

Shared Learning: Basics of Large-Scale Systems Improvement

Paulo Borem, MD and Kevin Little, Ph.D.

Last Updated on 05 September, 2024

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MCIC Presentation Notes

Introduction

Paulo Borem, MD has extensive experience with large-scale healthcare improvement interventions in Brazil, Portugal and multi-nation projects in Africa. He will apply his experience to a new project with 11 EDs in Sao Paulo Brazil. The ED project will launch before the end of 2024. Paulo and his colleagues have deployed management systems to increase the odds that improvements will be sustained over time. He will share his experience and insights with us today.

The ED environment

The ED care environment is characterized by a fast pace and diversity of patient conditions. In 2024, most emergency departments in the U.S. also face high demands for service. High daily demand increases the challenges for safety, effectiveness and efficiency. How can ED leaders continue to improve performance in this environment?

While the ED environment differs in important ways from other clinical settings, changes that have shown promise in other settings may work in your ED, with appropriate adaptation. The presentation today will invite your questions and perspectives to explore a set of changes to management of clinical operations that we believe are relevant to EDs.

Our common experience with improvement projects

Have you experienced an improvement project that failed? There are many ways a project might fail. Some projects never get off the ground or an initial great idea that worked in someone else's ED doesn't deliver improvement in local tests where you practice.

Let's focus on projects that showed promise initially but could not be sustained over time.



Think about an ED improvement initiative that failed to stick

What's your story?

We have had many projects just like yours.

Some of our failure modes include:

- The “new way” was too difficult to maintain, with too much burden for staff
- We didn’t address problems that emerged in dynamic clinical settings
- Staff turnover diluted knowledge and skills; training and on-boarding did not provide new staff with the skills and knowledge they needed
- Other initiatives and priorities demanded attention and effort, we lost focus
- We proposed changes that the front-line staff don’t think matters.

How can we prevent these failure modes? We’ll present what Paulo has learned over the past five years.

A look at the ICU Project 2018-2021—A “failure”?

Paulo helped to design and lead a large-scale project to reduce hospital-acquired infections in 118 public hospital ICU units in Brazil. Over two years, the project achieved more than a 50% reduction in HAI averaged across the ICU units. The main intervention deployed specific infection prevention “bundles.”



52% reduction CLABSI, CAUTI and VAP in 24 months

Bundle reliability was collected using checklist with check mark

How this story

evolved...

After 1 year almost no hospital was collecting process data (no sustainable process)

MoH requested for phase 2 a different way to CONTROL QUALITY

We embarked in a journey to explore different and novel ways to control quality

However, the project had a fundamental weakness. The method to achieve the lower HAI rates depended on a burdensome feedback cycle. After 12 months, almost all ICU units had stopped collecting data on adherence to the use of the care bundles that formed the foundation of the project.

The Ministry of Health in Brazil wanted to have more ICUs reduce infection rates. However, it seemed likely that initial good results would fade if the ICUs did not have a method to sustain use of the bundles through effective feedback.

The Ministry of Health asked for a change in methods to address this fundamental issue.

Paulo and his project colleagues embarked on a journey to explore different and novel ways to address sustainability of their interventions.

Prompted by the Ministry of Health's criticism, Paulo and his colleagues next designed and deployed a project to improve maternal mortality and morbidity, focused on interventions in Emergency Departments.

He extended the design used in the Maternal Mortality project in new projects that aimed to reduce infections in ICUs in Brazil and in ICUs and wards in Portugal.

The three new projects allowed him to test new ways to improve operations and sustain those improvements. We'll give you a brief look at each of these projects.

Paulo's new approach is based on two mind shifts

Paulo's mind has shifted from the way he worked in 2019. He now develops and deploys large-scale improvement projects with two foundations:

- Quality Improvement must integrate with Quality Control
- Problems are good to have

Quality Improvement must integrate with Quality Control

What's your experience in understanding the connection between Quality Improvement and Quality Control?

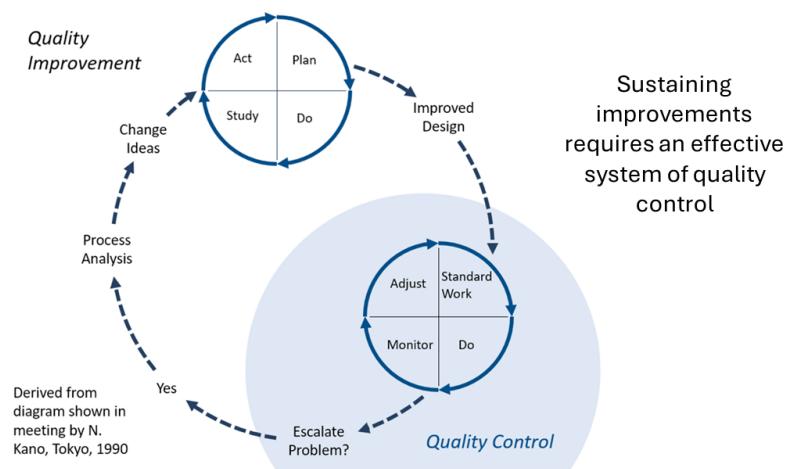
Paulo now firmly believes that Quality Improvement must be integrated with Quality Control to increase the odds that improvements will stick. If an organization does not have an effective system of Quality Control, you have to build that system as part of an improvement project.

The relationship between Quality Control and Quality Improvement may not be news to you.

Different quality experts have stressed QI and QC integration for decades but we didn't understand the implications as deeply as we do now.

For example, here's a diagram based on a sketch in 1991 by Dr. Noriaki Kano, an expert in Japanese Total Quality Control:

Quality Control is the foundation of Quality Improvement



In the diagram, Quality Control is the beginning and end of Quality Improvement. Quality Control itself is a cycle that starts with Standard Work.

"Standard work is a verb and not a noun....Standard work is meant to be a hypothesis to test the results of everyone doing something in the same way all the time....Standard work, therefore, is not the destination itself but simply a *tool* along the way in our endless quest to find the best, safest, and easiest way to deliver patient care." (*Getting to Standard Work in Health Care*, 2nd edition, p. 27).

Sustaining Quality Improvement requires a foundation in standard work. The foundation of standard work is the work standard: for each care process, what are the jobs and how should those jobs be done?

Paulo's experience with the Maternal Mortality Project opened the door to better ways to define and teach jobs through clear work standards.

Problems are good to have

The Kano diagram shows that Quality Control generates problems.

Here's our definition of problem: a problem is simply a gap between what you want and what you've got right now. A solution to a problem closes or eliminates the gap.

We now believe that your challenge and ours is to build management systems that make it easy for people to find and solve problems. That's a radical shift from seeking a management system that has no problems.

The more problems, the better!

