Lean Six Sigma DMAIC Project (Example)

Green Belt **Project Objective:**
To Reduce Clinic Cycle Time
(Intake & Service Delivery)

Last Updated: 1-15-14

Team: ***The Speeders***

Tom Jones (Team Leader)

Steve Martin	**Art Franklin**	**Mary Jefferson**
Amy Kidd	**Bob Villa**	**Jimmy Smits**

Linda Hill (Sponsor)

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Background

- The Community Health Organization (CHO) Leadership Team determined that Clinic Cycle Time (Intake & Service Delivery) needed improvement.
- This objective was driven by patient satisfaction survey results from throughout the service area.
- The Executive Director assigned Tom Jones as the Team Leader, and requested Mr. Jones to assemble a cross-functional company-wide team to develop a Project Charter and confirm the need for improvement.
- The team decided to use the DMAIC methodology and Lean Six Sigma tools to address this issue.

Theme Selection Matrix

The team evaluated cycle time in the context of the 5 greatest issues identified in the strategic planning SWOT process.

Theme Selection Matrix **Date: June, 2013**

Potential Themes	Importance	Need to Improve	Overall Score
Facility Cleanliness	3	4	12
Employee Lost Time Incidents	5	3	15
Employee Absenteeism	3	3	9
Clinic Cycle Time (Check-in to Check-out)	5	5	25
Customer Service Responsiveness	5	2	10

Scale:
1 *= Negligible* ***2*** *= Somewhat* ***3*** *= Moderate* ***4*** *= Very* ***5*** *= Extreme*

The team selected “Reduce Clinic Cycle Time” as its theme because cycle time was a driver of patient satisfaction, retention, and referral. Cycle Time was also a strategic objective and Key Performance Indicator on the Senior Leadership Scorecard.

Project Charter

Green Belt Team Project Charter		
Business Case	Project Name (Theme):	To Reduce Clinic Cycle Time (Current Actual = 70 Minutes)
	Problem / Impact:	Clients expect to be treated within a reasonable time. Longer than necessary Length of Stays (LOSs) cause Client dissatisfaction and loss of trust in the clinic's ability to meet their health care needs.
	Expected Benefits:	Reduce Arrival to Checkout (Intake & Service Delivery) Times: Reduced # of Client Complaints; Increase Client Satisfaction
Objectives	Outcome Indicators:	Q2 - Average # of Minutes to Serve Clients (from Arrival to Checkout)
	Proposed Target(s):	Target = 39 minutes
	Timeframe:	July 2013 through December 2013
	Strategic Alignment:	Supports CHO Strategic Plan
Scope	In Scope:	Clients within CHO Area
	Authorized By:	Linda Hill
Team	Sponsor(s):	Linda Hill
	Team Leader:	Tom Jones
	Team Members:	Steve Martin, Art Franklin, Mary Jefferson, Amy Kidd, Jimmy Smits
	Process Owner(s):	Linda Hill
	Mgmt. Review Team:	Dr. Kildare and Linda Hill
Schedule	Completion Date:	December 31, 2013
	Review Dates:	Monthly and Final Review in November 2013.
	Key Milestone Dates:	See Action Plan

Project Planning Worksheet

Note: In some cases a team may choose to use a Project Charter and a separate Project Planning Worksheet with DMAIC schedule as follows.

Project Planning Worksheet – Page 1 of 2

Theme	Reduce Clinic Cycle Time 31 minutes by 12/31/13 (77.5% of Gap)
Problem Statement (Summarize)	73.7% of Clients served that were taking longer than 30 minutes required CBC Lab Work
Team Work Location	Miami, FL
Team Name	The Speeders
Duration	6/13/13 **(mm/yy) through** 12/13/13 **(mm/yy)** **Sponsor:** Linda Hill

Team Members		
Team Leader	Tom Jones	**Team Info**
2nd Team Leader	N/A	Subject matter experts from various disciplines invited throughout meeting schedule.
Team Member 1	Amy Kidd	
Team Member 2	Steve Martin	
Team Member 3	Art Franklin	
Team Member 4	Bob Villa	
Team Member 5	Mary Jefferson	
Team Member 6	Jimmy Smits	
Team Member 7		

Meetings	#	Date	Time	Att.	#	Date	Time	Att.	#	Date	Time	Att.	#	Date	Time	Att.
	1	6/3	9:00a	7	**9**	7/30	6:00p	4	**17**	10/12	2:00p	7	**25**			
	2	6/10	10:00a	7	**10**	8/10	4:00p	4	**18**	10/31	9:00a	7	**26**			
	3	6/17	3:00p	5	**11**	8/17	3:00p	5	**19**	11/15	9:00a	4	**27**			
	4	6/24	2:00p	6	**12**	8/24	7:00a	3	**20**	12/3	10:00a	5	**28**			
	5	7/2	1:00p	5	**13**	8/31	8:00a	7	**21**	12/19	4:00p	7	**29**			
	6	7/9	9:00a	7	**14**	9/4	9:00a	7	**22**				**30**			
	7	7/16	11:00a	7	**15**	9/11	4:00p	6	**23**				**31**			
	8	7/23	Noon	6	**16**	9/18	5:00p	5	**24**				**32**			

Project Planning Worksheet

Note: In some cases a team may choose to use a Project Charter and a separate Project Planning Worksheet with DMAIC schedule as follows.

Project Planning Worksheet DMAIC Schedule – Page 2 of 2

Outline of Activities

= Proposed = Actual

STEP	2013 J	F	M	A	M	J	J	A	S	O	N	D	2014 J	F	M	Comments / Exceptions
Define																
Measure																
Analyze																
Improve																
Control																

Define → Measure → Analyze → Improve → Control

Reason for Improvement

- **Project Name:** Reduce Clinic Cycle Time (Intake & Service Delivery)
- **Situation:**
  - 11 Clinics in Service Area
  - Average Cycle time = 70 minutes
  - Industry Best = 30 minutes
  - Customer Satisfaction = 68%
  - Customer Complaints = 3.7/100 encounters
  - Strategic Issue related to patient satisfaction, revenue, and Federal funding
  - 20% of patients leave before being seen

