

# **Shared Learning: Lessons from Large-Scale Systems Improvement**

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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

Figure 1: Presentation Slide 4

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

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

However, this 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.

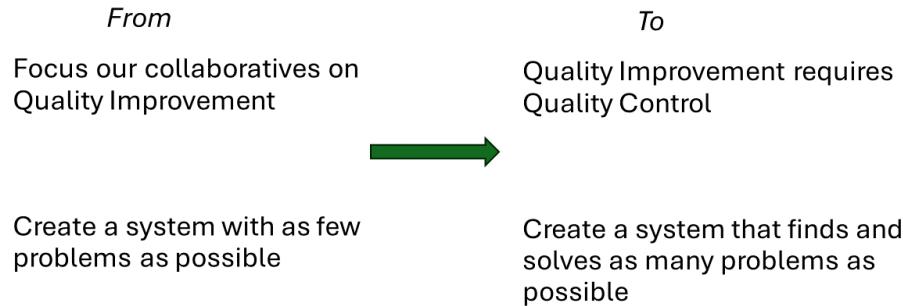
Prompted by the Ministry of Health's criticism, Paulo and his colleagues next designed and deployed a project to improve maternal mortality and morbidity, focused on interventions in Emergency Departments.

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 refer to these projects as we tell you about the management system that Paulo now proposes for his clients.

## Two Mind Shifts

### Shifts in Thinking



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

- Quality Improvement requires 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?

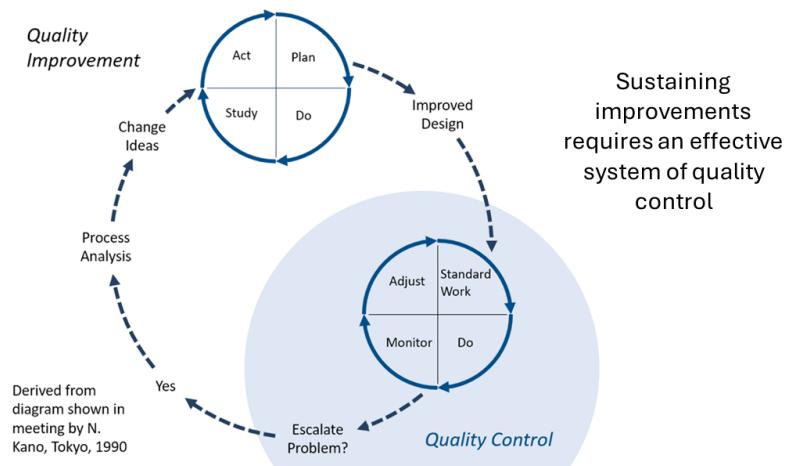
Paulo now firmly believes that Quality Improvement must be integrated with Quality Control to increase the odds that improvements will stick. If an organization does not have an effective system of Quality Control, you have to build a QC system as part of an improvement project. As Joseph Juran observed, Quality Control is not inspection of results and repair or fixing after the product or service is complete. Quality Control happens during operations

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 (the diagram appears in the [IHI White Paper, "Sustaining Improvement."](#)).

## 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 your 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 than typical organization or department improvement projects, which makes the daily problems easier to solve.

When your organization needs a special improvement project and your people use 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 will not rely solely 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.

## Our challenge in 11 EDs--New Project 2024

 > 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.