Of course, too many problems will overwhelm the best organization. You must catch the problems before the problems are too big and your people need sufficient skills and support to solve the problems they find.

"No problems is the biggest problem of all."

We've looked for a citation to this observation attributed to Taiichi Ohno, developer of the Toyota Production System. We haven't found a precise reference to this advice but we like the provocation.

How can you modify your existing management system to make problems more visible and ready for your people to solve?

The second phase of Paulo's ICU Improvement Project used several methods to make problems more visible, including a way to contrast the plan for core work with what people actually do, in real-time.

Quality Control builds capacity for Quality Improvement

In carrying out Quality Control during operations, people use the Plan-Do-Study-Act (PDSA) cycle explicitly every day. Daily experience with PDSA builds skills of supervisors and individuals as they solve problems connected with daily work. Daily work problems often have simpler causal relationships, which makes them easier to solve.

When your organization needs a special improvement project and your people have practice PDSA problem solving as part of Quality Control, you will have a large cadre of skilled people

who can contribute to the special project. Your special improvement project does not rely on staff specialists who often do not have detailed job-specific knowledge and know-how to develop solutions that will work well.

Improving performance of 11 EDs in Sao Paulo, Brazil: 4th Quarter 2024

Paulo and his colleagues are designing a learning community that aims to improve care in 11 EDs. Leaders in the 11 EDs will clarify several elements of care as they define standard work. The leaders in the EDs will also make it much easier to see and solve operational problems.

ED project: solve the following problems in a pilot of 11 EDs in a city with 21 million people that builds on Maternal Mortality and the ICU infection reduction projects



> 1,000 patients/day (80% shouldn't be there)



Protocols, when in place, are complex, impossible to apply



No Early Warning Score (NEWS) to detect patients deteriorating (to prioritize)



MDs (young) and RNs don't follow protocols causing harm, mortality and morbidity.



Focus in 7 conditions: respiratory distress, stroke, cardiac infarcts, sepsis, trauma, abdominal pain and heart congestion failure.

Here's a summary of the management system being designed for the ED project to solve the problems. This management system has emerged from experience in three large-scale improvement projects starting in 2019.

Our approach to Sustainable Operations

<u>The task for leaders</u>	<u>Elements</u>
<p>Make it easy for everyone to see the current state of operations, its problems and the solutions to its problems</p>	<ol style="list-style-type: none">1. Agree on the work<ul style="list-style-type: none">• Work Standard• Standard process2. Teach skills to do the work (JI method)3. Amplify Problems<ul style="list-style-type: none">• Huddles• Work observation: general scan (Gemba walk) and focused (K method)• Each person has a way to report4. Assign and solve problems5. Make performance visible

You are likely to be familiar with and may be using a version of one or more of the elements in your EDs.

We borrowed the term “Amplify problems” from Kim and Spear (2023), *Wiring the Winning Organization*. Kim and Spear describe a management system that makes it easy for staff and leaders to find and perceive problems. One pillar of their system is amplification.

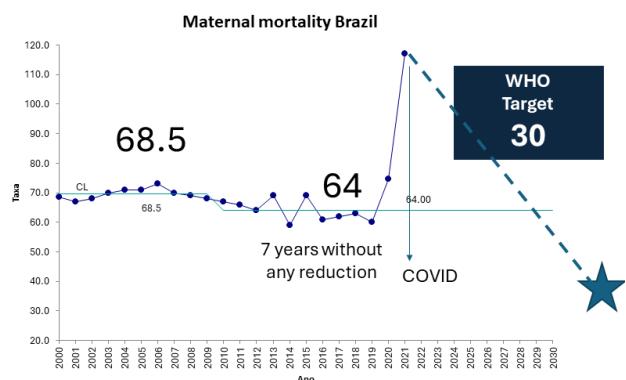
“*Amplification* is the act of calling out problems loudly and consistently enough so help is triggered to swarm them. Once the problems are swarmed, they are contained so they neither endure locally nor spread systemically. Then, they are investigated to determine their causes and create corrective actions that prevent recurrence. This requires that the signal of a problem is successfully generated, transmitted, received, and then reacted to.” (Kim and Spear, p. 233).

Lesson from the Maternal Mortality Project 2019-2021: agree on the work, teach the work

The Maternal Mortality Project focused on reducing birth-associated mortality in hospitals (mostly ED sites of care). The project was the first project Paulo and his colleagues led that integrated the technique of Job Instruction with a core clinical process.

Defining the problem

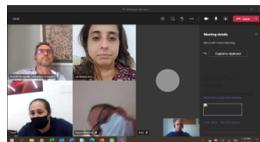
64 deaths/100,000 live births between 2012 to 2021.
Using same tactics not likely to reach the AIM=30



Project Design

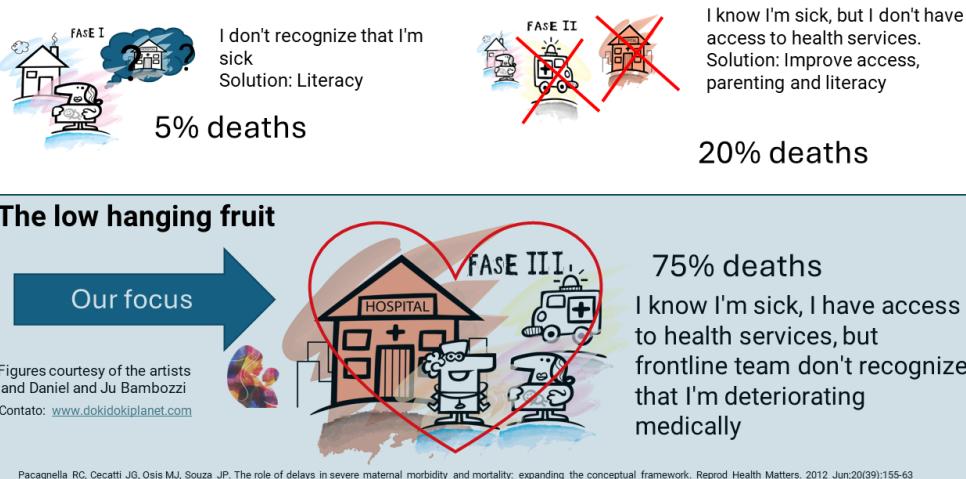


19 public hospitals
10,000 live births/month
(median)
Nov/2019 – March/2021, 16 months



100% virtual after COVID

Analysis of Baseline Conditions



Need different results? Change your approach

Traditional approach

1. Offer training to the healthcare professionals (clinical content)
2. Try to solve all problems of the whole continuum of care at once (prenatal care, hospital care, education, etc.)
3. Lecture, lecture, lecture

