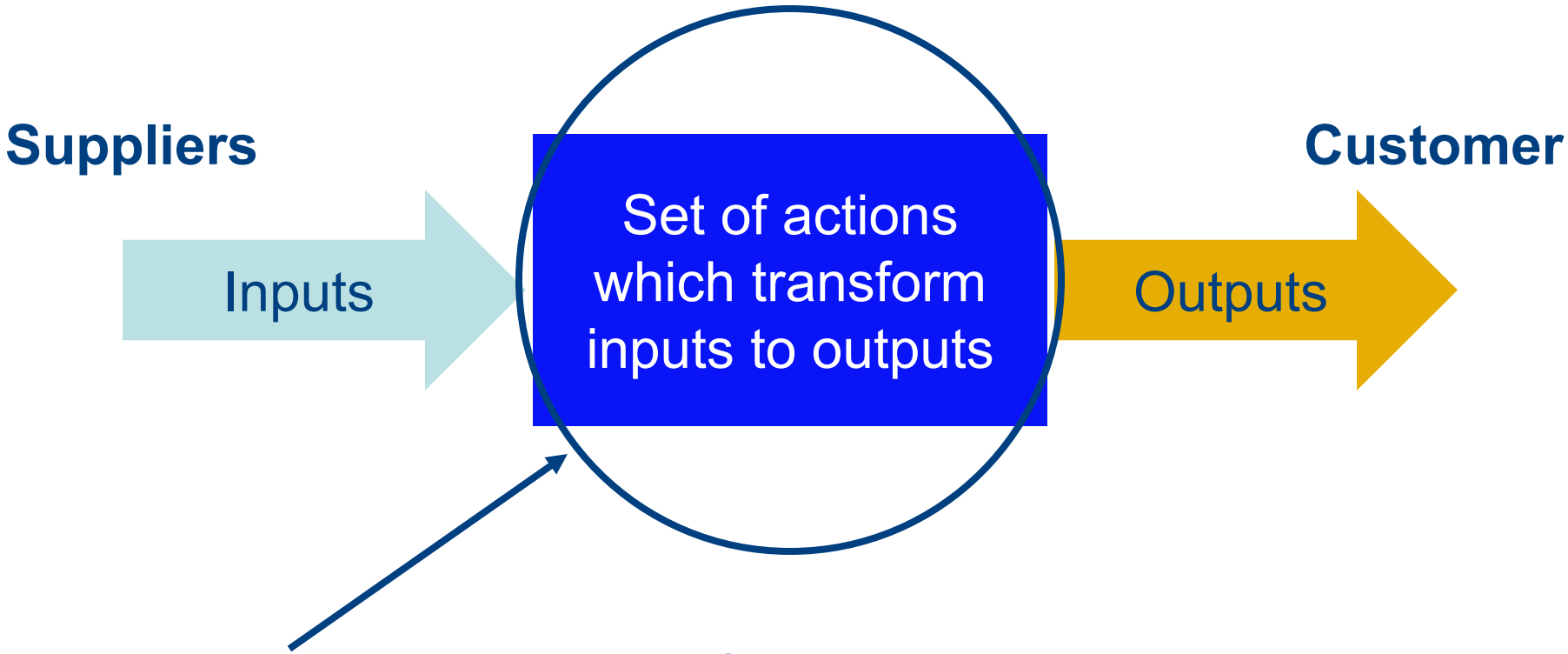
Lean Thinking
Part I

Learning Objectives

At the end of this module, you will be able to:

- Describe the elements of a process
- Draw a process map
- Explain what constitutes value in a process
- List the five fundamental lean principles
- Describe several concepts and tools for implementing lean principles

What is a Process?



Process: **A series of actions, changes, or functions bringing about a result**

Ref: http://www.dictionary.com, Jan. 8, 2003

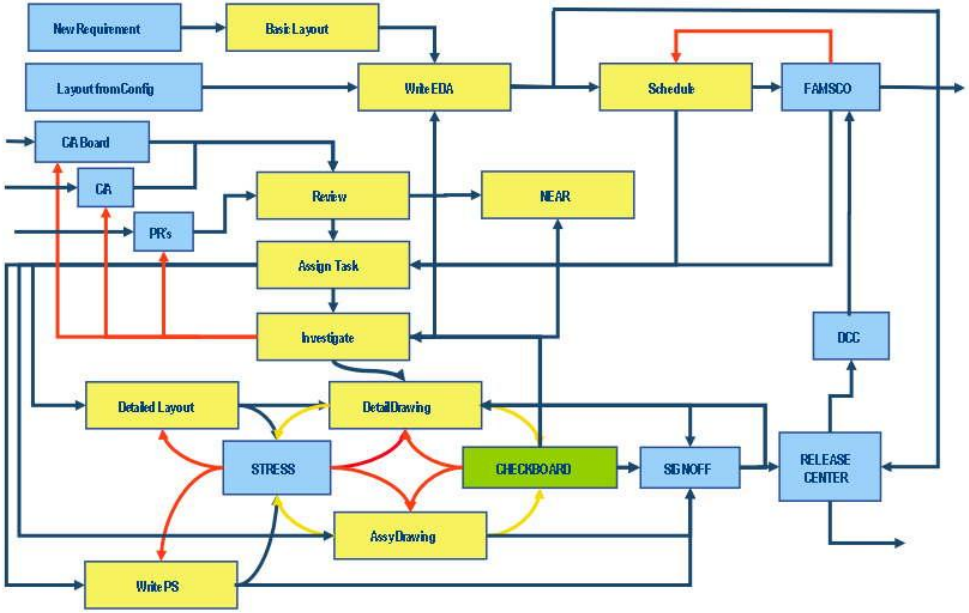
Identify the Customer

- What happens to the outputs of a process?