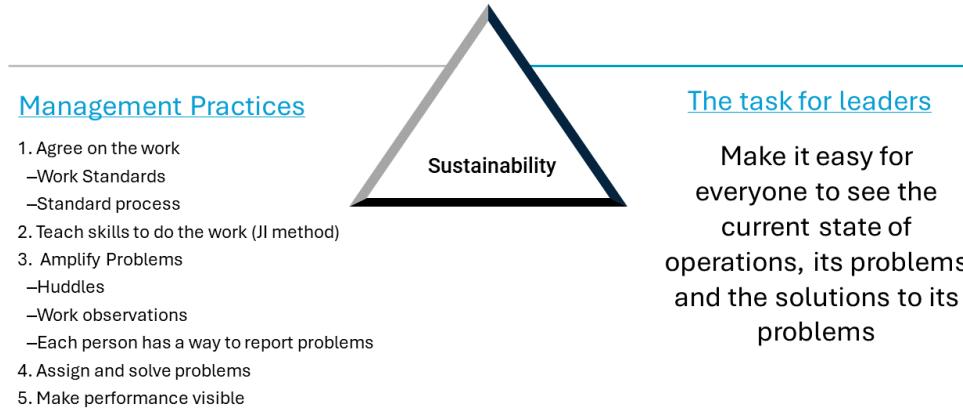
 Focus in 7 conditions: respiratory distress, stroke, cardiac infarcts, sepsis, trauma, abdominal pain and heart congestion failure.

### ED project aims: 12 months from start....

- Increase rate of bundle use for the seven conditions > 80% of patients
- Increase rate of high-risk patients with Early Warning Scores > 95%
- Increase patient perception of quality and safety (Net Promoter Score)
- Reduce waiting time for care for patients with EWS  $\geq 5$  and identification of potential infection
- Implement a system to detect and manage domestic violence

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

## Proposed Quality Control + Quality Improvement System for the ED project



You are likely to be familiar with and may be using one or more of the management practices in your EDs right now.

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).

## Lessons from the Maternal Mortality Project 2019-2021, changing care in the ED



### Lessons from Maternal Mortality Collaborative 2019-2021, changing care in the ED

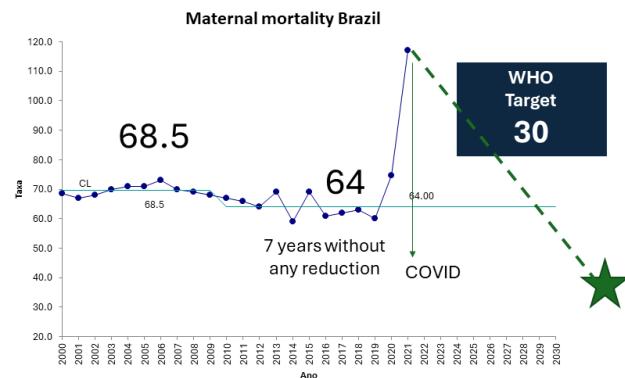
- Agree on the work
  - Work Standards
  - Standard process
- Teach skills to do the work (JI method)

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 deaths/100,000 live births.



# 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



I don't recognize that I'm sick  
Solution: Literacy

5% deaths



I know I'm sick, but I don't have access to health services.  
Solution: Improve access, parenting and literacy

20% deaths

### The low hanging fruit

Our focus

Figures courtesy of the artists and Daniel and Ju Bambozzi  
Contato: [www.dokidokiplanet.com](http://www.dokidokiplanet.com)



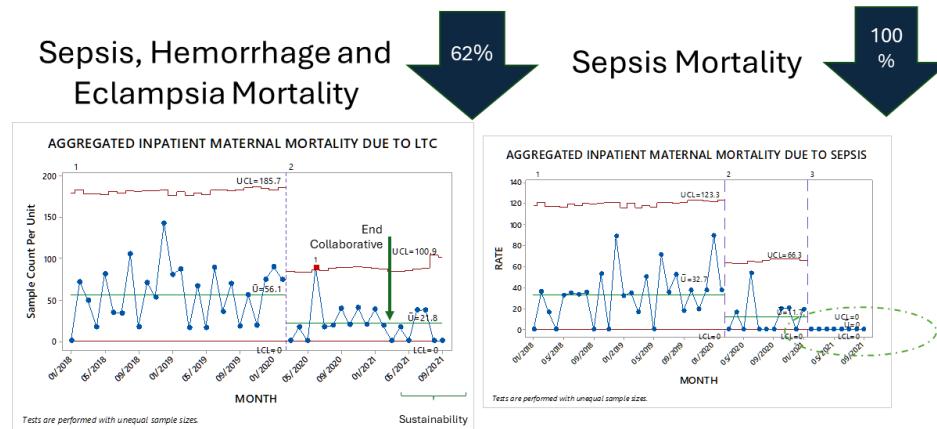
75% deaths

I know I'm sick, I have access to health services, but frontline team don't recognize that I'm deteriorating medically