New approach

1. Change the process of care first and then offer training to modify the behavior
--use a new way of Training "Job Instruction"
2. Declare your "normal"
3. Develop standard work and processes
4. Focus on where 75% of mortality happens - HOSPITAL, mostly the ED

Quick look at results of the project through 2021

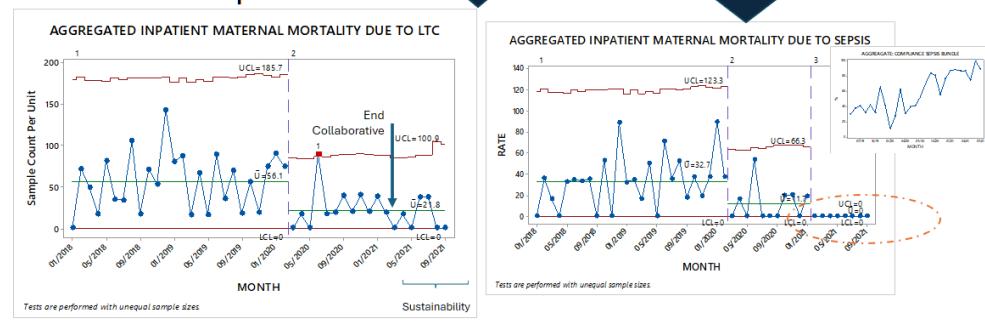
Hospital Maternal Mortality

19 public hospitals 2018 – Oct, 2021

Sepsis, Hemorrhage and Eclampsia

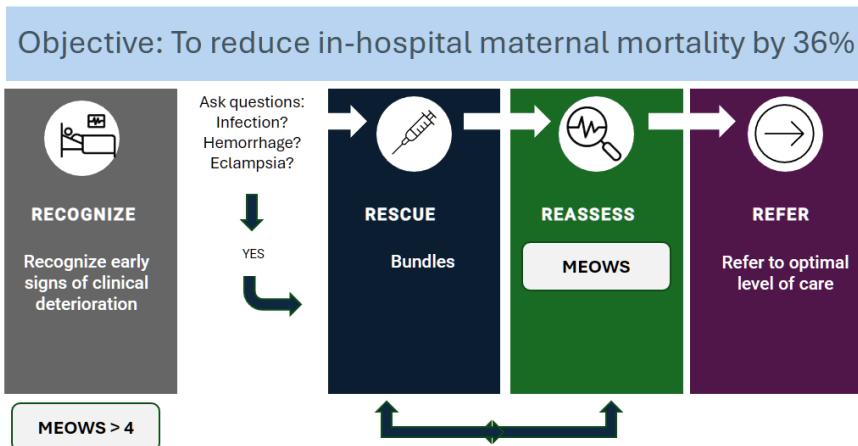
62%

100%



The MMP project team identified a high-leverage process, “4Rs to Rescue.” High leverage means that a small amount of change effort appeared likely to cause a large change in maternal mortality.

A High Leverage Process: "4Rs to Rescue"



To achieve the clear aim (work standard) for care of pregnant women, the project team developed specific bundles of care used to rescue.

To reduce variation in the way staff carried out the bundles, the project team applied a new way, “Job Instruction” to train staff in the key steps within each of the 4R process blocks. Here we illustrate the rescue bundle for suspicion of sepsis.

What was new in this project?

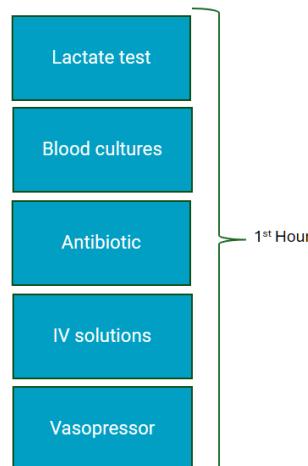
Bundle: Sepsis suspicion

Declare work standard: a clear aim or “normal”

- No pregnant women/parturient should die due to “failure to rescue” in the public hospitals
- At least 95% of pregnant women should have MEOWS calculated first contact and transition of care
- At least 95% of pregnant women/parturient should have a bundle applied if MEOWS>4 and yes to questions

Create and train people on standard work and process to achieve the aim

We used the Job Instruction method



Job Instruction

Job Instruction (JI) is one of the core methods in the Training Within Industry (TWI). We give a bit more information about TWI in the section [Teach skills to do the work \(JI Method\)](#).

JI requires one-to-one teaching. This is a striking difference from methods that lecture or demonstrate to groups.

Job Instruction Method: Skills to Carry out the Bundles

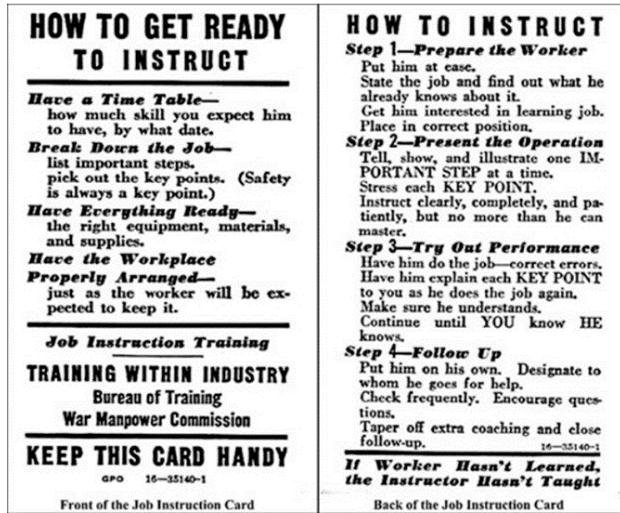


Image of JI card, 1944-5

Job Instruction requires that each person receive 1-1 training, job by job.

The instructor uses a Job Breakdown Sheet to guide the 1-1 training demonstration and explanation. The instructor uses the same teaching approach outlined 80 years ago.

Important steps	Key points	Reasons
1) Identify patient	<ul style="list-style-type: none"> Introduce yourself to the patient Ask for ID, check name, DOB, mother's name Explain what will be done 	<ul style="list-style-type: none"> Guarantee and strengthen the bond with the pregnant woman Make sure the name of the person is in front of you Promote trust
2) Perform anamnesis	<ul style="list-style-type: none"> Ask the reason for coming to the ER Ask about bleeding, fever, and high blood pressure 	<ul style="list-style-type: none"> Observe alert status Vital data may be normal now, but the pregnant/ postpartum woman may have been having these symptoms recently
3) Check --Temperature --RR --BP --Pulse	<ul style="list-style-type: none"> Start with Temperature Place the axillary thermometer on the arm opposite the clamp Observe the RR talking to the pregnant woman Do not use cell phone Wall or computer clock at your fingertips 	<ul style="list-style-type: none"> It takes longer to measure temperature with an axillary thermometer Avoid dropping the thermometer Prevent the patient from noticing and increasing the course of breathing Impression of distraction Facilitates the counting of RR
4) Calculate MEOWS	<ul style="list-style-type: none"> Use standard table If MEOWS 3 in a parameter or ≥ 4 in the sum, ask the 3 questions: Are there any signs of infection, eclampsia, or bleeding? 	<ul style="list-style-type: none"> Avoid mistakes and improve accuracy The answer yes is essential to decide on opening the bundles in the first hour
5) Open Bundle	None, Sepsis, Hemorrhage or Eclampsia	If we want to save the life of a pregnant woman, the rescue must be done in the first hour since the application of MEOWS. Avoid deterioration of the pregnant woman.