Reason for Improvement

Stakeholders and Needs

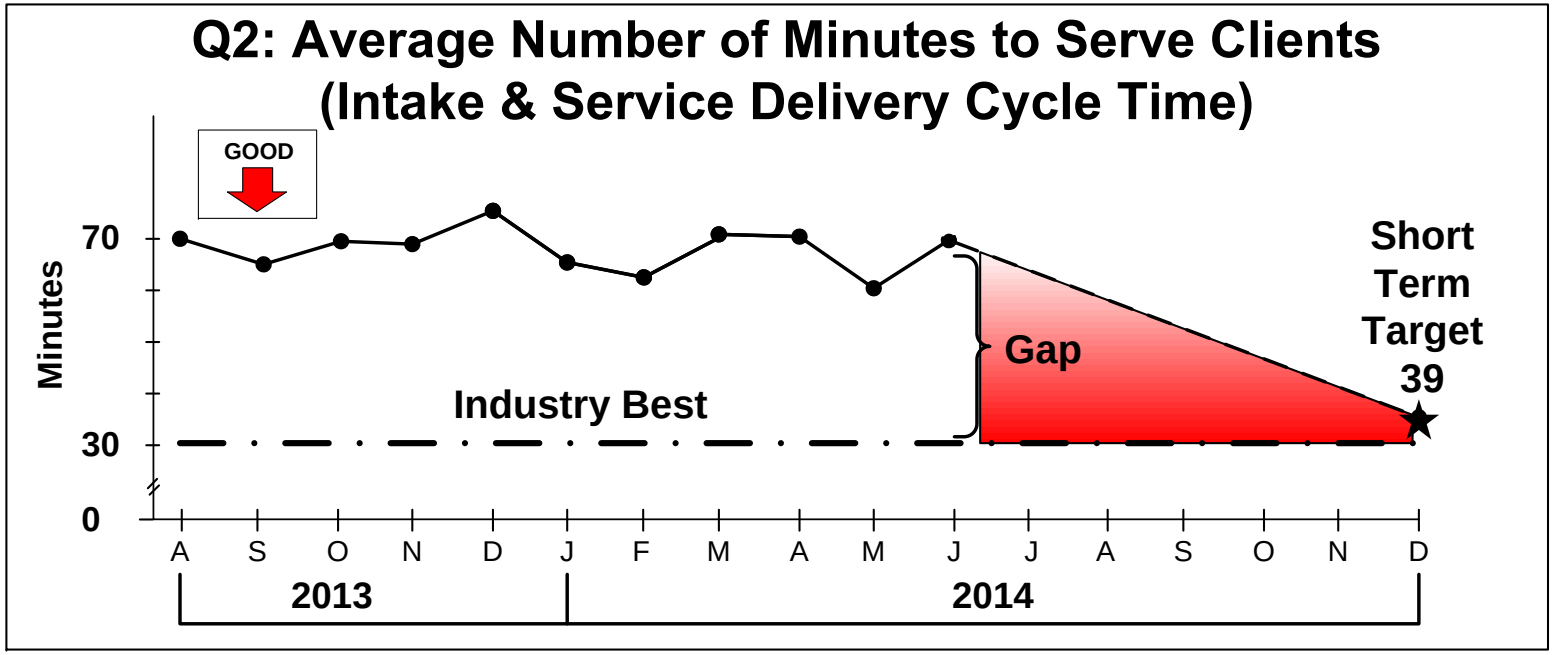
Stakeholders	Needs
Customer / Patient	Quality Medical Services
	Timely Medical Services
	Accurate Billing for Services
Company / Senior Leadership Team	Retain Existing Patients (Maximize Revenue)
	Add New Patients (Revenue Growth)
	Maximize Funding Potential (No Penalties)
Employees	Meaningful Work
	Career Opportunities
	Fair Pay and Benefits
	Recognition

1. ☑

Costs of Poor Quality

Stakeholder	Pain	Annualized "Costs"
Customer / Patient	Low Satisfaction	68% Satisfaction
Customer / Patient	Complaints	3.7/100 Encounters
Customer / Patient	Leaves Without Being Seen (LWOBS)	20% LWOBS
Company	Lost Patients	$1.5 Million Revenue
Company	Financial Penalties from Funders	$900,000 in Penalties
Employees	Rework	10% Rework = $2.5 Million per Year in Wasted Labor Expense

Line Graph



2.

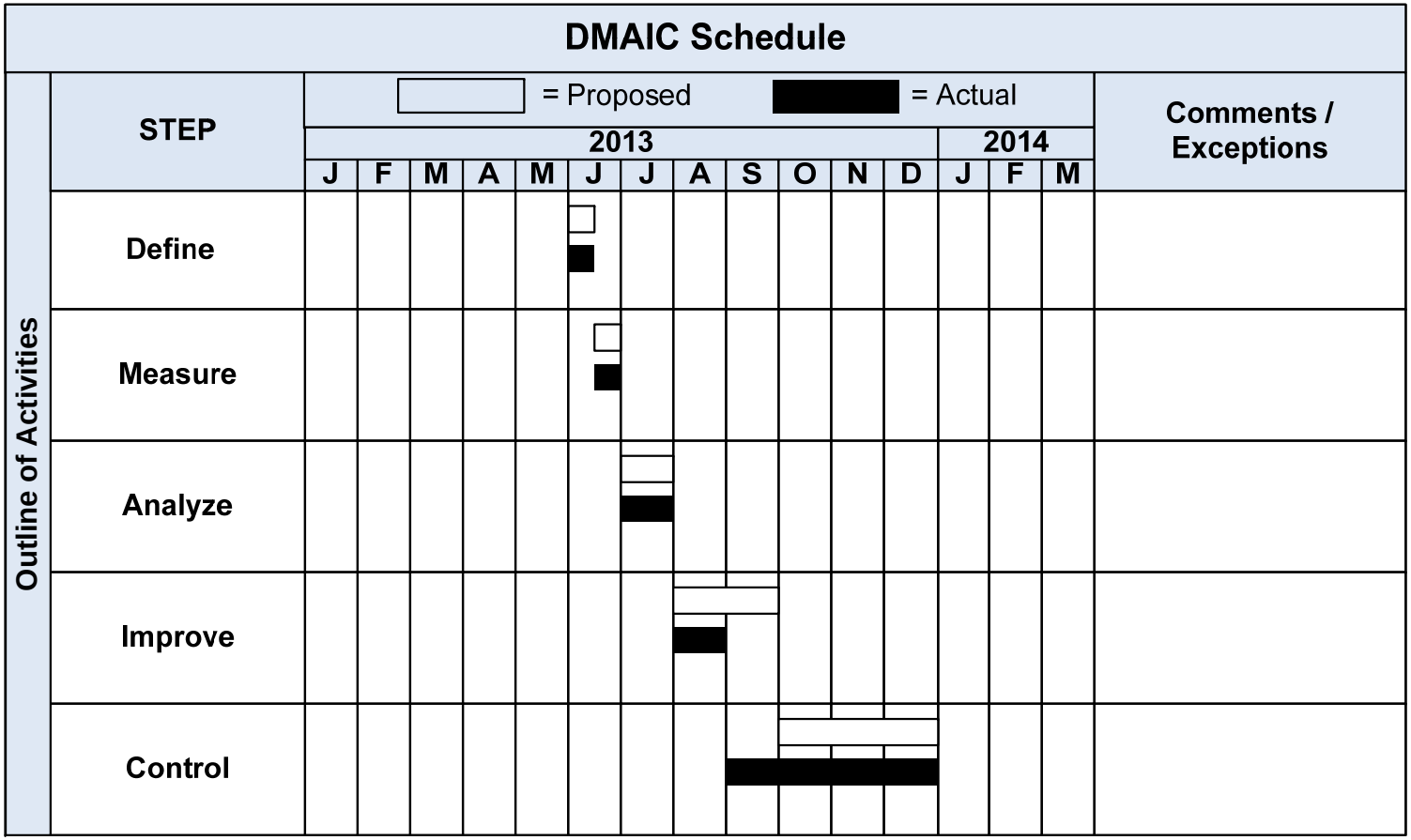
Theme: Reduce Clinic Cycle Time 31 minutes by 12/31/13 (77.5% of Gap).