Pacagnella RC, Cecatti JG, Osis MJ, Souza JP. The role of delays in severe maternal morbidity and mortality: expanding the conceptual framework. Reprod Health Matters. 2012 Jun;20(39):155-63

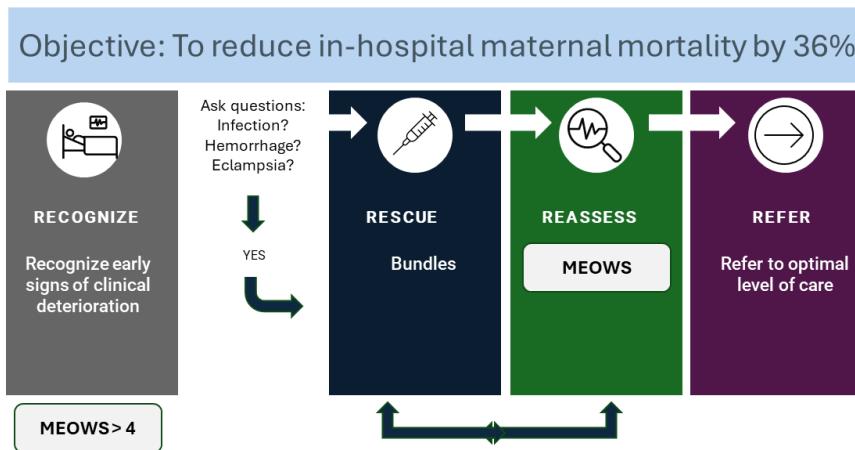
## Quick look at results of the project through 2021

## Hospital Maternal Mortality Results 19 public hospitals 2018 – Oct 2021



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’s the rescue bundle for suspicion of sepsis.

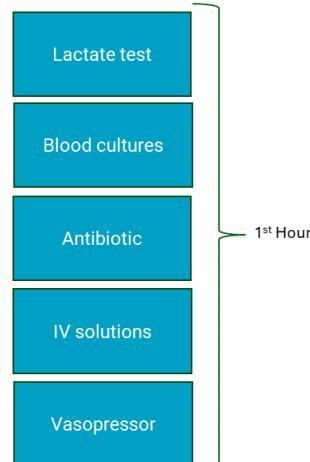
## What was new in this project?

- Declare work standard: a clear aim or “normal”
- No pregnant woman/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 defined “4Rs to Rescue” and used Job Instruction

Bundle: Sepsis suspicion

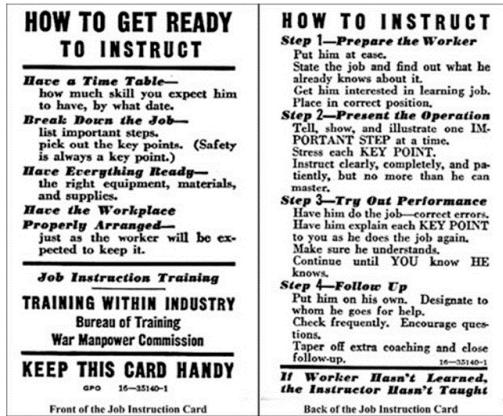


### Job Instruction

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



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

Image of JI card, 1944-5

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.

