KAIZEN AND LEAN SMALL TOOLS
Target Cost

- Owner – Universal Health Services
- Hospital costs in California - $1.5M to $2M per bed
- Target Cost for TVH was $140,000,000
  - 140 beds
  - 178,000 square feet
- An extremely aggressive target helps reinforce the need for innovation and collaborative spirit
BACKGROUND
TEMECULA VALLEY HOSPITAL

IFOA Contract Signers

Signing the contract was as symbolic as it was legally binding. Everyone was present – no one mailed it in.
BACKGROUND
TEMECULA VALLEY HOSPITAL
BACKGROUND

TEMECULA VALLEY HOSPITAL
What is Kaizen?

• Continuous Improvement
• Deming Circle/PDCA

How is it implemented?

• Toyota Production System
• Small Tools
Examples

- 5-why
- 5S
- A3
- Value Stream Mapping
- Reflection
PROBLEMS

No Matter how Great and Destructive your Problems May Seem Now, Remember, You’ve Probably only Seen the Tip of Them.
5 WHYS

- Problem solving tool
- Helps to identify symptoms
- Will identify root cause as symptoms are explored
- Use for problems related to human interaction
5 WHYS

Symptom?  Problem?
How do you do a 5 Why?

• Form a group
• Develop Problem Statement
• Ask “why?”, ask “why?”, ask “why?”...
• Develop countermeasures
• Implement change
5 WHYS

Problem Statement

Why 1

Why 2A

Why 3A

Why 4A

Why 5A

Why 2B

Why 3B

Why 4B

Why 5B

Why 2B

Why 3C

Why 4C

Why 5C

Why 2B

Why 3C

Why 4D

Why 5D

Why 2B

Why 3C

Why 4E

Why 5E

Why 2B

Why 3C

Why 4F

Why 5F

Why 2B

Why 3C

Why 4F

Why 5G

Why 2B

Why 3C

Why 4F

Why 5H
WHAT IS THE PROBLEM?

What we wanted: Approved, constructable civil documents

What we got: Unapproved, inaccurate, incomplete, uncoordinated civil docs.

Why?
5 WHY

TEMECULA EXAMPLE

5 WHY LOGIC TREE

WHY

1. Poor

Constructability Review on Docs

2. Continual Blind (Even after Multiple Red Passes)

3. Trusted Civil Experience on Site

4. Civil Design Team Was Not an Integrated Member of Our Team

5. Requests Were Not Responded to (Profiles, Etc.)

6. No Modeling (Subset of #1)

COUNTERMESURES
5 WHY

TEMECULA EXAMPLE

1. Early Collaborative Effort Was Low

2. Too Much Focus on Agency Approval and Land Development

3. The Inherited Site Plan Was Not Reviewed or Challenged

4. They Were Involved with the Project Prior to Our Team and We Learned That They Believed We Had Appropriate Clearances

5. FEED Plans Were Consistent and Often Team Did Not React (see 3b(ii) Communication)

6. Appropriate Builders Were Not Partnered w/Civil Developers (Design → Bid → Build)

7. Civil Team Was Not Making Appropriate Commitments in Big Room (Approvals, GC)

8. Civil Team Was Not On-Boarded

9. Perceived "Great Cost" of Proper Integration

10. No Analysis Attempted/Computed

11. Not Co-Located
From manufacturing...

- Sort
- Simplify
- Sweep
- Standardize
- Sustain
For design and construction...
5S
5S

After
5S

TOOL SHADOW BOARDS

BEFORE

AFTER
5S – TEMECULA EXAMPLE
When do we use them?

• When there is waste
• Improve workflow

How?

• Understand all aspects of current state
  – Activities, Operations, Steps, Durations
• Identify target areas of improvement
PROCESS & VALUE STREAM MAPPING
PROCESS & VALUE STREAM MAPPING
TEMECULA ED PROCESS MAP

Triage → Waiting → Assign Room → Provider Encounter → Collect Data → Assess Data → Treatment → Disposition

Non-Value Added, Pre-Process Waiting

Provider Encounter → Initial Treatment → Test Result Waiting → Assess Data → Assign Room → Definitive Treatment → Disposition

Non-Value Added IN-Process Waiting
### Diagnostic Services

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<tr>
<th>Service</th>
<th>Probability</th>
<th>Task Time Mean (min.)</th>
<th>Task Time Variability (min.)</th>
<th>ED Resource Required</th>
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<tr>
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<td>Respiratory Therapy</td>
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<td>3</td>
<td>RT</td>
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<td>MD</td>
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<td>MD</td>
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**TEMECULA ED PROCESS MAP**