What, How and Why: The Job Breakdown Sheet

The Job Breakdown Sheet guides a supervisor or trainer in teaching a skill to someone.

For each important step, the instructor presents key points about how to do the job and the reasons for key points.

We used the same JBS for each skill across all the EDs.

The instructor shows the important steps, then repeats the demonstration stating the key points and reasons for the key points. Next, the instructor observes the person do the job, with corrections as necessary. The person learning the job next demonstrates the important steps while repeating back the key points and reasons. When the instructor is satisfied that the person knows the important steps, key points and reasons, the person is ready to go to work.

What did Paulo's teams learn from their use of the JI method? What are the benefits?

- Everyone has clarity about the core jobs. Common agreement on core jobs provides the basis for future adjustments.
- New people can learn the important steps along with key points. The key points give how-to tips so new people carry out the work in the same way as current staff, reducing variation.
- People know why they are doing specific tasks a certain way. Knowing why helps to cement the sequence of steps and key points.
- While 1-1 training may seem inefficient, ultimately there is no other way we've seen that delivers the consistency of job performance produced by JI method.
- JI supports a Training Plan: who will know what and by when. We do not expect every person to master every job skill all at once. Supervisors and managers can organize a sequence for training. The training achievement of team members allows more effective

schedules to assure sufficient people with skills are present on each shift across shifts, accounting for vacations and leaves of absence. The training status naturally appears as a chart on the local visual management board.

Paulo's experience: People resist the systematic way of training at the beginning! When they understand the impact, they will adopt it.

Lessons from HAI reduction projects, 2021-present: make problems easy to see (and solve)

Paulo and his colleagues continued to apply the Job Instruction methods in two more projects that aimed to reduce hospital acquired infections. The project designers adapted bundles of care for HAIs first developed in the ICU Phase 1 Project. One project involved 200 ICUs in Brazil; the other project involved 20 public hospitals in Portugal ICUs and wards.



Testing and implementing

Amplify Problems

- Huddles
- Work observation: general scan (Gemba walk) and focused (K method)
- Each person has a way to report

Assign and solve problems

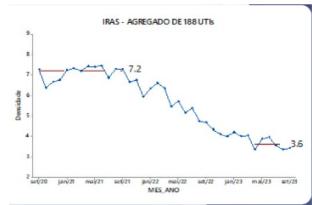
Make performance visible

The projects achieved their aims. Here is a summary slide for the Brazil ICU project

Summary: 180+ ICUs reporting

baseline periods vary depending on start date for bundles

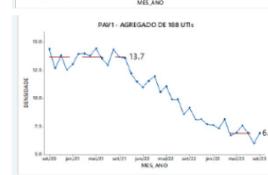
CLABSI



CAUTI



VAP



The HAI projects involved more elements of the management system that will be used in the ED Project.

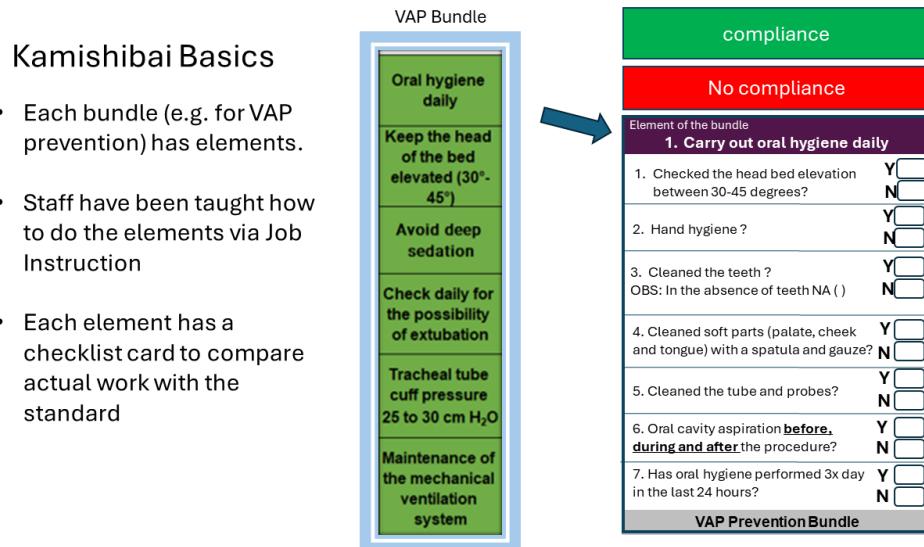
- ICUs and wards adapted shift huddles to include reflection on problems related to the HAI project the previous day and asked for any additional problems. The stand-up huddles were coached not to solve the problems but only to capture them.
- **WHAT CAN YOU SAY ABOUT TIPS FOR GEMBA WALKS???** [“Project leaders were coached on rounding/Gemba walks to look for problems—anything that caused stress to staff or delays or gaps in communication.”]
- The ICUs and wards introduced a way to invite and gather problems from the entire team. Anyone who identified a problem would describe it briefly and deposit into an envelope hanging on the management board. These problems as well as problems identified in huddles were reviewed once a week and assigned for solution by local project leaders.
- Each site of care built a daily management display board that contained graphs of key metrics, problem-solving status, and audit records of work. Huddles took place in front of the board to make it easy for people to discuss and identify issues.

We'll say more about the focused work observation because we think it is least familiar to you.

Focused Work Observation: the Kamishibai method

After people are trained in basic job skills using Job Instruction, how well are they able to carry out the jobs according to the standard?

The Kamishibai method is a way to link the job skills defined by Job Breakdown Sheets with a regular audit of work. Observers must be trained to compare the work with the work standard. If there is a safety issue, the observer must stop their colleague and fix the problem. If there are other deviations from the standard that are not safety issues, the observer notes the problem and debriefs with their colleague at the end of the observation.