## Job Breakdown Sheet: What, How and Why

Important steps	Key points	Reasons
1) Identify patient	<ul style="list-style-type: none"> <li>Introduce yourself to the patient</li> <li>Ask for ID, check name, DOB, mother's name</li> <li>Explain what will be done</li> </ul>	<ul style="list-style-type: none"> <li>Guarantee and strengthen the bond with the pregnant woman</li> <li>Most important time of the person is in front of you</li> <li>Provide trust</li> </ul>
2) Perform anamnesis	<ul style="list-style-type: none"> <li>Ask the reason for coming to the ER</li> <li>Ask about bleeding, fever, and high blood pressure</li> </ul>	<ul style="list-style-type: none"> <li>Observe alert status</li> <li>Vital data may be normal now, but the pregnant/ postpartum woman may have been having symptoms recently</li> </ul>
3) Check -Temperature -RR -SpO <sub>2</sub> -Pulse	<ul style="list-style-type: none"> <li>Start with Temperature</li> <li>Place the axillary thermometer on the patient's forehead</li> <li>Observe the RR taking to the patient's chest</li> <li>Do not use cell phone</li> <li>Wait or compare clock at your fingers</li> </ul>	<ul style="list-style-type: none"> <li>It takes longer to measure temperature with an axillary thermometer</li> <li>It is better to use a pulse oximeter</li> <li>Prevent the patient from noticing and becoming nervous during breathing</li> <li>Impression of distress</li> <li>Facilitates the counting of RR</li> </ul>
4) Calculate MIOWS	<ul style="list-style-type: none"> <li>Use standard rule of thumb: if a parameter <math>\alpha + \beta = 4</math> in the sum, ask the 3 questions:</li> <li>• Any history of pain, palpitations, etc.</li> <li>• Any history of pain, palpitations, etc.</li> <li>• Any history of pain, palpitations, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid mistakes and improve accuracy</li> <li>The answer was essential to decide on opening the bundles in the first hour</li> </ul>
5) Open Bundle	None, Septic, Hemorrhage or Electropia	If we want to save the life of a pregnant woman, the rescue must be done in the first hour after birth. Avoid deterioration of the pregnant woman.



Important steps	Key points	Reasons
2) Perform anamnesis	<ul style="list-style-type: none"> <li>Ask the reason for coming to the ER</li> <li>Ask about bleeding, fever, and high blood pressure</li> </ul>	<ul style="list-style-type: none"> <li>Observe alert status</li> <li>Vital data may be normal now, but the pregnant/ postpartum woman may have been having symptoms recently</li> </ul>

This JBS corresponds to the Recognize step of "4Rs to Rescue" Process

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?**

## Reflections on Job Instruction

- Everyone has clarity about the core jobs in the bundles.
- New people learn how and why, along with what to do.
- 1-1 training takes time but delivers exceptional consistency in work
- Job Instruction drives a Training Plan/Schedule for each team

Everyone has clarity about the core jobs. Common agreement on core jobs provides the basis for future adjustments and upgrades to work.

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.

### **Lessons from collaboratives to reduce hospital acquired infections**

2021 - 2023 - Collaborative in Brazil  
Reduce HAI by 50%  
200 public ICUs



2022 - 2025 Collaborative in Portugal  
Reduce HAI by 50%  
20 public hospitals



Amplify Problems

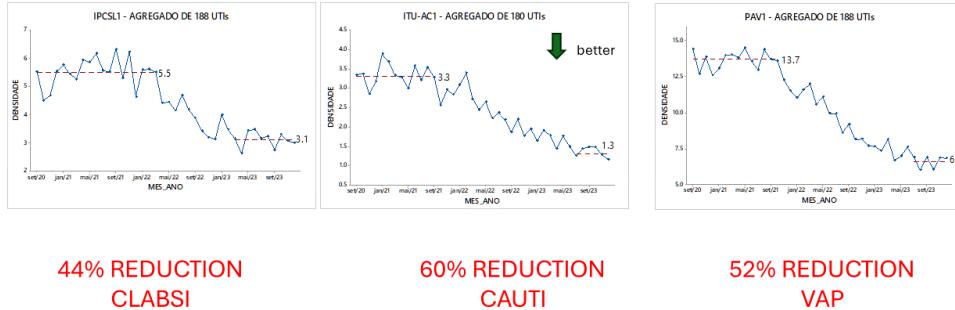
- Huddles
- Work observation
- Each person has a way to report problems

