	Independently, WGs recognize and bring issues forward as a group. Issues brought to the supervisor's attention have already been discussed with all applicable WG members and the WGs proposed solutions are provided. 5 IICPM. WG and supervisor are working to clearly delineate the WG's authority to independently troubleshoot and implement decisions. Team updates their standard work, with occasional reminders from supervisor. Structured team building activities occur at least Quarterly	WG's authority is clearly delineated and understood by all. WG independently recognizes, troubleshoots, and implements all decisions within their authority to do so. Supervisor serves as a coach, rather than primary problem-solver and as a result, higher-quality solutions are identified more quickly. 8 IIPM. WG manages its day-to-day activities independently. WG maintains standard work independently. Team building exercises occur at least monthly. Teams have occasional friendly competitions.	WG generates innovative ideas to better meet goals at every level, including agency alignment. >10 (IICPM). Teams frequently engage in voluntary team-building exercises. Teams have on-going friendly competitions. Lab staff are team players who use timely and objective data to drive decisions. They are flexible, progressive, and collaborative in their commitment to providing world-class quality services while maximizing value.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Current
Goal
1 Cleaning
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6 Alignment/Management of Goals
7 Celebration & Recognition
8 Personal & Professional Growth
9 Standard Work
10 Visual Systems
11 Communication
12 Huddle Meetings
13 Safety
14 Empowering Workers
15 Skill Versatility & Cross Training
16 Inventory Control
17 Return on Investment Metrics
18 Quality Assurance
19 Customer Service
20 Error Proofing
Performance Level
5
4
3
2
1
WORLD – CLASS
INSPIRING
LEADING
LEARNING
LEAVING

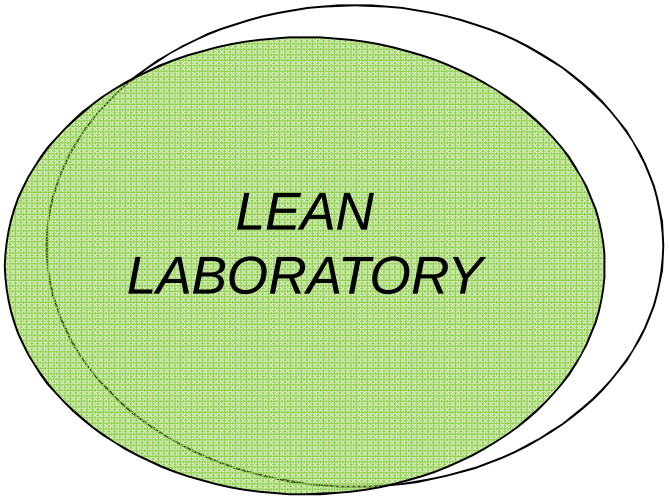
Snap-shot (not a summary!)

- Reduced test ordering hands-on time by 75%
- Increased capacity in specimen receiving by 95%
- Decreased cost of data mining by an average of 92% per report
- Increased value to customers through higher quality & lower cost
- Realigned lab goals directly with Agency's Vision, Mission, Values and Agency Strategic Plan
- >200 hours of experience to 12 student volunteers
- 1 student has committed another 90 hours this Fall as an intern – utilizing LEAN to improve delivery of Public Health Essential Services
- More projects wrapping up and more in the pipeline – Lean is all about continuous improvement

The Customer

- Benefits for the customer!

- External
  - The Public
  - Our Clients
  - Our Partners
- Internal
  - Other Agency Departments
  - Our bosses
  - Our direct reports
  - Each other!



We are getting Leaner every day!

- More nimble organization
- Empowered workers
- Better communicators
- Systematic thinking towards
  - Eliminating waste
  - Maximizing value
- Building trust
- Making improvements, progress, and long-term direction visible to the entire team

- Our goal is to have a reputation of being an outstanding investment
  - Within our Agency
  - Among the citizens of Tulare County
  - Among our partners

LEAN Implementation Team Members

- Consultant from BD: Patrick Maul
- APHL: Cathy Johnson, Pandora Ray, Karen Breckenridge
- LEAN leader colleagues also certified 2013 - 2014
  - Jennifer Eastman-Faulwetter (AK State PHL, Anchorage). Kwadwo Owusu-Ofori (City of Milwaukee PHL, WI), Karen Stephani (NYS Dep. of Ag & Mkts Food Lab, Albany), Leila Filson (Florida PHL, Jacksonville)
- Tulare County, CA:
  - Executive Steering Committee
    - HHSA Director, Dr. Cheryl Duerksen
    - HHSA Public Health Director, Mr. Jason Britt
    - HHSA Deputy Director of Health Operations, Ms. Karen Elliott
    - County Health Officer, Dr. Karen Haught
  - Lab Staff:
    - 3 Milk Technicians
    - 2 Lab Assistants
    - 1 Office Assistant
    - 5 PHMs
    - 1 Lab Manager
  - IT support
- External Partners:
  - 12 Student volunteers