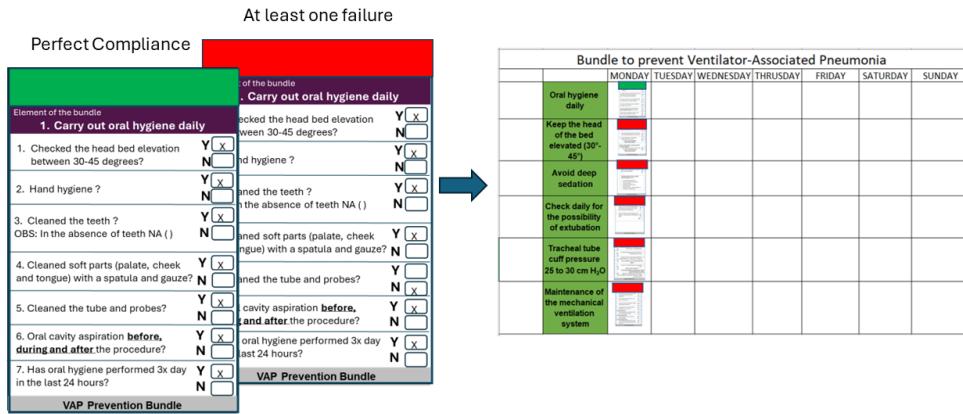
Regular audits yield a picture of performance. A display board enables everyone to see the state of compliance with the core work skills in the clinical unit, week by week. Adherence to the standard is rated as pass (Green) or fail (Red).

Perfect Compliance 	At least one failure																											
Element of the bundle 1. Carry out oral hygiene daily <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>1. Checked the head bed elevation between 30-45 degrees?</td><td style="text-align: center;"><input checked="" type="checkbox"/> Y <input type="checkbox"/> X</td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> N</td></tr> <tr><td>2. Hand hygiene ?</td><td style="text-align: center;"><input checked="" type="checkbox"/> Y <input type="checkbox"/> X</td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> N</td></tr> <tr><td>3. Cleaned the teeth ? OBS: In the absence of teeth NA ()</td><td style="text-align: center;"><input checked="" type="checkbox"/> Y <input type="checkbox"/> X</td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> N</td></tr> <tr><td>4. Cleaned soft parts (palate, cheek and tongue) with a spatula and gauze?</td><td style="text-align: center;"><input checked="" type="checkbox"/> Y <input type="checkbox"/> X</td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> N</td></tr> <tr><td>5. Cleaned the tube and probes?</td><td style="text-align: center;"><input checked="" type="checkbox"/> Y <input type="checkbox"/> X</td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> N</td></tr> <tr><td>6. Oral cavity aspiration before, during and after the procedure?</td><td style="text-align: center;"><input checked="" type="checkbox"/> Y <input type="checkbox"/> X</td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> N</td></tr> <tr><td>7. Has oral hygiene performed 3x day in the last 24 hours?</td><td style="text-align: center;"><input checked="" type="checkbox"/> Y <input type="checkbox"/> X</td></tr> <tr><td></td><td style="text-align: center;"><input type="checkbox"/> N</td></tr> </table>	1. Checked the head bed elevation between 30-45 degrees?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X		<input type="checkbox"/> N	2. Hand hygiene ?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X		<input type="checkbox"/> N	3. Cleaned the teeth ? OBS: In the absence of teeth NA ()	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X		<input type="checkbox"/> N	4. Cleaned soft parts (palate, cheek and tongue) with a spatula and gauze?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X		<input type="checkbox"/> N	5. Cleaned the tube and probes?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X		<input type="checkbox"/> N	6. Oral cavity aspiration before, during and after the procedure?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X		<input type="checkbox"/> N	7. Has oral hygiene performed 3x day in the last 24 hours?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X		<input type="checkbox"/> N
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VAP Prevention Bundle	VAP Prevention Bundle																											

The person who observed the work places the completed card on a summary display. The

summary display has a column for each day of the week and a row for each bundle element. The card is placed in the relevant cell of the display.

Elements of the bundle are audited daily and shown on weekly calendar chart



Furthermore, each clinical unit usually summarizes “green” weekly performance for each bundle in a time series chart.

Here's a view of the improvement in compliance for the VAP prevention bundle. Results for the other infection bundles were similar.

One innovation Now planned for a first test in a multi-country project in Africa that started earlier this month: use AI tools to reduce manual effort to translate the weekly performance into a run chart or control chart. A photo of the Kamishibai board will be taken at the end of the week and then run through an application to count the red and green cards each day and convert the counts to a run chart or a control chart that then will be posted on the management board. The project in Africa is also testing ways to use AI bots to process language data to reduce burden on staff.

What did Paulo's teams learn from their use of the Kamishibai method? What are the benefits?

The Kamishibai method takes effort to establish. Construction of the board and cards is one easy step that is inexpensive (< US\$10). The main challenge is getting the clinical unit members comfortable and persistent with daily work observation and the red-green scoring.

Remember that in the ICU Phase 1 project, ICU teams used bundle-compliance checklists that were summarized and reviewed monthly. This was the feedback system that collapsed after the first year.

Kamishibai increases the velocity of the action/response cycle to deviations from the desired bundle practice. A monthly cycle in the ICU Phase 1 project is now a daily cycle. This 30-fold

increase in review cycle frequency means that problems in jobs are caught much earlier and have less chance to result in an infection. Every day, at least some staff members explicitly compare job performance with the desired state and catch deviations.

Here are additional benefits the project designers and teams have identified:

- No variation among hospitals about the definition of compliance to each element of the bundle. The Job Breakdown Sheets, process instruction, and Kamishibai cards are uniform across all the participating hospitals.
- Problems with the elements of the bundles became annoyingly visible. The red cards on the wall are out in the open for anyone to see.
- In many other applications of the Kamishibai method, a supervisor or other formal leader audits the work. In the HAI projects, most of the audits are done by peers, which increases job awareness throughout the team.

Question for the audience: how could Kamishibai method work in your ED?

Here's the schematic of a Kamishibai board for the new ED project. Mention core conditions that will follow use of NEWS.

Process	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Recognize deterioration (NEWS)	M ■	A ■	M	A	M	A	M ■
Question to orient Rescue	■	■					
Rescue (immediate)	■	■					
Rescue (bundle)	■	■					
Reassess	■	■					

Deeper dive on elements of the management system

KL idea: highlight how each element either contributes to the QC system OR amplifies problems

Agree on the work

Agreement on the details of specific jobs that produce products and services is the foundation of quality control.

How do you characterize the desired outcomes embodied by your products or services?

The definition of quality gets translated into sets of instructions your organization will use to produce the outcomes:

- the characteristics of the product or service you intend to produce;
- the conditions of equipment and the environment that support production;
- the step by step operations by people to make everything happen.