They go to a CUSTOMER!

- External customers - are outside an organization, money is typically exchanged with external customers
  - End users are customers who pay for an operational or consumable product or service
- Internal customers - are inside an organization, money is typically not exchanged directly with internal customers
- Customers also drive the inputs to a process through their needs and requirements

Process Maps



Process map for pre lean engineering drawing release

Courtesy of Lockheed Martin Corporation. Used with permission.

Source: "Lean PD Efforts for F-22", LAI Product Development Winter Workshop, January 27, 2000.

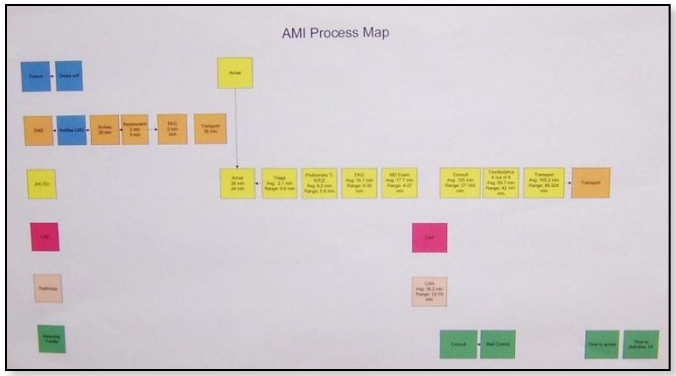


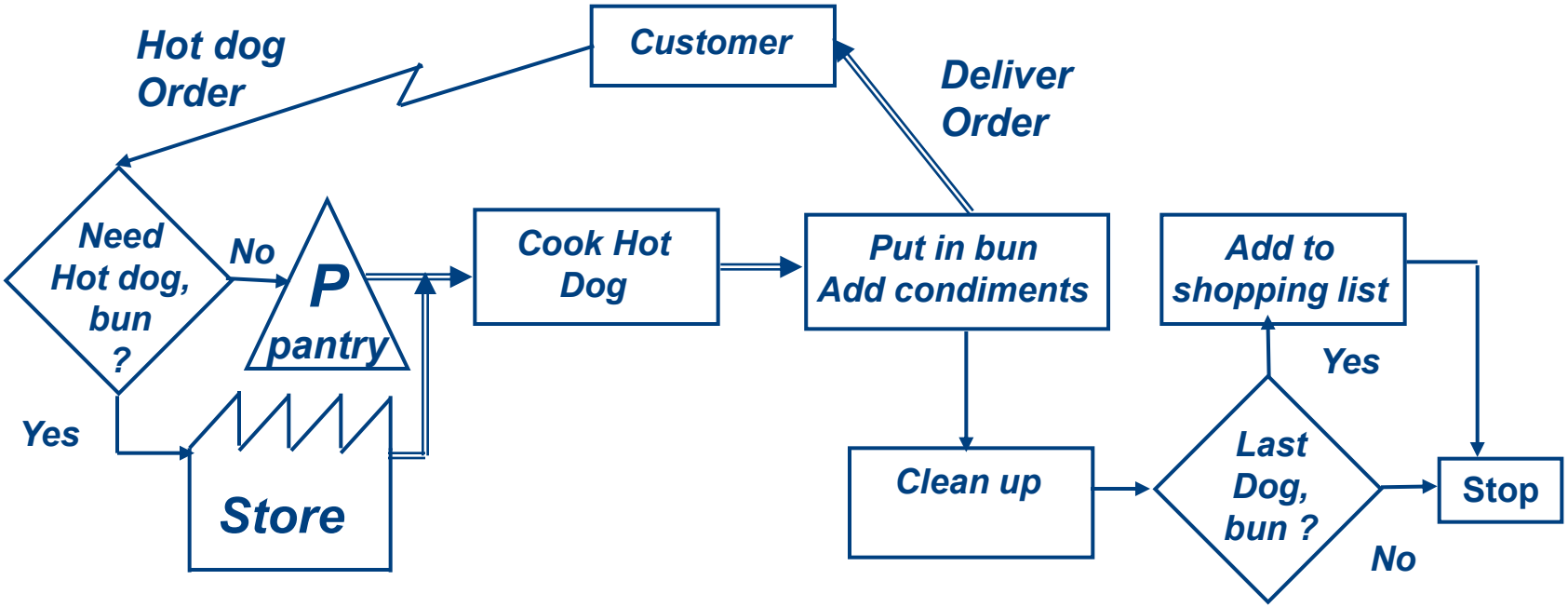
Photo by Earll Murman

Process map for pre lean treatment of Acute Myocardial Infarction (aka heart attack).