Assign and solve problems

Make performance visible

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

## Infection Reductions HAI Project Brazil, Sept 2020 - Sept 2023



Note: UTI in the graph headings is the Portuguese acronym for ICU, not urinary tract infection

## What was new in the HAI projects

### Amplify Problems

- Huddles used to surface problems
- Work observations
- Problem-reporting method

### Assign and Solve Problems

- Weekly review cycle, posted status

### Make Performance Visible

- Management boards



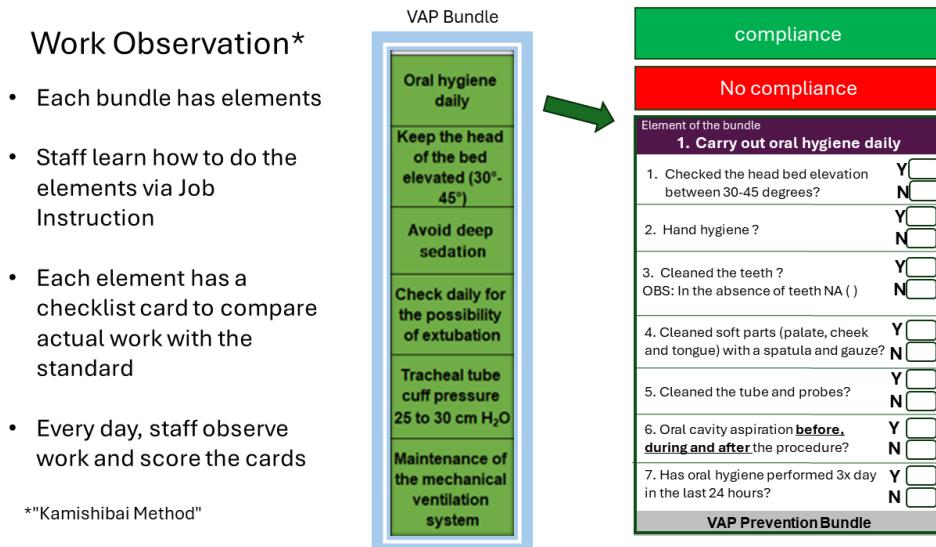
The HAI projects involved several elements of the management system that will be used in the ED Project.

- Huddles: 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 the problem statements.

- Problem Identification: 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 the description 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.
- Management Boards: 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 work observations because we think is the most novel aspect of Paulo's recent projects.

### Work Observations: 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.

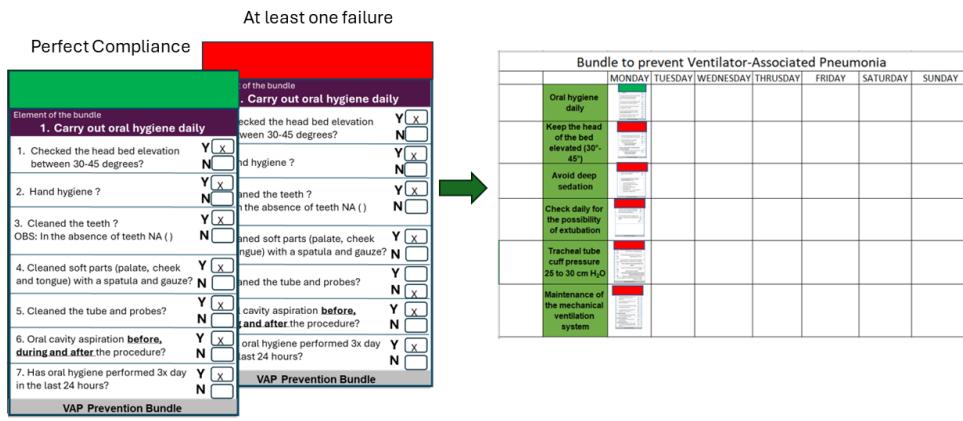
The team takes the results from regular audits to build a picture of performance. A display board enables everyone to see the state of compliance with the core work skills in the clinical unit, week by week. Adherence to the standard is rated as pass (Green) or fail (Red).