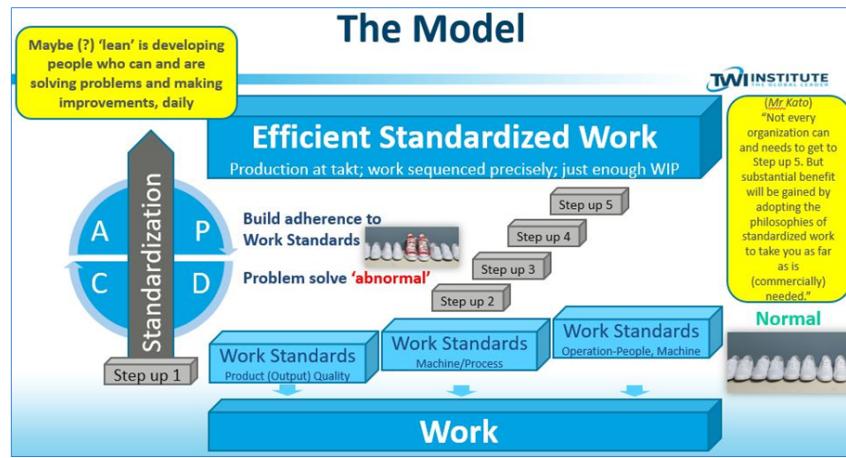
The instructions are referred to as work standards, which are the foundation of standard work defined above.

The Quality Control cycle during operations requires that we set up operations in two ways:

- (1) make it easy to see any differences when you contrast the outcomes and process of actual operations with the work standards and
- (2) catch and reduce differences by corrective actions.

Isao Kato, a key associate of Taiichi Ohno at Toyota starting in the 1950's, summarized the essence of Quality Control in his "Step-ups" Model.

Isao Kato's Step Up Model



Learn more about Mr Kato's model by viewing Oscar Roche's 'What Is...' [video](#) produced for Lean Frontiers

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In Kato's model:

- Step up 1 defines Normal—what you expect, in the sense of a ‘Norm’.
- Step up 2: Make it easy to see the difference between Normal and Abnormal. Step up 2 enables you to see problems!
- Step Up 3: Problem solve (reduce the gap) between Normal and Abnormal.
- Step up 4: Refine the workflow to drive out waste and develop skills of people.
- Step up 5: Assure the continued health of the first four step ups.

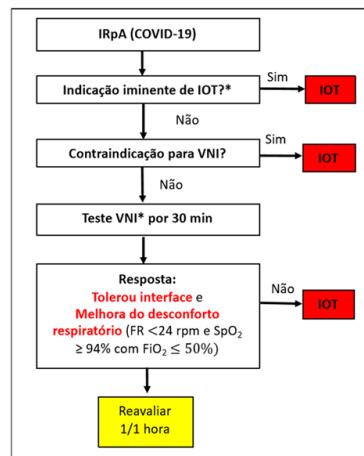
Step ups 1-3 are the core activities of standard work. Step up 4 and Step up 5 merge with the elements of the overall management of operations. See <https://www.iecodesign.com/blog/2021/1/13/work-standard-and-standard-work> for further discussion.

Here's an illustration of work standards from the ICU project, Phase 2 (VAP = ventilator acquired pneumonia)

Example: Prevention of VAP per Nat'l Guidelines

- Ventilation only when indicated
- For ventilated patients:
 1. Perform routine oral hygiene
 2. Keep the head of the bed elevated (30 ° -45 °)
 3. Reduce sedation
 4. Check extubating daily
 5. Keep the cuff pressure of the tracheal cannula (cuff) between 25 to 30 cmH₂O (or 20-22 mmHg)
 6. Maintain the mechanical ventilation system per local regulatory agency recommendations

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Work Standard Example: Output Service Quality

Patients leave the ICU without experiencing ventilator associated pneumonia (VAP).



This work standard tells us we need an operational definition of VAP: how to decide if a patient has VAP or not that is clear to all.

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Work Standard Examples: Environment & Equipment

For ventilated patients:

- Bed elevation between 30° and 45° (except COVID patients with pronated position)



- Cuff pressure of tracheal cannula between 25-30 cm H₂O



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Work Standard Example: Operations and Staff Roles



Aspiração de saliva e fluidos antes, durante e depois da Higiene Bucal



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Pair of Nurse Technicians will carry out oral hygiene:

Oral Hygiene Protocol	When	Why
Prepare Care	Three times each 24 hours	To remove microorganisms that if aspirated can lead to pneumonia
1.1 get kit		
1.2 assure hand hygiene		
1.3 check patient ID		
Clean using Clorexidine w aspiration		
2.1 clean tube		
2.2 clean bottom of mouth	2.1 - 2.4 at least 7 minutes	
2.3 clean tongue		
2.4 clean teeth		
End Care		
3.1 check cuff		
3.2 check head elevation		
3.3 assure hand hygiene		

7

Teach skills to do the work (JI Method)

Job Instruction is one of part of the Training Within Industry curriculum.



Rosie the Riveter
Naomi Parker Fraley was
the real-life inspiration

How can supervisors can promote productivity and safety working with their people?

Training Within Industry* has 3 pillars: JI, JM and JR



Developed by the US government in the 1940s to develop skills of supervisors in war-related factories

TWI was invented and developed through dozens of test cycles 1940-1945 by the United States War Manpower Commission. TWI's development is a great example of iterative refinement, PDSA in action.

The Commission created and refined three 10-hour courses aimed at supervisors:

1. Job Instruction: How to do a job correctly and safely (JI)
2. Job Methods: Basic industrial engineering (JM)
3. Job Relations: The human side of supervision (JR)

The Commission also created a course for trainers, Program Development.

TWI was introduced to Japanese engineers and managers as part of the U.S. occupation of Japan after 1945.

"[The] Japanese Labor Ministry still controls the use of TWI by administering programs and licensing other organizations to conduct the 'J'courses." (Dinero, p. 47)

Toyota leaders incorporated TWI into the nascent Toyota Production System in the 1950's.

Here are images of the World War II era pocket cards for JM and JR, to complement the pocket card for JI we showed earlier.

Job Methods

HOW TO IMPROVE JOB METHODS

A practical plan to help you produce GREATER QUANTITIES of QUALITY PRODUCTS in LESS TIME, by making the best use of the Manpower, Machines and Materials, now available.

STEP I—BREAK DOWN the job.

1. List all details of the job exactly as done by the Present Method.
2. Be sure details include all:
 - Material Handling.
 - Machine Work.
 - Hand Work.

STEP II—QUESTION every detail.

1. Use these types of questions:
 - WHY is it necessary?
 - WHAT is its purpose?
 - WHERE should it be done?
 - WHEN should it be done?
 - WHO is best qualified to do it?
 - HOW is the 'best way' to do it?
2. Also question the:
Materials, Machines, Equipment, Tools, Product Design, Layout, Work-place, Safety, Housekeeping.