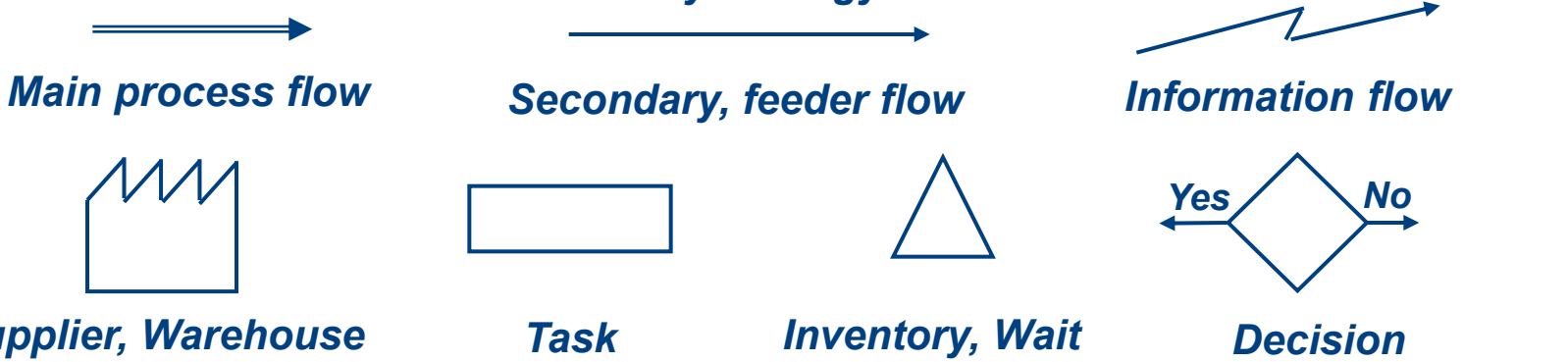
Courtesy of Jefferson Healthcare, Port Townsend, WA. Used with Permission.

- **Only understood processes can be improved**
- **Understanding a process is easier when it can be visualized**
- **A *process map* is an organized visualization of all the interrelated activities which combine to form a process**

Process Map For Fixing a Hot Dog

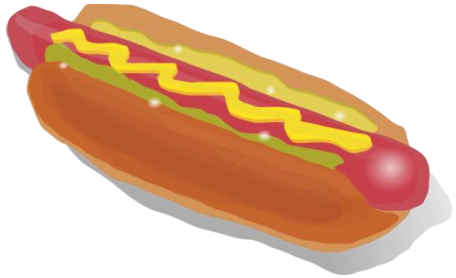


Symbology



Team Exercise: Hot Dog Stand Process Map

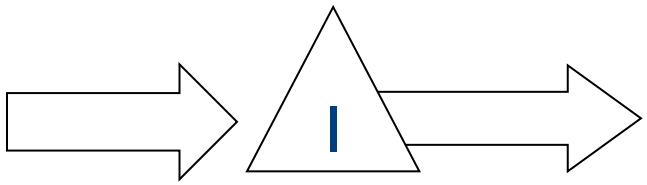
Sasha



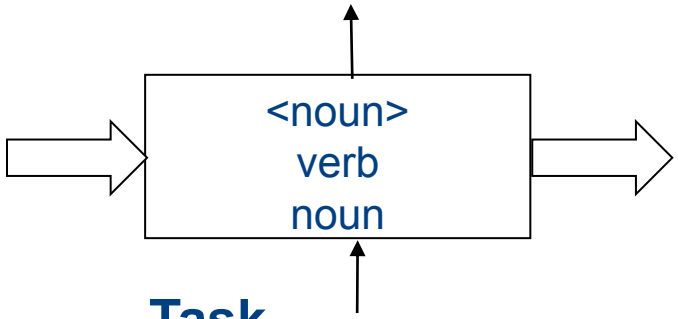
Andy

- Develop a process map for S&A Hot Dogs
  - Identify process input(s) and output(s)
  - Make a rectangular post-it note for each process element
  - Arrange on easel chart from input to output
  - Add decision (diamond) and wait/inventory (triangle) post-its as needed
  - Draw lines for process & information flow
- In 10 minutes, be prepared to explain your process map to the class