3.

Define | Measure | Analyze | Improve | Control

DMAIC Schedule

A schedule for completing the five DMAIC steps was developed.



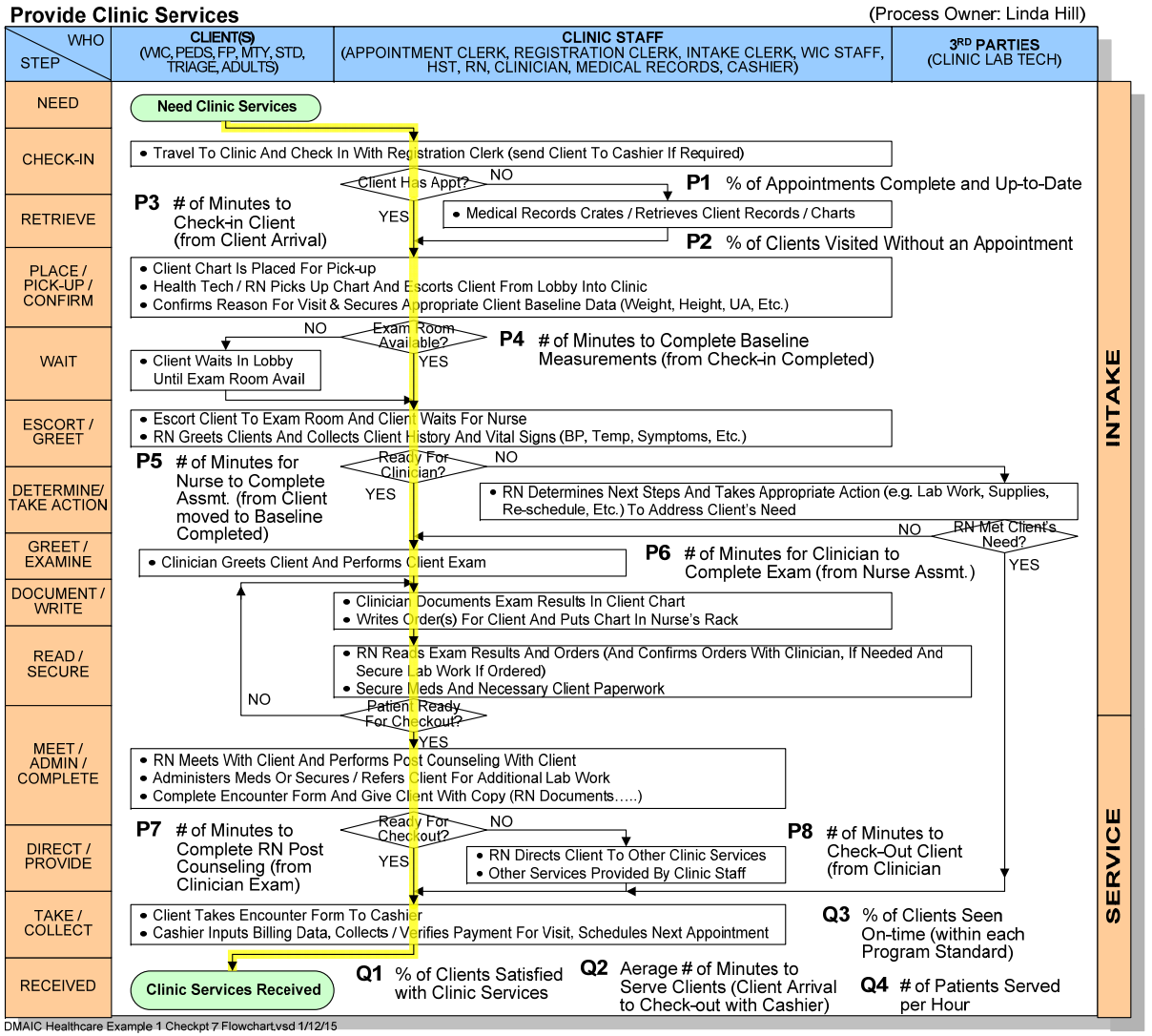
4. ☑

The Sponsor signed off on the project's purpose, scope, and significance. 5. ☑

Define → **Measure** → **Analyze** → **Improve** → **Control**

Flow Chart

- The team developed a flow chart.



Define | Measure | Analyze | Improve | Control

Eight (8) Categories of Waste (Muda)

The team applied the **8 Wastes** to the process with an emphasis on cycle time.

- **D**efective parts, services & rework
- **O**ver-production
- **W**aiting
- **N**on-utilized talent & wasted knowledge
- **T**ransporting
- **I**nventory
- **M**otion
- **E**xcess processing

8 Wastes

8 Wastes	Potential Causes of Waste
1. Defects & Rework	• Patients show up late for appointments. • Walk-ins are accepted and worked into the patient flow. • Must call-back patients many times to reach them.
2. Over-production	Requiring patients to change gown when not necessary.
3. Waiting	• Patient waits for blood draw and lab work. • Patients without appointments are mixed with those that have appointments. • Exam rooms are not available. • Patient must wait for nurse. • Clinician not informed immediately when nurse completes exam. • Patient must wait to be checked out. • Patients must wait in line at cashier.
4. Non-Utilized Talent & Wasted Knowledge	• Only clinicians are allowed to order lab work. • Physicians required to complete routine paperwork.
5. Transporting	Must move equipment between exam rooms.
6. Inventory	Supplies and equipment are ordered based on the calendar rather than demand.
7. Motion	Desk top computers not positioned in exam rooms to provide convenient access by physician or nurse.
8. Excess Processing	Unnecessary tests may be performed on the patient.