**Patient Arrival:**
- Empirical Daily Variability
- Empirical Acuity Distribution
- Empirical Arrival Distribution

**Quick Registration**
- Uniform Distribution

**Triage Available**

**Wait for Triage**
- PDQ RN/MD Triage Triangular Distribution

**Bed Available**

**Wait for ED Bed**

**RN Assessment**
- Triangular Distribution

**MD Assessment**
- (Levels 1 – 4 Only)
- Triangular Distribution

**Meds Ordered**
- YES 76%

**RN Administer Meds**
- Triangular Distribution

**Diagnostic Services**
- YES 68%

**Centralized Services**
- X-Ray
- CT / MRI
- Fluoro
- Uniform Distribution

**Wait for Results**

**RN Follow-up**
- Triangular Distribution

**MD Follow-up**
- Triangular Distribution

**Treatment Services**
- YES 47%

**Admit Ordered**
- YES 15%

**Wait for Bed in Hospital**

**MD Order Discharge**
- Percentage of Task Time

**RN Admin Discharge**
- Triangular Distribution

**RN Transport Call**
- Triangular Distribution

**EVS Room Clean**
- Triangular Distribution
ED FUTURE STATE FLOOR PLAN

Entrance

Ambulance Vestibule
When do we use them?

- Multi-faceted problem
- Multi-disciplinary problem
- For complicated analysis
- Presentation of value proposition
- As a record of decision
Section 1 – Background

The UHS Temecula Design and Construction teams have been asked to generate substantial cost savings through innovation. Innovation of construction means and methods is a primary area of focus. The prefabrication of the patient room bathroom has been identified as an opportunity to put some of these strategies into practice.

The patient room bathroom is an attractive element for application of prefabrication for the following reason:
- **Repeatability** – the top three floors of the building are identical in floor plan and patient room layout
- **Modularity** – the bathroom represents a relatively small portion of the room and appears to be an appropriate size for prefabrication and transport to the point of installation
- **Multi-trade Assembly** – it will take efforts from MEP and drywall trades in order to successfully construct and install the module – especially attractive from an innovation standpoint

The prefabrication of the patient room bathroom module represents realization of one of the initial innovation ideas from early on in the design process. It was identified early as an opportunity for substantial improvement. The team believes it is the right thing to do should the costs align with the target budget.

Section 2 – Problem Statement/Current State

Current standards related to patient bathroom construction dictate that these bathrooms shall be stick-built, in place, with framing and plumbing trades coordinating their work in order to complete the assembly. The general sequence is as follows:

1. After the concrete deck has adequately cured, the plumbing trade moves batched material to the point of installation.
2. The plumbing trade completes riser piping and in wall not in conflict with framing. All cold water, hot water, waste and vent piping required for the assembly is installed in place.
3. The framing trade is given the go-ahead from the plumbing trade to complete the framing of the walls.
4. The plumbing contractor installs any through-stud pipe required, and straps all pipe to the studs.
5. Framing and plumbing inspections are scheduled.
6. Drywall begins.

Section 2 – Problem Statement/Current State (continued)

Primary issues or challenges presented by prefabricating this module are as follows:
- OSHPD’s lack of familiarity with prefabrication strategies and deviation from standard construction practices
- Trade partners lack of experience in building, installing and obtaining successful inspection of such a module
- Trade partners lack of experience in projecting the cost/savings of building such a module
- Framing will need extra strength in order to hold the pipe while it’s moved into place
- Set-up costs for an on-site prefabrication warehouse/tent may be substantial

From an innovation standpoint, the team believes that prefabrication of multi-trade assemblies will drive the industry to better labor productivities and lower construction costs. There is a strong desire to prefabricate this module, even if those estimated costs are not substantial.

The team feels that a mock-up assembly will help us to identify other potential problems with this assembly and allow us a chance to remedy them prior to actual construction. We may also be able to refine our construction sequence in order to maximize savings. We are also optimistic that prefabrication of these assemblies can reduce the overall construction duration, in turn, reducing the general conditions costs of the primary project players.

Section 4 – Analysis

The team has prepared a construction sequence identifying all of the steps required for construction and installation of the prefabricated bathroom module. Upon completion of the appropriate sequence, the team provided labor, material and rental equipment cost estimates to perform the work based on the agreed upon prefabrication plan. Associated cost variation from traditional building practices are as follows:

- **Framing Labor Costs** $18,000
- **Bracing Costs** $20,734
- **Crane Costs** $14,000
- **Tent Costs** $90,100
- **Plumbing Labor Costs** $148,000
- **GC Costs** $0

**TOTAL** $1,166 SAVINGS

Although the overall savings appear to be minimal at this point, the desire to innovate and learn will ultimately drive this decision.

Section 5 – Proposal

Based on the anticipated cost savings at this time (at worst the team breaks even), we propose to prefabricate patient room bathrooms. Prior to a final decision, a mock-up will be constructed to verify or revise our initial cost projections. At that point, we may elect to move forward with prefabrication or implement other ideas to allow for even greater construction productivity. The mock-up is vital to understanding the build of the module. Mock-up construction should take place in February of 2011.

Section 6 – Follow up

This idea was discarded following construction of the mock-up. The bathroom should have been designed first, then inserted.
Background UHS has asked our team to validate the cost and timeframe required to construct the Temecula Valley Hospital (TVH) template in Corona (CRMCII) as a replacement hospital for the existing Corona Regional Medical Center (CRMCII). The purpose of this validation is to outline the primary cost and schedule differences and prove CRMCII to be a viable project at a cost of less than $150MM. This team was selected based on the experience and knowledge accumulated during the TVH design and construction effort. No team is better qualified to assess the difference in scope between TVH and CRMCII.