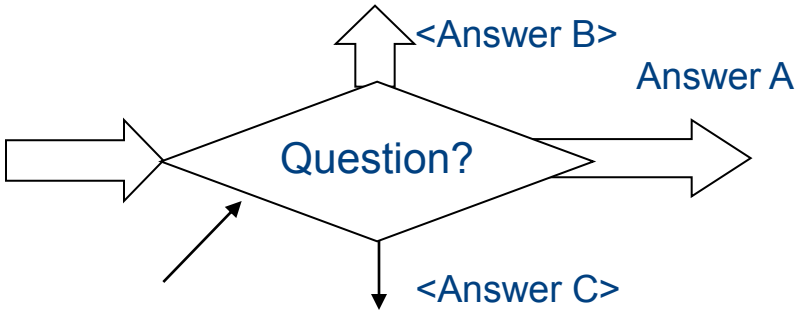
Basic Mapping Symbols



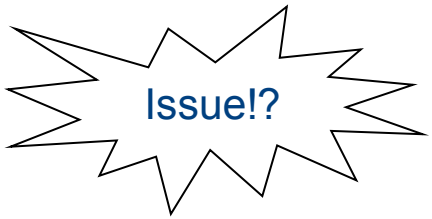
Inventory or waiting



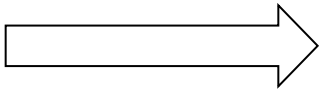
Task



Decision



Burst



Main process flow

Secondary, feeder flow

Information flow

No “Right” Answer

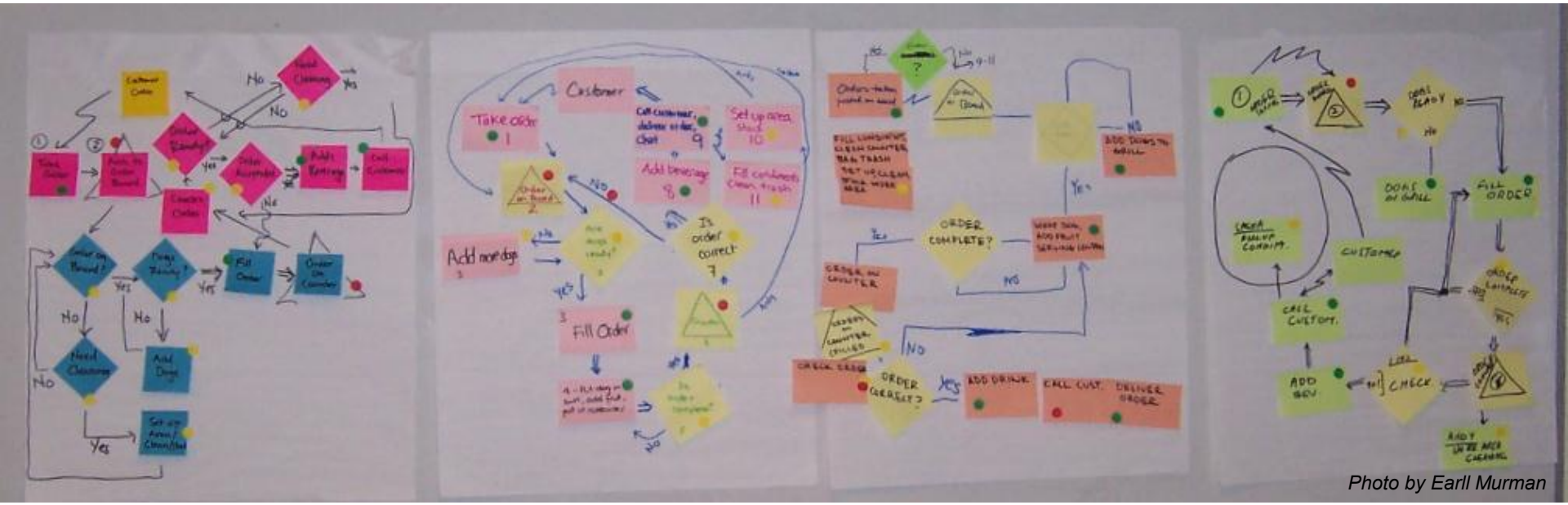


Photo by Earll Murman

- A process map is a 2-D visualization of a process taking place in 3-D space and time
- Many ways to map even a simple process
- Goal is to capture and communicate the key features of the process
- Avoid unneeded details of each step

Process Wrap Up

- Processes underlay everything we do
- Understanding and improving processes is the key to improving productivity
- The fundamentals of lean thinking are the foundation of modern process improvement

Five Lean Thinking Fundamentals

- Specify *value*: Value is defined by customer in terms of specific products and services
- Identify the *value stream*: Map out all end-to-end linked actions, processes and functions necessary for transforming inputs to outputs to identify and eliminate waste
- Make value *flow* continuously: Having eliminated waste, make remaining value-creating steps "flow"
- Let customers *pull* value: Customer's "pull" cascades all the way back to the lowest level supplier, enabling just-in-time production
- Pursue *perfection*: Pursue continuous process of improvement striving for perfection

Ref: James Womack and Daniel T. Jones, Lean Thinking, New York, Simon & Schuster, 1996

Specify *Value*

Value Added Activity

Emphasize

- Transforms or shapes material or information or people
- And it's done right the first time
- And the customer wants it

Non-Value Added Activity – Necessary Waste

Minimize

- No value is created, but cannot be eliminated based on current technology, policy, or thinking
- Examples: project coordination, regulatory, company mandate, law