Checksheet (Used to collect & analyze data)

A checksheet was developed to collect data on patient flow through the clinic for 100 patients. 6.

Clinic Services Summary

BC	DEMOGRAPHICS													Milestone Dates / Times									
	Client Information											Clinic			M1			M2	M3	M4	M5	M6	M7	M10
A	B	C	D	E	G	H	I	I	I	I	I	J	K	L	M	N	O	P	Q	R	S	T	U	X
Line #	Program Type	Client Had Appmt? Y/N	Client Gender	Client Eligibility Status	Client Age at Arrival Date	Client Speaks English?	Visit Type	Chief Complaint	Acuity	Primary Diagnosis	Lab Test	# of People Under staffed during Visit Day	Clinic Locn	Sched'd Appmt Time	Arrival Date / Time: Date	Day	Time	Check In Compl (ready for Pickup)	Baseline Measures Compl'd	Moved to Exam Room	RN Completes Vitals / Asmt	Clinician Completes Client Exam	RN Completes Post Counseling	Checkout Compl'd by Cashier
		%Y	%F		Avg	%Y																		
		40.0	66.7		41.8	40.0																		
1	Matern	Y	Fema	Medicaid	82	Y	Check	Dizziness	Urgent	Dizziness -	Culture/GM	-2	Mirama	1:30 PM	07/05/06	We	1:30 PM	1:41 PM	1:56 PM	2:15 PM	2:34 PM	2:52 PM	3:15 PM	3:24 PM
2	STD	N	Male	Self-Pay	20	N	Supplie	- Possible	Less-Urg	Finger Abs	UA (w/o Mi	0	Coral G	9:00 AM	07/06/06	Th	9:00 AM	9:13 AM	9:20 AM	9:35 AM	9:45 AM	9:56 AM	10:12 AM	10:23 AM
3	Adults	Y	Fema	Medicaid	19	Y	Proble	Other,Urina	Less-Urg	Bladder Inf	No Labwor	-1	Miami E	NA	07/05/06	We	1:30 PM	1:41 PM	1:56 PM	2:15 PM	2:34 PM	2:52 PM	3:15 PM	3:24 PM

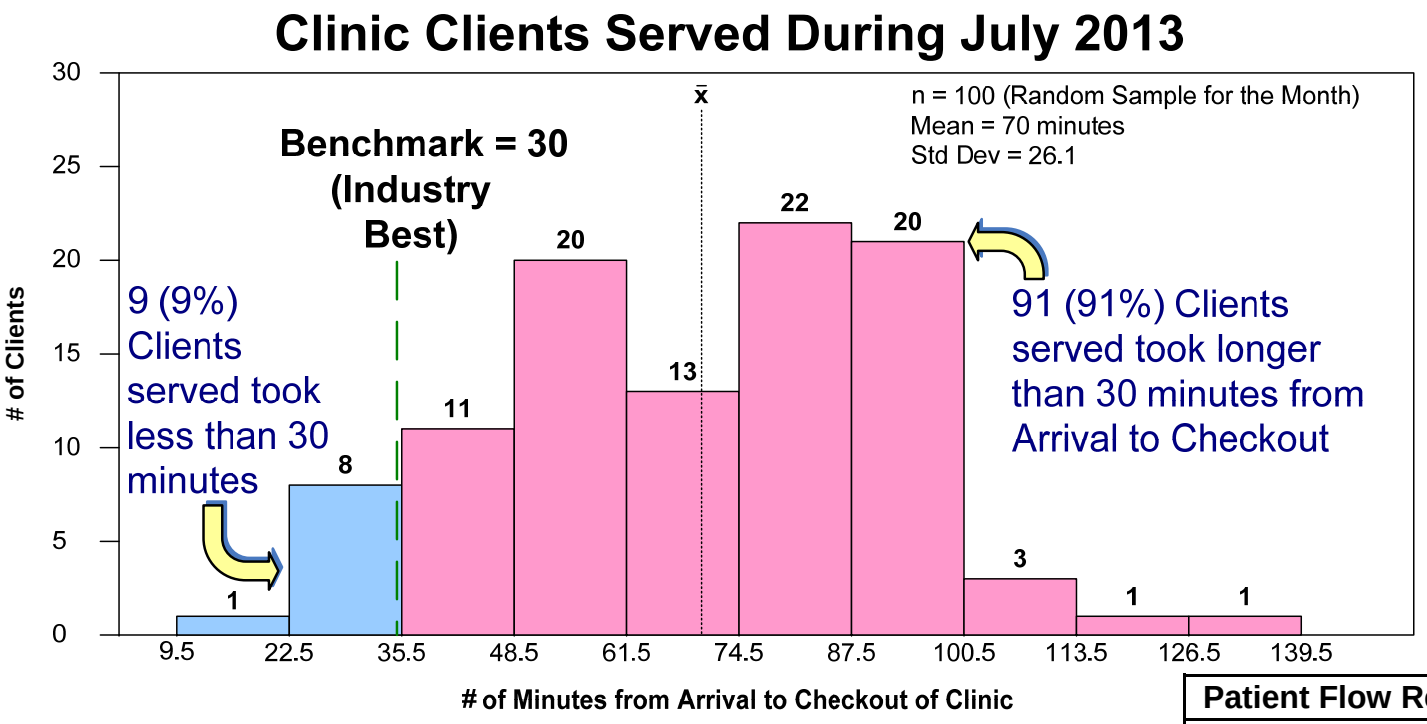
Duration (Minutes)												
Y= P-O	Z= Q-P	AA= R-Q	AB= S-R	AC= T-S	AD= U-T	AE= X-U	AF= X-O	AG= W-V	AH	AI	AJ=Y if AF <=Std	AK
Arrival to Chk In Compl	Ck In Compl to Basline Compl	Baseline Compl to Exam Room	Exam Room to RN Asmt	RN Asmt to Clinician Exam	Clinician Exam to Post Counseling	Post Counseling to Cashier CkOut	Arrival to Cashier CkOut	Lab Work Start to Lab Compl'n	Appmt Info Complete and Up-to-Date Y/N?	Client Visited without an Appmt? Y/N	Client Seen On Time? Y/N	Comments (Variations from normal process)
Average # of Minutes									%Y			
12.0	11.0	17.0	14.5	14.5	19.5	10.0	98.5	2.0	50.0	50.0	0.0	
P3	P4	P5	P6	P7	P8	P9	Q2		P1	P2	Q3	
11	15	19	19	18	23	9	20	2	Y	Y	N	System down;
13	7	15	10	11	16	11	78		N	N	N	
11	15	19	19	18	23	9	24	2	Y	Y	N	

Note: *Checksheets may be used in all DMAIC steps.*

Histogram - Stratification

7.