16-31488-1

STEP III—DEVELOP the new method.

1. ELIMINATE unnecessary details.
2. COMBINE details when practical.
3. REARRANGE for better sequence.
4. SIMPLIFY all necessary details:
 - Make the work easier and safer.
 - Pre-position materials, tools and equipment at the best places in the proper work area.
 - Use gravity-feed hoppers and drop-delivery chutes.
 - Let both hands do useful work.
 - Use jigs and fixtures instead of hands, for holding work.
5. Work out your idea with others.
6. Write up your proposed new method.

STEP IV—APPLY the new method.

1. Sell your proposal to the boss.
2. Sell the new method to the operators.
3. Get final approval of all concerned on Safety, Quality, Quantity, Cost.
4. Put the new method to work. Use it until a better way is developed.
5. Give credit where credit is due.

Job Methods Training Program
TRAINING WITHIN INDUSTRY
War Manpower Commission

GPO 16-31488-1

Job Relations

HOW TO HANDLE A PROBLEM

DETERMINE OBJECTIVES

Step 1—Get the Facts
Review the record.
What policies, rules, regulations apply?
Talk with individuals concerned and get opinions and feelings.
Be sure you have the whole story.

Step 2—Weigh and Decide
Fit the facts together and consider their bearing on each other.
What possible actions are there?
Check each action against objectives weighing effect on individual, group, and production.
Select the best actions.
Don't jump to conclusions.

Step 3—Take Action
Should I handle this myself?
Who can help in handling?
Should I refer this to my supervisor?
Consider proper time and place.
Explain and get acceptance.
Don't pass the buck.

Step 4—Check Results
How soon and how often will I check?
Watch for changes in output, attitudes, and relationships.
Did my action help production?

WERE OBJECTIVES ACCOMPLISHED?

A Supervisor Gets Results Through People

FOUNDATIONS FOR GOOD RELATIONS

1. Let Each Employee Know How He Is Getting Along
Figure out and tell him what you expect.
Point out ways to improve.

2. Give Credit When Due
Recognize extra or unusual performance.
Tell him while it's fresh.

3. Tell An Employee in Advance About Changes That Will Affect Him
Tell him WHY if possible.
Get him to accept the change.

4. Make Best Use of Each Person's Ability
Look for ability not now being used.
Never stand in an employee's way.

People Must Be Treated As Individuals

JOB RELATIONS TRAINING
U. S. Civil Service Commission
JR-2 April 1945 16-44302-1 GPO

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Amplify problems

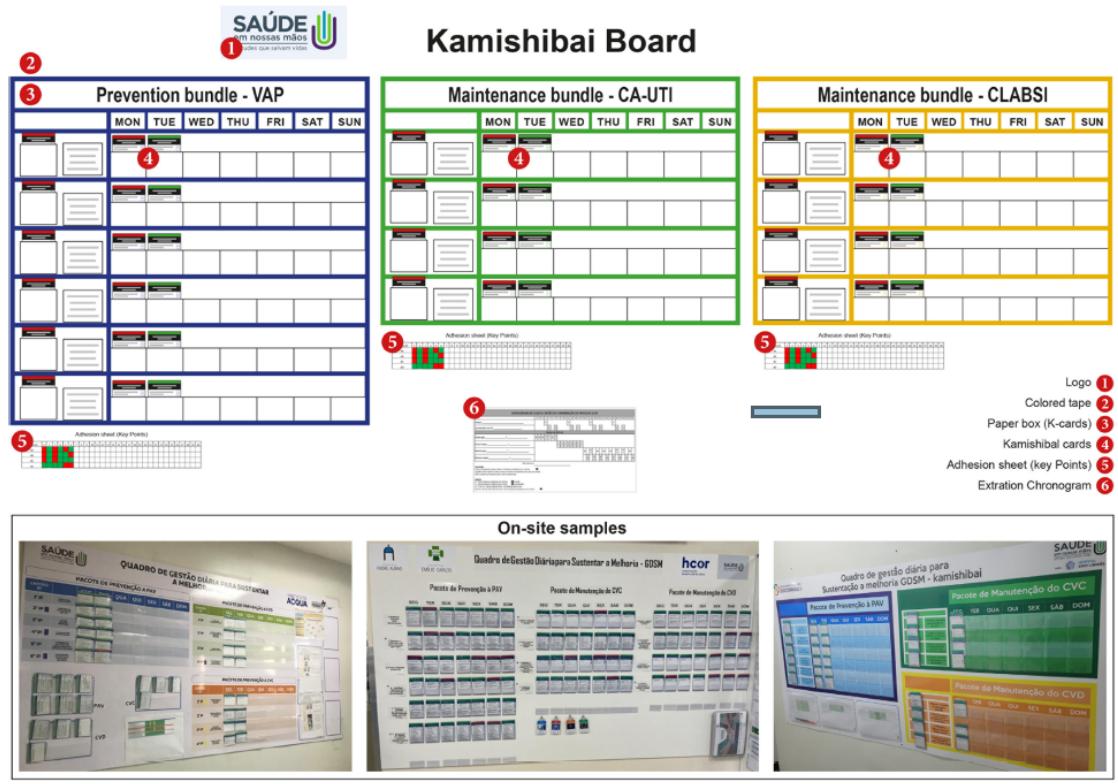
Refer to Kim and Spear use of the term

Huddles

Gemba Walks

Pay attention to process (flow)—the value stream. How are local leaders managing flow? What issues have the local team escalated to others and what is the degree of responsiveness? Pay attention to the quality control system: how well do huddles run? How effective is the use of the Kamishibai method? How are people solving problems? Are skills in PDSA and structured problem solving deepening?

Kamishibai method



The image above is from Bravo et al. (2023).

Individual problem reporting

Problem report sheet

- Available to everyone
- Every time someone sees a defect, he/she should report it and put it in the Board of ideas/problems
- All problems are analyzed in a weekly meeting

Problem observed:
Is there anything you can do now to resolve the issue?
<input type="checkbox"/> YES (SEE AND SOLVE)
<input type="checkbox"/> NO (REQUIRES ANALYSIS)
IF YES (SEE AND RESOLVE)
Proposed solution:
Responsible:
Expected end:
Status:
Help chain:
IF NOT (NEEDS ANALYSIS)
Open an/A3

Assign and solve problems

Problem-solving is not an occasional activity; there is a weekly cycle of identification and assignment. Dividing the set into Just Do It and Structured Problem Solving.

Key point: if the same Just Do It problem recurs more than X times (X = 3?) then it deserves more analysis (don't keep adjusting something that shouldn't keep breaking.)

Is there an agenda for weekly review?