Non-Value Added Activity - Pure Waste

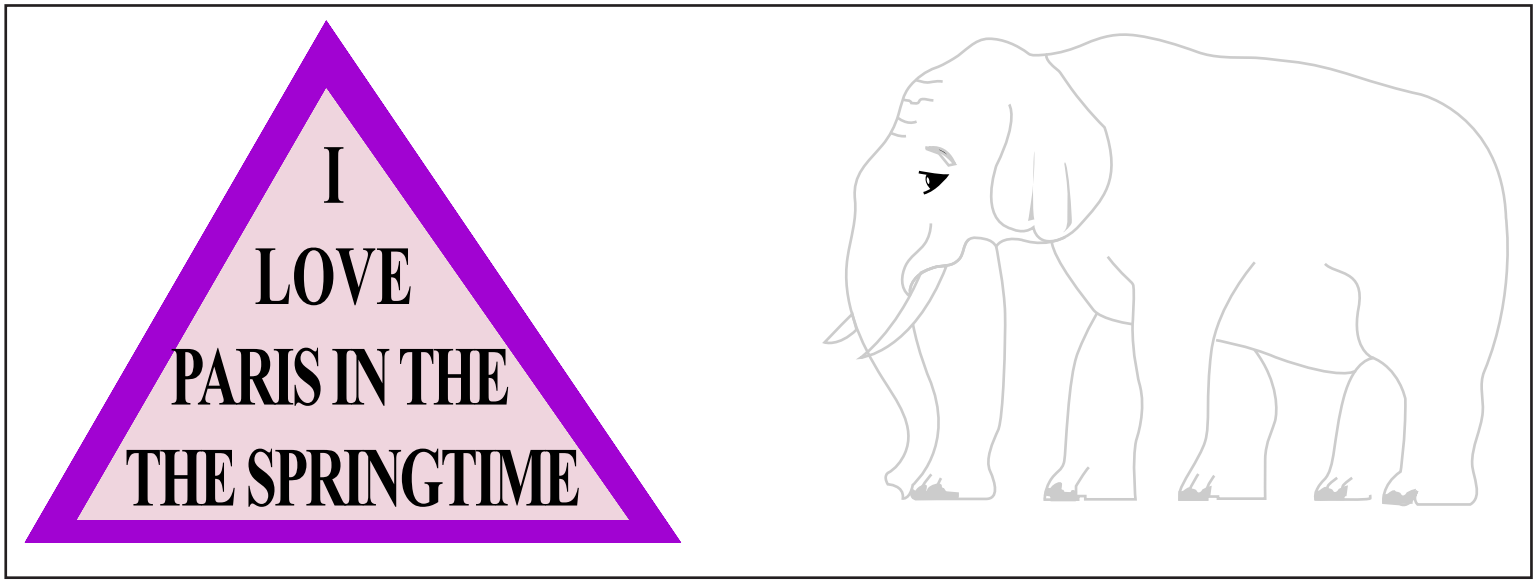
Eliminate

- Consumes resources, but creates no value in the eyes of the customer
- Examples: wait time, inventory, rework, excess checkoff, accidents

Does Inspection Add Value?

Value | Value Stream | Flow | Pull | Perfection

Can you see any mistakes?



Images by MIT OpenCourseWare.

Is inspection a value added, non value added necessary waste, or non value added pure waste activity?

Identify the *Value Stream*

Value | **Value Stream** | Flow | Pull | Perfection

- **A value stream is…**
  - **ALL the linked end-to-end activities that take place to deliver value**
  - **Starts with raw materials or initial information**
  - **Ends with the end customer/user**

Customer needs/requirements, schedules

Product or service valued by the customer

What Moves In a Value Stream?

Value | **Value Stream** | Flow | Pull | Perfection

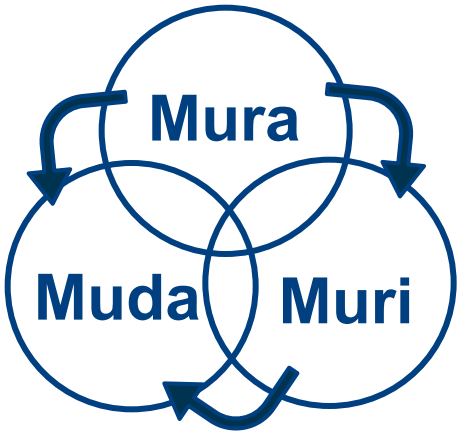
In manufacturing… material flows

In design & services…information flows

In human services…people flow

Analyzing the Value Stream

- **Muda – Non value added**
  - Look for the eight wastes (next slide)
- **Muri – Overburden of people or equipment**
  - Results in safety and quality problems
- **Mura – Unevenness**
  - Irregular or fluctuating production or workload due to poor planning, staffing, inoperative equipment, missing supplies, or irregular demand.