The team collected a random sample of 100 clinic clients served during July 2013. **The team analyzed the data many ways and found…**



Patient Flow Report
When: June 2013
Where: Miami, FL
Who: J. Smits x 313

The team looked closer at these 91 clients served.

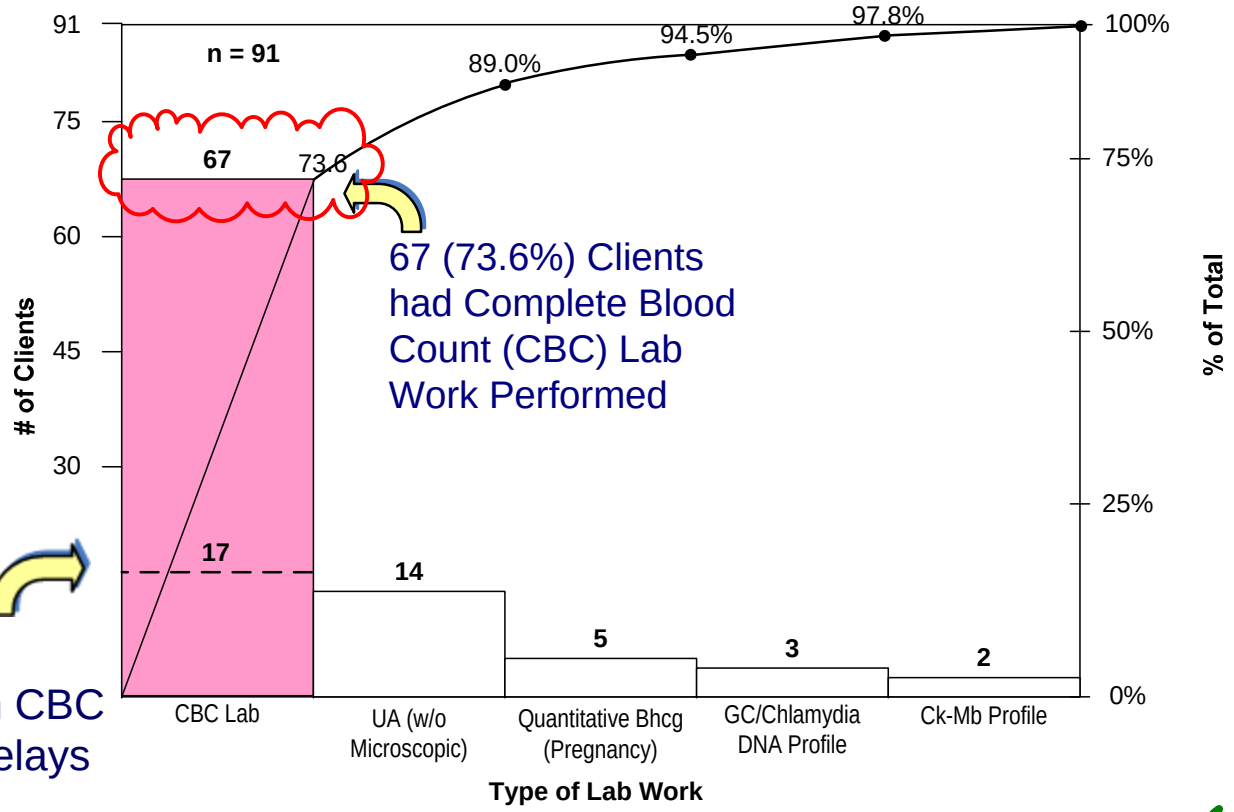
Define | Measure | Analyze | Improve | Control

Pareto Chart – Stratification Continues

The team stratified the 91 clients which took longer than 30 minutes many ways and found…

7.

Clinic Clients Served During July 2013 taking longer than 30 minutes from Check-in to Check-out and involving Lab Work.



We set a target to reduce the percentage of CBC Lab clients taking longer than 30 minutes from check-in to check-out by 75%.

8.

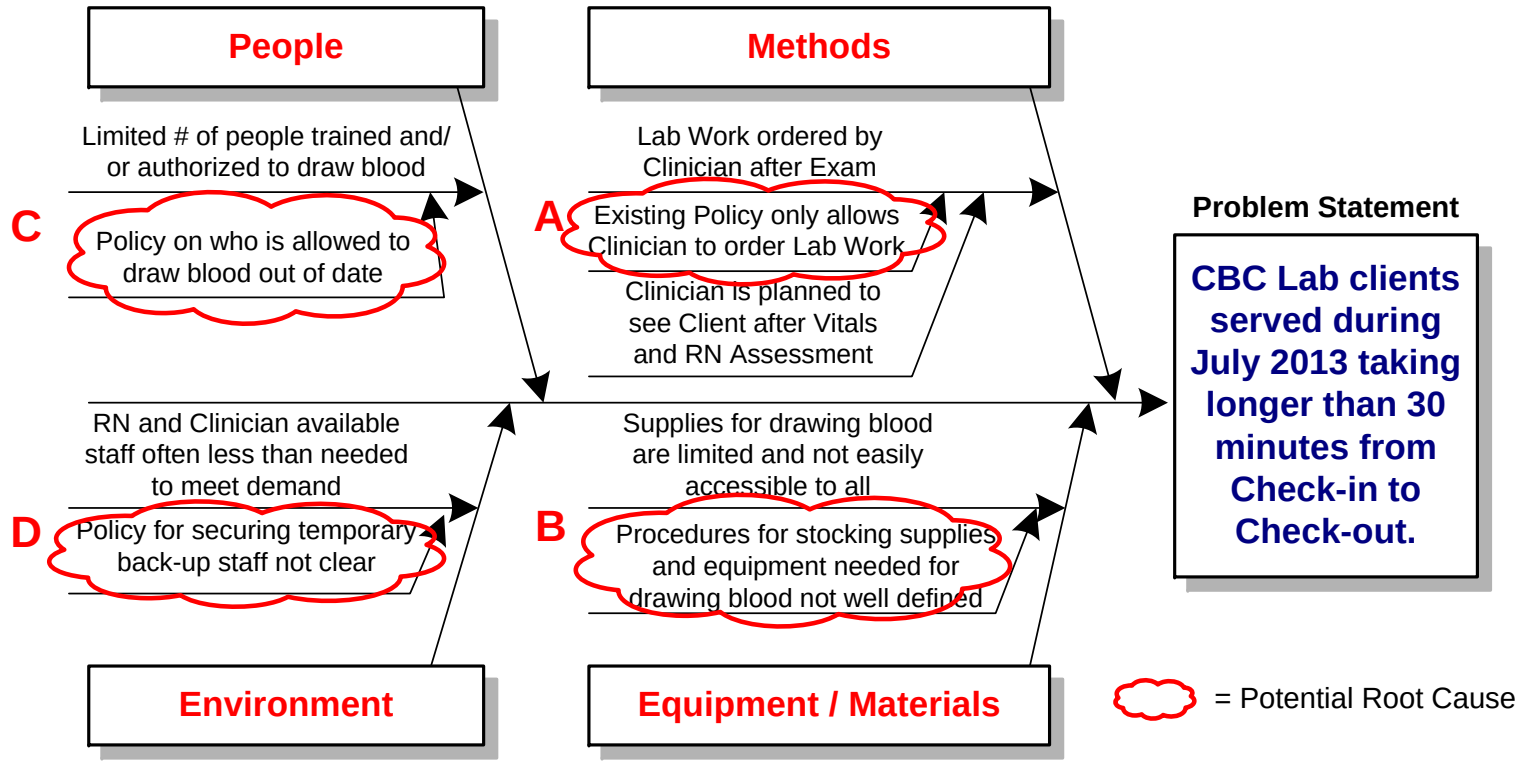
Define | Measure | Analyze | Improve | Control