1. how many problems do we have?
2. Sort in the 2 x 2 matrix impact vs feasibility.
3. Who: RN and MD supervisor and front-line rep on the project. Also Pharmacy may come and go.
4. 20 minutes
5. Management Board shows projects and the help chain, end date and status. See Solve and A3. Leave up to the unit on the number of new projects to add.

Who does it?

How are assignments made?

How long does the weekly review take? Where is the status of projects shown? Usual advice is to LIMIT THE NUMBER OF IMPROVEMENT PROJECTS to N (N<=5). YOU CAN'T START ANOTHER PROJECT UNTIL ONE PREVIOUS PROJECT IS FINISHED

The Lancaster option

Make performance visible

Performance measures

What belongs on the board? core measures during collab.

An analog board

Why not just keep everything in the computer?

“The system needs to speak to you.” The computer is not accessible to everyone. YOu have to log in, find the right place...people give up! When it is on the wall, you can’t escape everyone sees the same thing.

Thhe benefits outweigh ~10 minute a day to keep up the board

During the collab, the RN leader has the job to keep the board updated. Outside the collab, the unit leader has the job.

Appendix

Tips for improving a management system

1. Take the usual advice in change management: Test on a small scale. E.g. take one bundle related to one condition in the ED project. Develop the Job Breakdown Sheets, determine how Kamishibai method could work. “Testing on a small scale” builds confidence and know how and contains risks of failure. Table 7.1?

Link to “Model Cell” language. Kim and Spear theory.

2. Embrace simulations (refer to Kim and Spear, too.) You Tube video McDonald simulation.

What about Quality Planning?

If you are familiar with Joseph Juran's Quality Trilogy, Quality Planning complements Quality Improvement and Quality Control.

Importantly, Juran insisted that Quality Control be done during operations, not after. In other words, Quality Control is not inspection of results and repair or fixing after the product or service is complete.

Figure 3. Whole System Quality Approach: Quality Planning, Quality Control, and Quality Improvement Activities by Stakeholder Group

Quality Planning	Quality Control	Quality Improvement	Patients, Families, and Communities
POINT OF CARE			
Offer input to inform organizational strategy as primary customer group	Offer feedback on quality experience to inform understanding of performance	Engage as co-producer in relevant QI activities	
Inform plans and requirements to execute on the strategy locally	Identify and solve problems as they arise (gaps with standard), escalate as necessary	Lead and engage in local QI activities and identify potential QI projects	Clinicians
Translate strategy into a plan for unit setting and outline requirements for execution	Monitor performance and direct solutions, escalate problems as necessary	Lead QI projects and capture ideas for potential QI work	Unit-Level Leaders
Facilitate strategic planning process, support research and analysis activities	Support development of QC standard work and infrastructure	Support local QI activities and inform project prioritization efforts	Quality Department Staff
Work with executives and unit leaders to articulate how to execute on strategy	Identify cross-cutting problems and trends close feedback loops	Sponsor QI projects, lead cross-cutting QI efforts	Departmental Leaders
Identify customers, prioritize needs, and develop strategy	Mobilize resources to address emergent and cross-cutting problems	Sponsor and commission prioritized QI projects	Executive Leaders
Ensure organizational strategy is quality-centric	Review quality performance on a regular basis	Review performance of major QI projects on a regular basis	Board of Directors

Quality Planning is the way an organization identifies areas of opportunity and change related to strategy and markets, including listening to customers. Quality Planning is not reacting to immediate operational problems. Quality Planning addresses design of new products and services and the translation of the design into production through initial experiments and pilot-scale operations.

While we won't address Quality Planning today, we believe that Quality Planning must rest on understanding the health and performance of operations and on an effective Quality Control system.

You see that the Kano diagram does not show a role for Quality Planning. For example, the Kano diagram does not show a path of improvement projects that emerge from Quality Planning rather than responses to operational problems.

Example: The rapid pivot in 2020 to COVID protocols in clinical settings is an example of an exogenous change that drove changes to operations. Healthcare organizations with robust QC systems adapted quickly and more safely relative to other organizations. (Baptist Health,

Skip Steward, <https://www.lean.org/the-lean-post/articles/building-a-learning-organization-kata-webinar-snippet/>).

Presenters

Paulo Borem, MD has practiced as a vascular surgeon. He is a Senior Director of the Institute for Healthcare Improvement (IHI), an Improvement Advisor, and a Patient Safety Officer (PSO) certified by IHI. Dr. Borem has led more than 15 large-scale initiatives in Portugal, Brazil, and Africa to reduce hospital-acquired infections, maternal deaths, unnecessary cesarean sections, and post-operative deaths and improve Joy in Work. He is also responsible for IHI's Improvement Specialist training courses in Portuguese-speaking countries. Dr. Borem is trained in Job Instruction, Job Relations and Job Methods by the TWI Institute. Contact: pborem@ihi.org

Kevin Litttle, Ph.D. (statistics) has worked as an improvement advisor to health care projects since 2001. As a senior Improvement Advisor with the Institute for Healthcare Improvement, he has recently supported IHI's Pursuing Equity projects and learning communities to decarbonize healthcare operations. He currently serves as improvement advisor to a project funded by the West Institute that aims to reduce hospital admissions through integration of care by ACOs and Geriatric EDs in the United States . Contact: klittle@iecodesign.com.

Sources of influence

Our thinking and consultation practice has several major influences. You may be familiar with one or more of the following. We think the least familiar to most people is the Training Within Industry (TWI) approach to front-line operations.

- Deming through API and IHI (Model for Improvement, System of Profound Knowledge);
- Juran (Juran Trilogy, the definition of self-control);
- Lean approach to design and deployment of production systems (various authors list) and advice on specific elements of operations management;
- Training Within Industry skills for supervisors and management.

For further study [or references?]

Donald Dinero (2005), *Training Within Industry: the foundation of Lean*, Productivity Press, New York.

Patrick Graupp and Martha Purrier (2022), *Getting to Standard Work in Health Care: Using TWI to Create a Foundation for Quality Care*, Routledge, Boca Raton, FL.

Jim Lancaster (2017), *The Work of Management: A Daily Path to Sustainable Improvement*, Lean Enterprise Institute, Cambridge, MA.

report on TWI 1940-1945

Gene Kim and Steven J. Spear (2023), *Wiring the Winning Organization*, IT Revolution, Portland, OR.

Papers published on ICU Phase 1, Maternal Mortality, Portugal ICU and wards, ICU Phase
2

M.A.S. Bravo et al. (2023), Adapting lean management to prevent healthcare-associated infections: a low-cost strategy involving Kamishibai cards to sustain bundles' compliance, *International Journal for Quality in Health Care*, 35(4), 1-6.

Direct application of lean manufacturing experience may not yield insights in every clinical application (Lillrank)

IHI Whitepapers