Tulare County Public Health Lab: (l. to r) Steven Nunez, microbiologist II; Cynthia Bisgeir, milk technician II; Judy Chrisner, office assistant II; Veronica Cadiz, microbiologist II; Roxanne Haskell, office assistant II; Ha Le, microbiologist I; Judith Sanchez-Duran, milk technician II; Peggy Carlson, laboratory assistant II; Victoria Sandoval, milk technician I; Mary Sanchez, laboratory assistant II; Stephen West, microbiologist II; Denise Lopez, public health lab manager

Thinking Big in Tulare County, CA: Giant Trees, Large-scale Farms, and a Grand Year for the PHL

by *Nancy Maddox*, writer

Tulare County has the distinction of being the location where one of the world's most infectious pathogenic bacteria was first observed—hence its name, *Francisella tularensis*. And the bulrushes known as "tules" that once lined the shores of Tulare Lake (after which the county is named) are the origin of the term "in the tulles," meaning in the middle of nowhere. Yet the county's fame extends beyond these two distinctions.

Nestled in the shadows of the Sierra Nevada, a major mountain range in eastern California, Tulare County is home to some of the richest agricultural land in the United States. The historically agrarian county provides fresh foods to 84 countries and its agricultural industry—including the region's largest dairy production region—is worth over $6 billion annually.

The county lies in the heart of California, taking up nearly 5,000 square miles of the San Joaquin Valley. It is the gateway to the famous Sequoia National Park, with its giant redwood and sequoia trees, and home to the Tule River Reservation of the Yokut-speaking Native American tribes. Its year-round sunshine, thriving arts communities, weekly farmers markets, cultural festivals, and proximity to a broad range of outdoor recreational opportunities make it attractive to the many tourists who visit—and often relocate to—the area.

The county boasts easy access to the mountains of the High Sierras for snow sports (while coastal beaches are only two hours' away in the other direction), a multi-city mural trail featuring creative "wall art," and a local opera company. Tulare County is home to about 442,000 people and attracts a diverse population, in part because of its location midway between Los Angeles and San Francisco. Many residents—about 60% of whom report Hispanic or Latino origin—work either directly in agriculture or in supporting industries.

Facility

The Tulare County Public Health Laboratory occupies a 6,750-square-foot facility built to meet its needs in 1992. The facility is located in the city of Tulare and is connected to the county hospital, a 1920s-era building that houses various local government offices and a hospital clinic. In 2005, the laboratory gained a new BSL-3 suite and negative-air-pressure anteroom to accommodate testing for high-risk agents.

Laboratory Leaders

Robin Purves, MS, PHM, is the part-time, semi-retired director of the public health laboratory, providing general direction and consultation related to federal CLIA regulations. Purves, who holds degrees in microbiology and business, began his career in the Tulare County Public Health Laboratory as a trainee in 1973. After more than 40 years at the laboratory—27 as director—he says, "Keeping up with new technology, the ever-changing regulatory environment, and the daily operation of a multifaceted laboratory that helps protect the health of the public has made for an incredibly satisfying career."

Microbiologist Veronica Cadiz

Since 2011, Denise Lopez, MS, PHM, has served as the day-to-day laboratory manager, overseeing staff, laboratory operations, and regulatory compliance. Lopez was born in southern California but moved with her family to Tulare County as a toddler. She is a "proud graduate" of nearby Fresno State University, where she earned degrees in biology and molecular biology. "I've spent most of my life in the Central Valley," said Lopez, "and I thoroughly love the area and the people here."

Lopez began her career with Tulare County Public Health Laboratory in the final year of her master's program when she secured a public health microbiologist traineeship. "I finished my training and received certification from the state (as a public health microbiologist) in 2007," she said. "And then I became the BT training coordinator and clinical lab liaison in 2008. As the training coordinator, I had a great opportunity to learn about the entire laboratory, including regulatory requirements, security, biosafety, and so forth."