Problem Statement and Target

- **Problem Statement:** 73.6% of clients served that were taking longer than 30 minutes from Check-in to Check-out required CBC Lab work. 9.
- **Target:** We will reduce the percentage of CBC Lab clients taking longer than 30 minutes from Check-in to Check-out by 75%. 10.
- If the target is achieved, the team determined that it could achieve the short term target of 39 minutes Average Cycle Time on the Theme Indicator in the Define step.
- The team looked closer at these 67 clients.
- The Sponsor signed off on the project's focus and target. 11.

Cause and Effect (Fishbone) Diagram

The team completed Cause and Effect Analysis and found… **12.** ☑



The team next looked to verify the 4 identified Potential Root Causes. **13.** ☑

Define | Measure | **Analyze** | Improve | Control

Probable Cause Verification Matrix

The team collected data to verify causes and summarized its findings on a Verification Matrix.

	Potential Root Cause	How Verified?	Root Cause or Symptom	
A.	Existing Policy only allows Clinician to order Lab Work	Team reviewed current Policy and guidelines and verified Policy only allows Clinician to order Lab Work.	Root Cause	A
B.	Procedures for stocking supplies and equipment needed for drawing blood not well defined	Team reviewed current guidelines and verified that no clear Policy exists.	Root Cause	B
C.	Policy on who is allowed to draw blood out of date	Team reviewed current guidelines and found Policy is current and matches company standards	Symptom	C
D.	Policy for securing temporary back-up staff not clear	Team reviewed current guidelines and found there is no written Policy on when to secure back-up staff to meet staffing needs.	Root Cause	D

Probable Cause Verification Matrix

- A checksheet was developed and 100 samples were taken to determine the frequency of occurrence of each selected cause. This enabled the team to estimate the impact of each root cause on the gap. Three (3) primary causes were verified by the team. **14.** ☑

  - Root Cause A = present 35% of the time = 23 patients; **15.** ☑
  - Root Cause B = present 22% of the time = 15 patients;
  - Root Cause D = present 19% of the time = 13 patients;

    Total = *51 patients*

    Estimate: 51 ÷ 67 = 76% which approximates the target in the Measure step of a 75% reduction.

- The sponsor signed off on the verified root causes and impact on the gap. **16.** ☑

Countermeasures Matrix

17. ☑
18. ☑

The team developed and evaluated countermeasures and many potential practical methods and narrowed them down to 6:

Rating Legend: 1 = None 2 = Some 3 = Substantial 4 = High 5 = Extreme				Ratings				
Problem Statement	**Verified Root Causes**	**Counter-measures**	**Practical Methods**	Effectiveness	Feasibility	Overall	Take Action? Yes / No	
Clinic Clients served during July 2013 taking greater than 30 minutes from Arrival to Checkout and involved CBC Lab Work	A. Existing Policy only allows Clinician to order Lab Work	Revise the policy	A1- Develop protocols approved by Clinicians to order Lab Work under certain conditions found by the RN	**4**	**4**	**16**	**Y**	1
			A2- Have Clinician see the Client first	4	2	8	N	
	B. Procedures for stocking supplies and equipment needed for drawing blood not well defined	Develop properly defined procedures	B1- Develop procedures for keeping supplies stocked	**5**	**5**	**25**	**Y**	2
			B2- Use "Kanban" cards to notify staff when supplies down to reorder levels	**5**	**5**	**25**	**Y**	3
	D. Policy for securing temporary back-up staff not clear	Develop standardized staffing procedures	D1- Develop procedures for when to call in back-up staff	**4**	**5**	**20**	**Y**	4
			D2- Cross-train staff to be able to back-up certain positions when vacancies arise	**4**	**4**	**16**	**Y**	5
			D3- Identify paid temporary or volunteer persons willing to come in and help when vacancies arise	**4**	**3**	**12**	**Y**	6

The team next looked closer at implementing the 6 practical methods chosen.

Define | Measure | Analyze | **Improve** | Control

ets™

Barriers and Aids Analysis

The team performed Barriers and Aids Analysis on the 6 Practical Methods selected:

19.

Countermeasure(s): Implement 6 Practical Methods to Improve Clinic Cycle Time		
Barriers		**Aids**
Impact (H,M,L)	**Forces Against Implementation**	**Forces For Implementation**
M	1) Lack of buy-in by Clinic staff (supported by Aid: 1,2,3,4).	1) Management very supportive of efforts due to expected gains in efficiency and patient satisfaction.
M	2) Possible temporary workload issue for staff (supported by Aid: 1,2,3).	2) Beneficial impact on timeliness of Clinics.
H	3) Resources are limited (supported by Aid: 1,2,3).	3) Reduced costs and workload will result.
H	4) Budget is limited (supported by Aid: 1,2,3).	4) Other Clinics already have implemented some of the countermeasures.

The team incorporated this analysis into the action plan.

Action Plan

The team developed an action plan to implement the countermeasures / practical methods (CM / PM). 20.