## Two-sided cards

Perfect Compliance		At least one failure	
<b>Element of the bundle</b> <b>1. Carry out oral hygiene daily</b>			
1. Checked the head bed elevation between 30-45 degrees?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X	<input type="checkbox"/> N	<input type="checkbox"/> Y <input checked="" type="checkbox"/> X
2. Hand hygiene ?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X	<input type="checkbox"/> N	<input type="checkbox"/> Y <input checked="" type="checkbox"/> X
3. Cleaned the teeth ? OBS: In the absence of teeth NA ()	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X	<input type="checkbox"/> N	<input type="checkbox"/> Y <input checked="" type="checkbox"/> X
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	<input type="checkbox"/> Y <input checked="" type="checkbox"/> X
5. Cleaned the tube and probes?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X	<input type="checkbox"/> N	<input type="checkbox"/> Y <input checked="" type="checkbox"/> X
6. Oral cavity aspiration <b>before, during and after</b> the procedure?	<input checked="" type="checkbox"/> Y <input type="checkbox"/> X	<input type="checkbox"/> N	<input type="checkbox"/> Y <input checked="" type="checkbox"/> X
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	<input type="checkbox"/> Y <input checked="" type="checkbox"/> X
<b>VAP Prevention Bundle</b>			

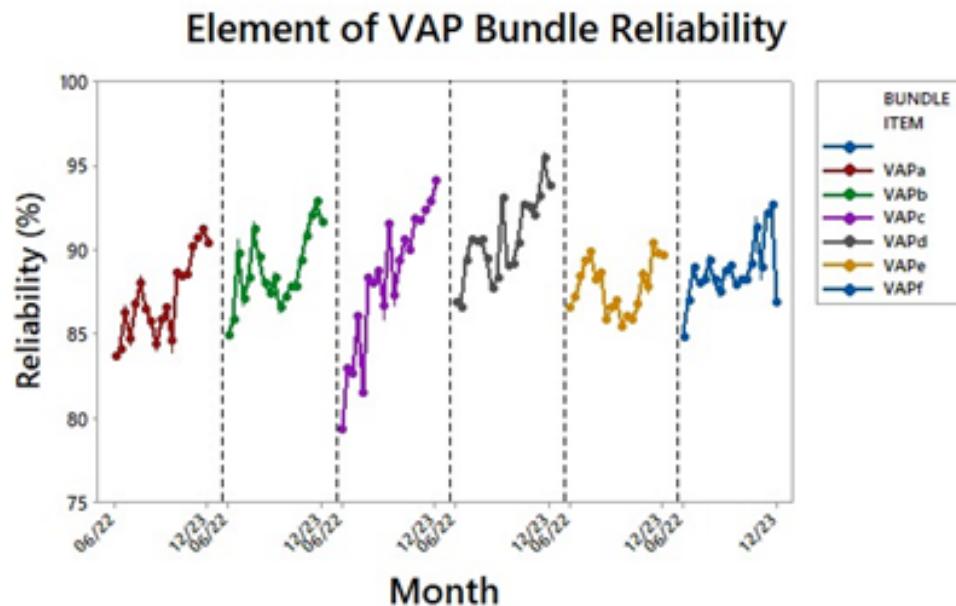
The person who observed the work places the completed card on a summary display. The summary display has a column for each day of the week and a row for each bundle element. The card is placed in the relevant cell of the display.

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



Each clinical unit usually summarizes weekly performance in a time series chart, one graph per bundle so that the history of previous weeks is not lost.

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



**Automation innovation** An innovation is 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 weekly Kamishibai records into a run chart or control chart. A photo of the Kamishibai board will be taken at the end of each week and then run through an application to count the red and green cards in the photo. The app then converts the counts to a control chart. The team will post the chart on the management board. The project in Africa is also testing ways to use AI tools to process language data into summaries.