Current State CRMCII is a hospital constructed in 1960 and is in need of extensive repair to both structural and non-structural elements. A project intended to repair these deficiencies is currently underway, but UHS leadership has questioned the true value of the $34MM project, as well as $60MM in other required technology-based improvements, as it relates to the longevity of the hospital as a viable acute-care facility. The planned improvements will allow CRMCII to remain operation through 2030 only. There is land, immediately adjacent to CRMCII, that could potentially accommodate the CRMCII footprint.

Future State CRMCII will be a 2010 CBC compliant acute-care facility consisting of 5-stories and 179,000 sq. ft. Services include:
- 120 med/surg patient rooms
- 20 ICU rooms
- 12 bed ED + adjacent 28 bed CTU
- 6 Operating Rooms
- 1 Minor Procedure Room
- Nuclear Medicine
- MRI and CT
- Mobile Tech Dock
- 500 FTEs
- 40 ED/CTU rooms

Like TVH, CRMCII will allow for expansion of 1st Floor D&T services to the east and west. Future expansion of infrastructure such as bulk O2, emergency power and associated fuel storage have been planned. Year 2030 requirements related to onsite water and sewage storage have also been planned. Parking for the facility (as pictured) will exist on grade only. No parking structure will be required. In contrast to TVH, CRMCII will not include a helipad.

Analysis: Schedule
See milestone schedule for CRMCII (attached).

- Begin Entitlement/Approval Process: 2/17/2012
- Begin Construction: 5/27/2013
- Substantial Completion: 4/10/2015
- License: 8/10/2015

Total project duration is 42 months.
TVH project duration is 45 months.

Primary differences in schedule when compared to TVH can be attributed to:
- EIR (Environmental Impact Report) duration is 12 months and will drive start of construction—not OSHPD plan approval. This duration includes all EIR preparation, hearings and approvals.
- The 9 increments submitted at TVH are condensed to 6 increments with submittal of Increment 1 design package to OSHPD occurring within 3 months of project approval.
- Construction to begin 15 months after project approval.

Analysis: Risks

Size and Services The team has learned that CRMCII should contain elements of a tertiary hospital. The team will need UHS to identify the need for services unaccounted for in the TVH design. See the attached table.

Flexibility in Future Expansion While expansion of the facility will be possible, the size and orientation of the site makes this substantially more difficult than the effort required at TVH.

Facility and Staff Impacts CRMCII staff and patient parking will be unaffected during construction activities. Parking will be made available at lots immediately adjacent to the existing facility.

Land Acquisition It is assumed that all land required for initial build-out of CRMCII can be obtained. Estimated costs to obtain have been included.

Environmental Impact Report Conditions of approval and associated costs are not fully understood today. We’ve allotted costs for items we can anticipate, but there may be requests that we have not considered.

Utility Relocations and Tie-ins/Other Improvements We’ve assumed costs for utility tie-ins as we understand them today. Should conditions differ from those anticipated, we could take on substantial cost.

Proposal While most of the repairs being considered for CRMCII are voluntary in nature, the seismic upgrades to the CRMCII structure are required for the facility to continue providing acute-care services following December 31, 2012. We can delay the start of these seismic upgrades until June 1, 2012 in order to allow for thorough cost and scope analysis of CRMCII. Should the CRMCII project be rejected based on the cost and scope presented, seismic upgrades to CRMCII can resume now and be completed by May 1, 2013.

We propose...that UHS make $3.5MM available to this team by February 2, 2012 for further analysis and site specific design of CRMCII. We can provide cost and scope certainty of CRMCII to UHS by June 1, 2012.

Analysis: Budget

Total Cost
- TVH: $150,044,000
- CRMCII: $148,503,266
- Savings: $1,540,733

Primary variances in cost are as follows:
- Design and Preconstruction Efficiency $8,000,000
- Software Application Licensing due to Reuse $3,800,000
- Medical Equipment Reuse $1,500,000
- Corona Development Property Premium $2,000,000
- Predicted Material and Labor Cost Escalation $3,800,000

See complete TVH vs. CRMCII budget analysis (attached).

Immediately Required Actions & Follow Up Immediate actions will consist of the following:
- Borings of the site should be taken immediately in order to allow for immediate commencement of structural design on February 2, 2012. Estimated cost is $20,000. UHS approval needed.
- Continued evaluation of services and programming differences between CRMCII and CRMCII. Begin developing concepts to accommodate these services at the CRMCII site.
- Continued communication with City and Agency personnel in order to develop a firm understanding of potential Conditions of Approvals and other impacts to the plan in place.
REFLECTION

Fundamental in creating an environment of learning and *kaizen*

When do we use them?

• Following a breakdown
• But...they should be occurring regularly

START, STOP, KEEP