- **Mura is a root cause**
  Muda is an outcome

Ref: J. Liker, *The Toyota Way*

Eight ~~Seven~~ Types of Waste

1. Over-production	Creating more material or information or tests or treatment than needed
2. Inventory	More material or information than needed
3. Transportation	Moving material or information or people
4. Unnecessary movement	Moving employees to access or process material or information or patients
5. Waiting	Waiting for material, information or treatment - or work in process waiting to be processed.
6. Defective outputs	Errors or mistakes causing the effort to be redone to correct the problem
7. Over-processing	Processing more than necessary to produce the desired output
8. Unused employee creativity	Losing improvement opportunities by not engaging or listening to employees

Unnecessary Movement

Value | **Value Stream** | Flow | Pull | Perfection

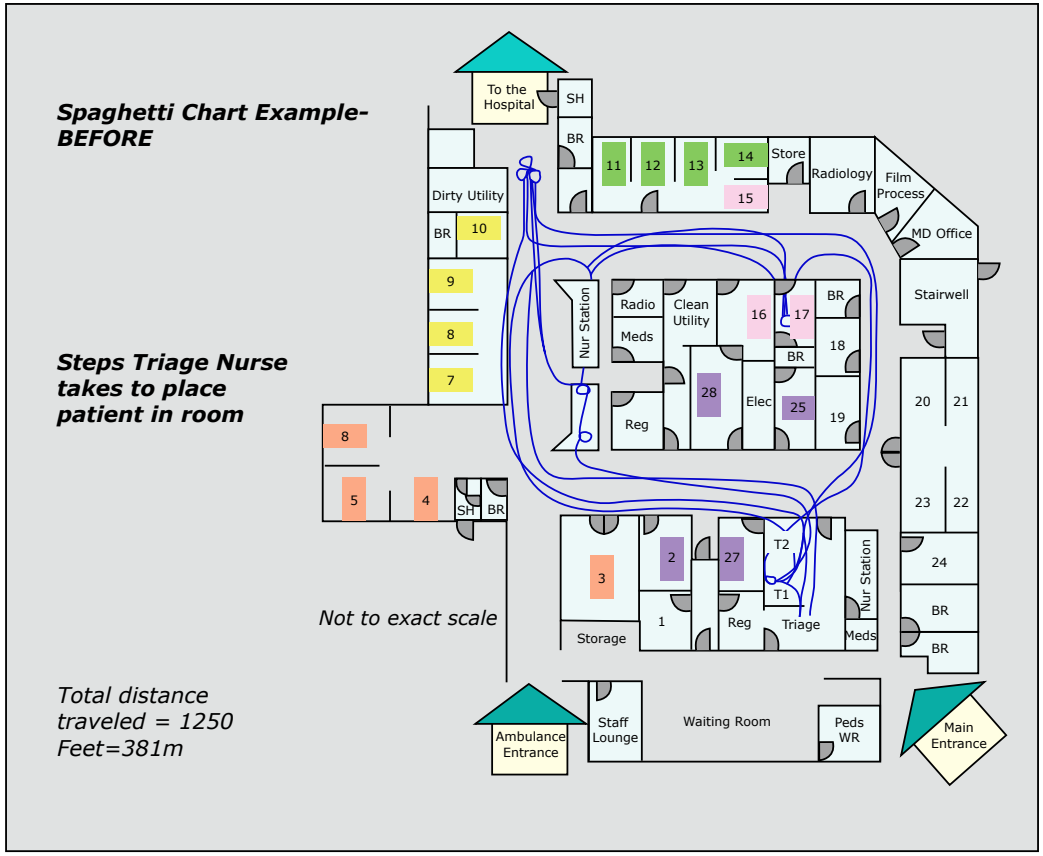


Image by MIT OpenCourseWare.

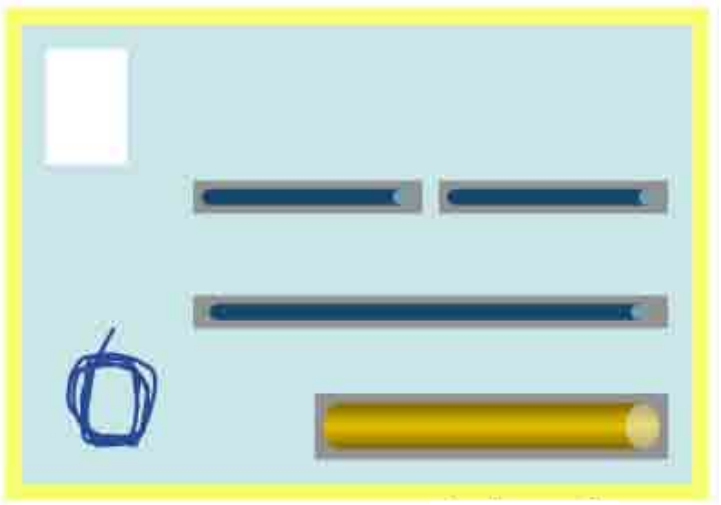
Spaghetti charts are a powerful visual tool for seeing unnecessary movement