Lopez was promoted to laboratory manager in 2011 and became the Environmental Laboratory Accreditation Program (ELAP) director for water testing in 2012.

Staff

In addition to Purves and Lopez, the laboratory employs three state-licensed milk technicians (one of whom is also a licensed phlebotomist), three lab assistants (all of whom are licensed phlebotomists), two full-time office assistants, and five state-licensed public health microbiologists (PHMs), including dual-licensed PHM/clinical laboratory scientists. There is currently one vacancy for a laboratory assistant.

Pride in the laboratory runs deep. "The Tulare County Laboratory is well respected in the public health community for the outstanding service it provides, the expertise of the staff, and the way it has maximized the investment the community has placed in it," said Jason Britt, MS, the county's director of public health services.

Revenue

The public health laboratory has an annual budget of approximately $1.2 million, which comes from a combination of fees, grants, and state and local revenue.

Testing

Tulare County Health Officer, Karen Haught, MD, MPH, said, "I am very appreciative that, as the health officer, I have such an excellent public health laboratory to depend on. I can be confident in the work of the lab and know that it is always ready to respond. Our county is well served by the breadth of testing that it provides and its collaboration in the region and state."

The laboratory performs approximately 42,000 tests each year. Among these, Lopez reports "just occasional" testing for the county's eponymous bacterium, *Francisella tularensis*. "We are not a hotbed for tularemia," she said.

The single highest-volume service is dairy testing to support a $1.8 billion dairy industry in the nation's largest milk shed. Other high-volume services include drinking water testing and clinical testing for chlamydia/gonorrhea, tuberculosis, and HIV. Tuberculosis, in particular, is a problem in rural parts of Tulare County, where many people lack transportation to medical facilities and infectious diseases tend to circulate in tight-knit communities.

The laboratory supports community health surveillance and outbreak investigations for a large slate of infectious and foodborne pathogens. Currently, laboratory scientists are working with the county's health officer, communicable disease unit, epidemiologist, and environmental health unit to backstop an investigation of a multi-state outbreak of salmonellosis linked to raw chicken products from three California Foster Farms production facilities.

As the only laboratory with a BSL-3 suite in Tulare, Kings, and Kern counties, the public health laboratory performs reference testing for high-risk infectious agents for hospitals in the tri-county area, as well as Laboratory Response Network testing for rapid bioterrorism rule-out or confirmation.

Other critical services include recreational water testing and support for unexplained death investigations when an infectious disease is suspected.

Success Stories

- "In addition to having an amazing lab staff that is highly trained and knowledgeable, maintaining that workforce is our biggest success story," said Lopez. "The diversity of services we provide with the relatively small number of staff we have is amazing. We have scientists who are highly cross-trained in some of the most challenging areas of microbiology—bacteriology, parasitology, mycobacteriology, mycology—and we're really quite proud of that."
- This summer, the Tulare County public health laboratory was one of four labs in the country awarded a CDC grant—administered through APHL—to implement "LEAN Six Sigma," an evidence-based strategy for quality improvement and responsive customer service, including certifying a LEAN leader within the laboratory. "In order to implement LEAN, we're going to be using Orchard Software's HarvestTM Laboratory Information System (LIS) to increase our efficiency and improve our quality of service. We've already begun the LIS implementation process, which is occurring concurrently with the LEAN implementation, so it will be a very busy next few months for us," Lopez said. "We haven't updated our LIS in about 12 years, and we're very excited about the flexibility and functionality of the new LIS...It's been an exciting year of new opportunities for us."
- In addition to scientific services, the laboratory offers workforce development services, including training for hazardous materials packaging and shipping, volunteer opportunities for college students, and biological specimen collection training for area fire department and environmental health HAZMAT teams.

Lopez counts her close association with APHL and the California Association of Public Health Laboratory Directors as a "tremendous" asset, facilitating many of the laboratory's successes. "Each of those associations has been a valuable resource, and the individuals themselves are just top-notch."

Veronica Cadiz, microbiologist, in the negative-air-pressure anteroom used for testing high-risk agents

Challenges

- "We have the same challenge that all public health laboratories deal with, which is limited and fluctuating resources. Whether we're considering bringing on a new test or evaluating an existing test or process, part of being LEAN is asking the right questions and gathering the right data, such as: What's the impact on our community's health to be able to perform this test or not perform this test? Is there a more effective way to provide this service or to streamline processes to make the best use of the resources we have?"
- "The California microbiologist public health