WHAT: Implement 6 CM / PM to Improve Clinic Cycle Time

Legend: ■ = Actual □ = Proposed

ELEMENTS (HOW)	WHO	SCHEDULE (WHEN) 2013	Cost
		Jul / Aug / Sep / Oct / Nov / Dec	
1. Develop Countermeasures / Practical Methods:			
A1) Develop protocols approved by Clinicians to order Lab Work under certain conditions found by the RN.	Jimmy	Completed 8/30/13	
B1) Develop procedures for keeping supplies stocked.	Tom T.	Completed 8/31/13	
B2) Use "Kanban" cards to notify staff when supplies down to reorder levels.	Dr. House	Completed 8/28/13	$3,000
D1) Develop procedures for when to call in back-up staff.	Steve Martin	Completed 8/30/13	
D2) Cross-train staff to be able to back-up certain positions when vacancies arise.	Ben Franklin	Completed 8/30/13	
D3) Identify paid temporary or volunteer persons willing to come in and help when vacancies arise.	Tom J.	Completed 8/30/13	
2. Secure Management approval of countermeasures. (Share Clinic and staff benefits and cost savings)	Team	Completed 9/30/13	--
3. Communicate / train regional staff in CM / PM and related policies / procedures. (Share Clinic and staff benefits and cost savings.)	Team	Completed 9/30/13	$1,000
4. Implement pilot for countermeasures.	Team	Completed 10/11/13	$500
5. Review pilot and determine benefits and adjust as necessary and present results to management.	Team	Completed 10/16/13	$500
6. Establish ongoing responsibilities and standardize countermeasures into operations	Team	Ongoing	$500
		Total Cost	**$5,500**

21. 22.

- The team implemented the pilot and then completed the action plan.
- The sponsor signed off on the action plan and expected results.

23.

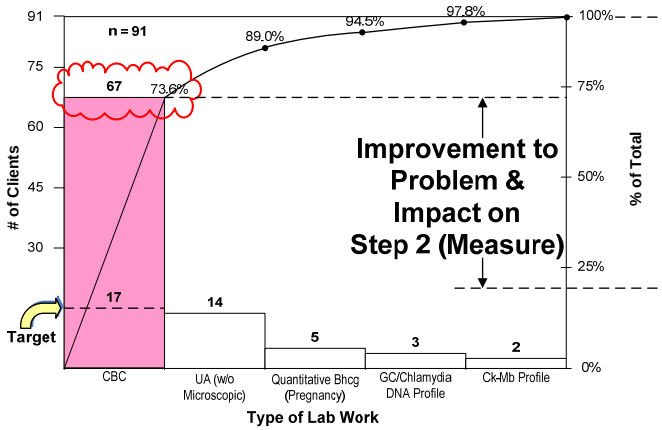
Define → Measure → Analyze → **Improve** → Control

Step 5: Control

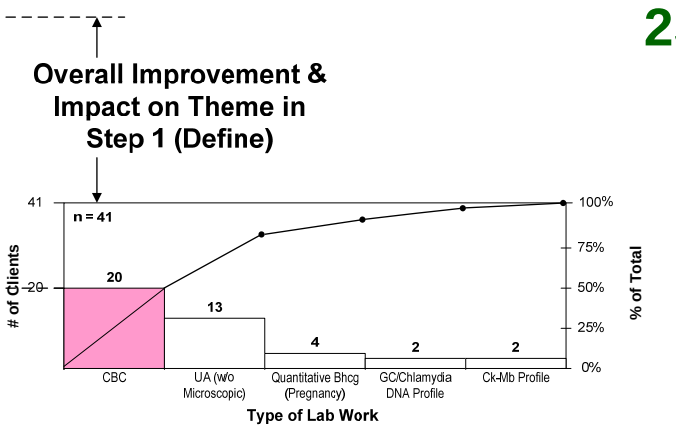
Results

- First, the team confirmed that each root cause identified in the Analyze step was eliminated. **24.** ☑
- Next, the team evaluated the impact of countermeasures on the problem shown in the Measure step by doing another sample of 100 patients and developing "Before" and "After" Pareto charts of clients who exceeded the 30 minute cycle time.

Before



After



25. ☑

- Reduction of 47 CBC Lab patients = 70.2% reduction.
- Target was 67 x 75% = 50 CBC Lab patient reduction.

26. ☑

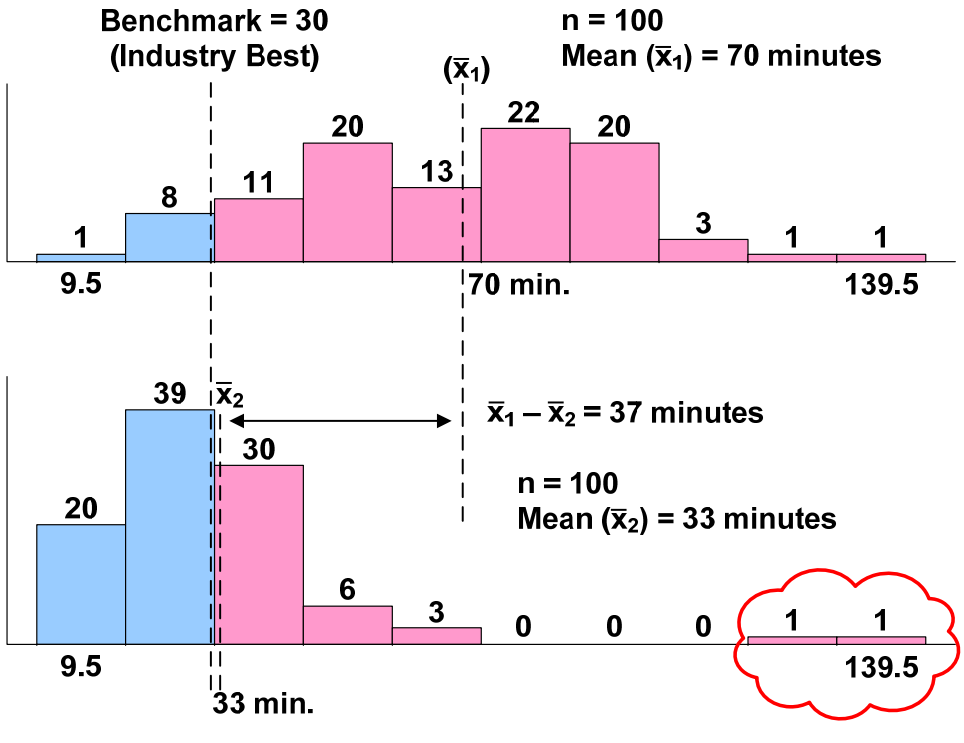
The team almost achieved its target for CBC reduction.

Define | Measure | Analyze | Improve | Control

Step 5: Control

Then, the team developed “Before” and “After” Histograms using the same sample data used for the Pareto analysis.