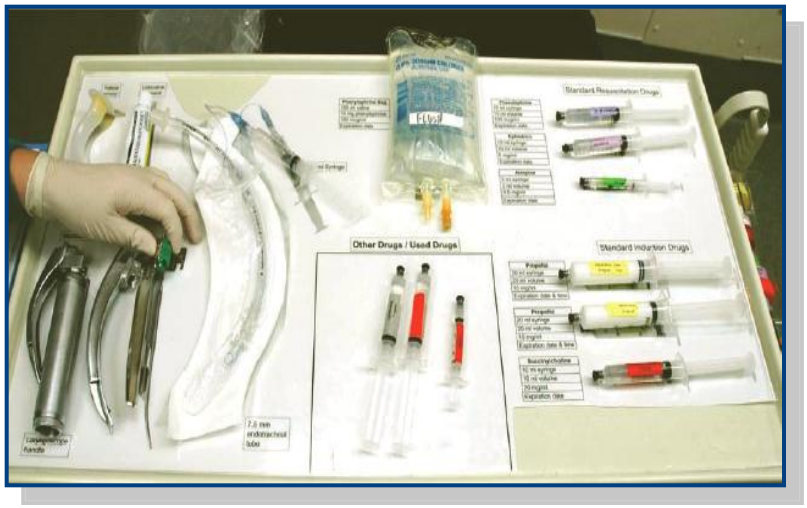
Source: University of Michigan Health System, Ann Arbor, MI

Kitting

Value | **Value Stream** | Flow | Pull | Perfection

Combining all relevant material, parts, and/or information into a single package which can be delivered to the Point-of-Use (POU) in a process to reduce unnecessary movement





Courtesy of University of Michigan Health System, Ann Arbor, MI. Used with permission.

Mistake Proofing (*poka yoke*)

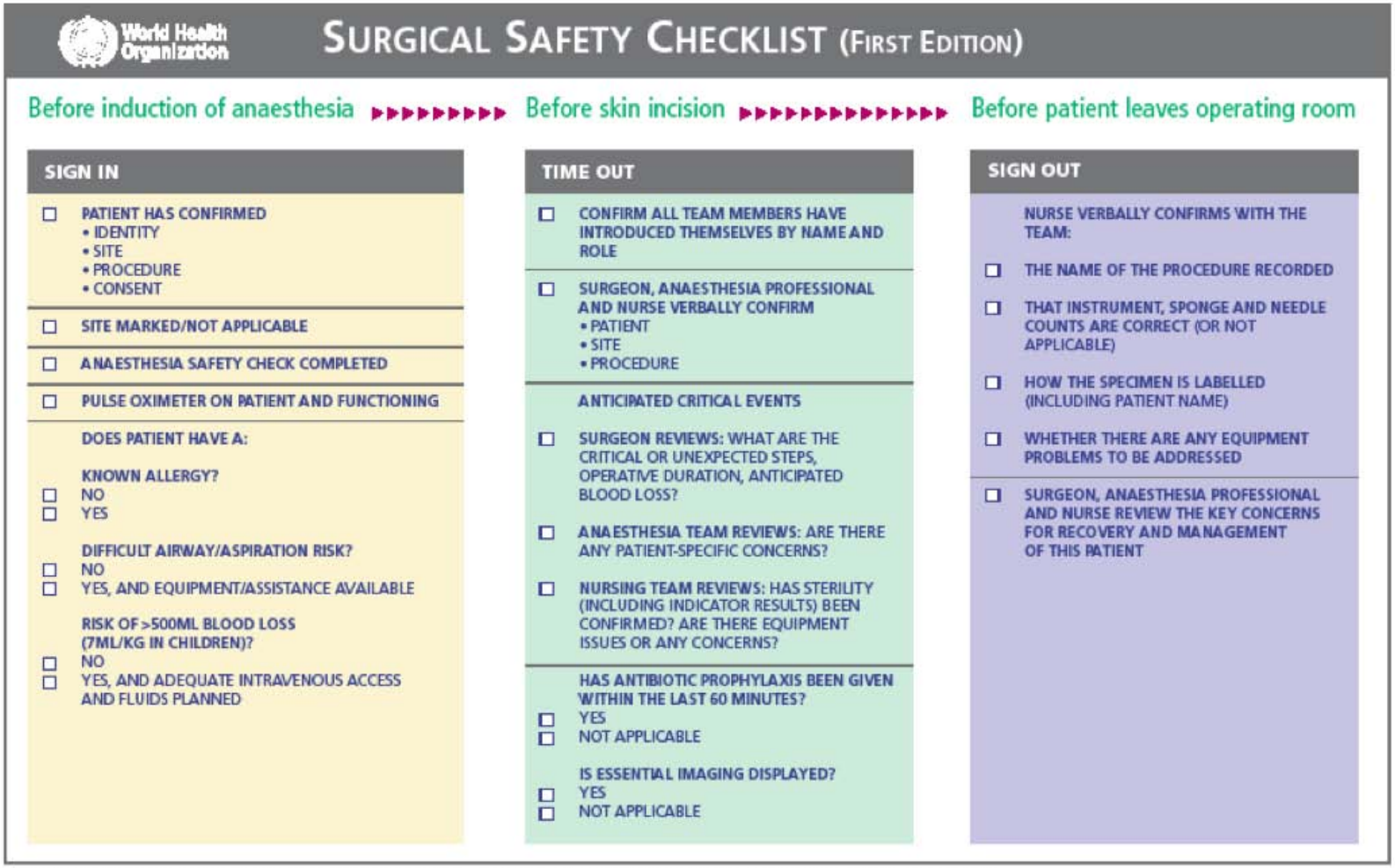
- "Mistake-proofing is the use of process or design features to prevent errors or the negative impact of errors"
- Healthcare examples:
  - Wristbands
  - Self blunting syringes
  - Automatic wheel chair brake
- Others:
  - "Left" and "right" side wires with different connectors
  - Asymmetric mounting points
  - Break-away gas nozzle with auto-shutoff

Photos by Earll Murman

Ref: "Mistake-Proofing the Design of Health Care Processes", Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services. http://www.ahrq.gov/qual/mistakeproof/

Checklists Reduce Defective Work

Value | **Value Stream** | Flow | Pull | Perfection



World Health Organization

SURGICAL SAFETY CHECKLIST (FIRST EDITION)

Before induction of anaesthesia ▸▸▸▸▸▸▸▸▸ Before skin incision ▸▸▸▸▸▸▸▸▸▸▸▸▸ Before patient leaves operating room

SIGN IN

- ☐ PATIENT HAS CONFIRMED
  - IDENTITY
  - SITE
  - PROCEDURE
  - CONSENT
- ☐ SITE MARKED/NOT APPLICABLE
- ☐ ANAESTHESIA SAFETY CHECK COMPLETED
- ☐ PULSE OXIMETER ON PATIENT AND FUNCTIONING

DOES PATIENT HAVE A:

KNOWN ALLERGY?
- ☐ NO
- ☐ YES

DIFFICULT AIRWAY/ASPIRATION RISK?
- ☐ NO
- ☐ YES, AND EQUIPMENT/ASSISTANCE AVAILABLE

RISK OF >500ML BLOOD LOSS (7ML/KG IN CHILDREN)?
- ☐ NO
- ☐ YES, AND ADEQUATE INTRAVENOUS ACCESS AND FLUIDS PLANNED

TIME OUT

- ☐ CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE
- ☐ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM
  - PATIENT
  - SITE
  - PROCEDURE

ANTICIPATED CRITICAL EVENTS

- ☐ SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?
- ☐ ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?
- ☐ NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?

HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES?
- ☐ YES
- ☐ NOT APPLICABLE

IS ESSENTIAL IMAGING DISPLAYED?
- ☐ YES
- ☐ NOT APPLICABLE

SIGN OUT

NURSE VERBALLY CONFIRMS WITH THE TEAM:

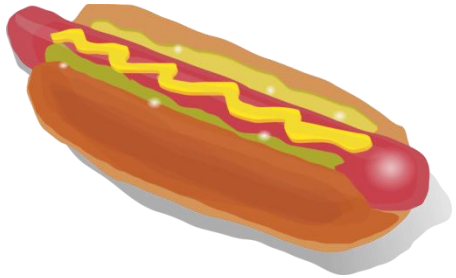
- ☐ THE NAME OF THE PROCEDURE RECORDED
- ☐ THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)
- ☐ HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)
- ☐ WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED
- ☐ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT

THIS CHECKLIST IS NOT INTENDED TO BE COMPREHENSIVE. ADDITIONS AND MODIFICATIONS TO FIT LOCAL PRACTICE ARE ENCOURAGED.

Source: World Health Organization Surgical Safety Checklist (First Edition). Retrieved May 8, 2009 from http://www.who.int/patientsafety/en/index.html

Waste (Muda) Walk

Sasha



Andy

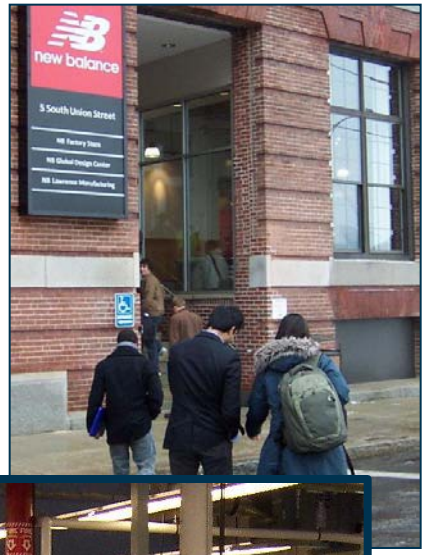
- With your team, take 10 minutes to Identify with colored dots the
  - Value added process steps
  - Necessary waste process steps
  - Pure waste process steps
- Use the 8 wastes as a guide

- Be ready to report your answers to the class, including your questions

Go to the *Gemba*

*Gemba** - the actual place

- Basic tenet of lean thinking – go to the place where work is being done and observe first hand the process in action
- Japanese call this *genchi genbutsu*, or go see for yourself
- Honda calls this the *three actuals*
  - Go to the actual place
  - Talk to the actual people
  - Doing the actual work
- Relying on data and observations produced by others does not give a complete understanding



Photos by Earll Murman

* Sometimes the alternate transliteration *genba* is used.

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