25. ☑



(Before Countermeasures)

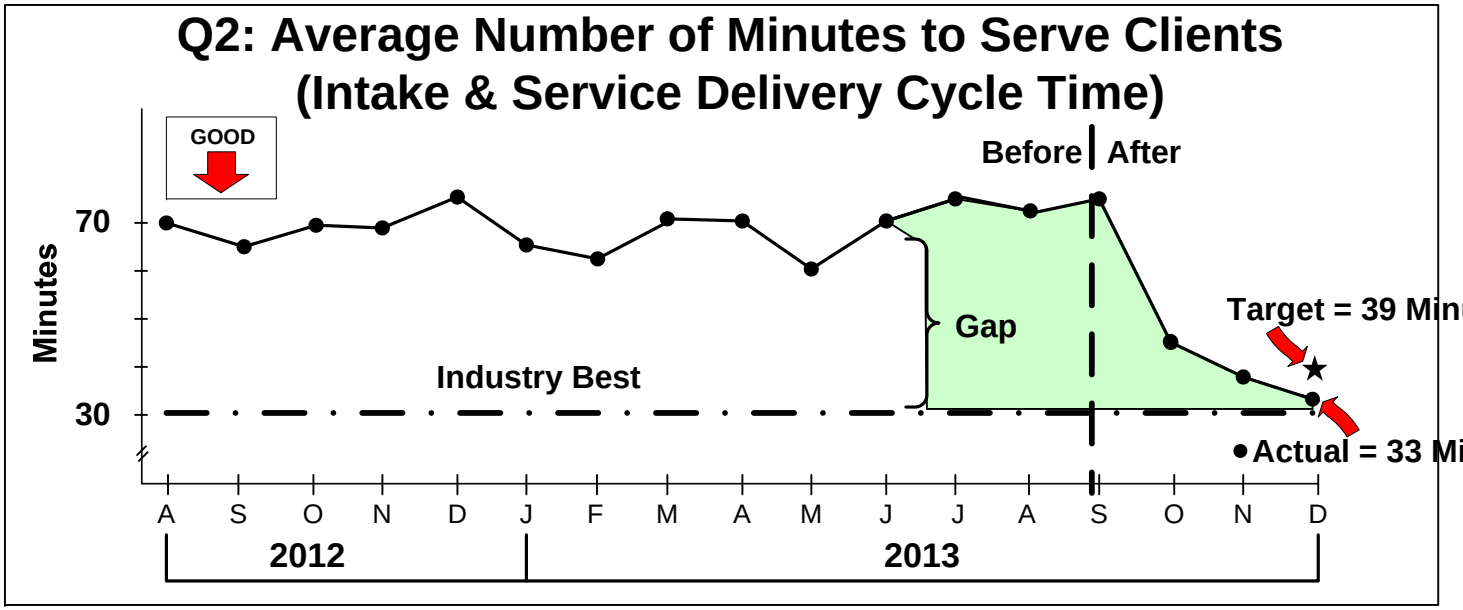
(After Countermeasures)

- Average Cycle Time was reduced from 70 to 33 minutes.
- The 2 outliers were attributed to unscheduled walk-ins.

Define → Measure → Analyze → Improve → **Control**

Step 5: Control

- Finally, the team evaluated the impact of counter-measures on the Theme Indicator represented by the line graph in the Define step. 27.



Standardization

- New procedures were put in place and monitored monthly by QA to ensure compliance. 28.
- Employees were trained on the new procedures. 29.
- Improvements were replicated at all other clinics. 30.

Define | Measure | Analyze | Improve | Control

Step 5: Control

Lessons Learned & Future Plans

1) The team recommended that unscheduled walk-ins be addressed to minimize impact on scheduled patient flow and clinic cycle time. **31.** ☑

2) Lean Six Sigma offers a different way to review problems, 80% of which can be solved using the basic tools. **32.** ☑

3) The flow chart helped a diverse group of team members to see the process clearly and examine it for waste.

4) Identifying cause(s) using the tools and techniques is better than guessing at what you **think** are the causes, or focusing on low impact causes.

5) Even though the team focused on CBC Lab Work, other problem areas improved because of the increased awareness of wasted time.

Step 5: Control

Lessons Learned & Future Plans

6) The DMAIC framework provided a basis for logical analysis and for communicating the improvements to others.

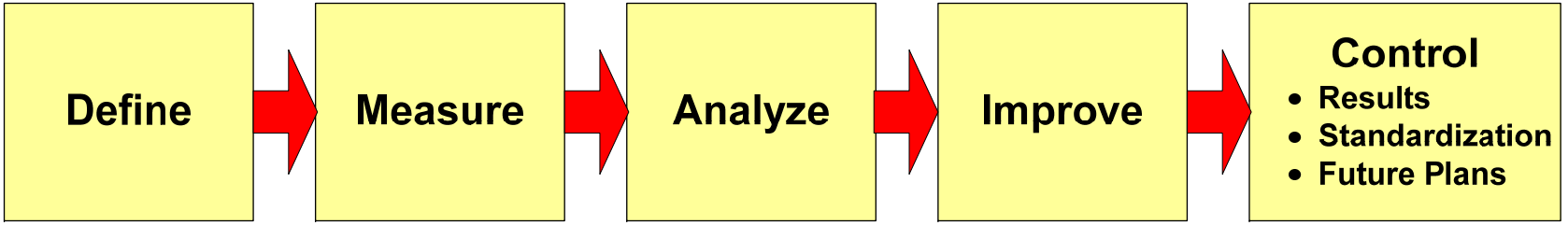
7) Subsequent to this successful project and results, management replicated the new system to the other 10 clinics.

8) Management identified other areas from the Theme Selection Matrix to target the application of Lean Six Sigma tools.

The sponsor signed off on the results and next steps. **33.** ☑

DMAIC Summary

Key Learning Points



- The DMAIC Story should flow and be logical.
- Show the linkage of the measure used in the Define step to the organization's Key Performance Indicators (KPIs) and/or Strategic Plan.
- Use the "Before and After" technique in the Control (Results phase) step to reinforce the value of analysis and impact.
- Let the data tell the story with minimal supporting text.
- The DMAIC Story should stand on its own.

Summary

- Lean tools can engage the entire workforce in the continuous improvement mindset.
- Six Sigma tools are important for the ongoing management and improvement of processes.
- DMAIC is a logical way of thinking, problem solving, and communicating.
- Basic tools can solve most business issues.
- Solving problems without considering the process that created them yields minimal impact, and any benefits achieved will not be sustainable.

Contact Information

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