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

## Reflections on Kamishibai Method

- Set-up/learning take initial effort
- Saves time and improves care in the long run
  - Job problems are caught daily
  - Peers learn to observe bundle elements, reinforcing their own practice
- Problems became annoyingly visible to leaders (red for not compliant)
- No variation among hospitals to check if there was compliance or not to the element of each bundle
- Actual display is very cheap (< US\$10), feasible in our projects

The Kamishibai method takes effort to establish. The main challenge is getting the clinical unit members comfortable and persistent in 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 has now shifted to 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. 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.

The Kamishibai board shows everyone the state of job performance on key elements of care. Problems with the elements of the bundles became annoyingly visible to the unit supervisor. The red cards on the wall are out in the open for anyone to see. In Paulo's experience, local leaders work hard to reduce red cards.

As indicated by the slide, the project designers and teams found the method suited their collaborative projects. They found very little variation among hospitals about the definition of compliance to each element of the bundle. Low variation makes it simpler to aggregate numbers across settings to assess overall impact. Also, the cost of construction of the display board and cards was modest.

\*\*Question for the audience: how can the Kamishibai method work in an ED environment?\*\*

Here's the schematic of a Kamishibai board for the new ED project.

### Schematic of Kamishibai Board for the ED project

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

The ED project in Brazil will focus on patients who present with seven conditions: respiratory distress, stroke, cardiac infarcts, sepsis, trauma, abdominal pain and heart congestion failure.

The project team plans to develop Job Breakdown Sheets to cover the steps of the generic rescue process, including the specific rescue bundles for each condition.

What challenges and countermeasures do you see in application of the Kamishibai method in the ED environment?

## Additional notes on elements of the management system

### Agree on the work

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

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

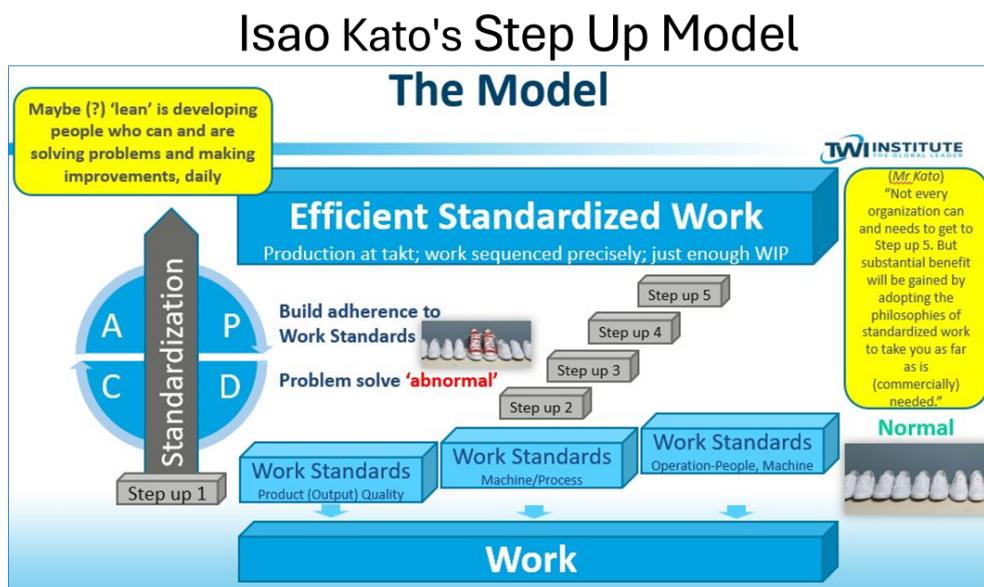
- the characteristics of the product or service you intend to produce;
- the conditions of equipment and the environment that support production;
- the step by step operations by people to make everything happen.

The instructions are referred to as work standards, which are the foundation of standard work as defined by Graupp and Purrier (2023)..

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-up" Model.



In Kato's model:

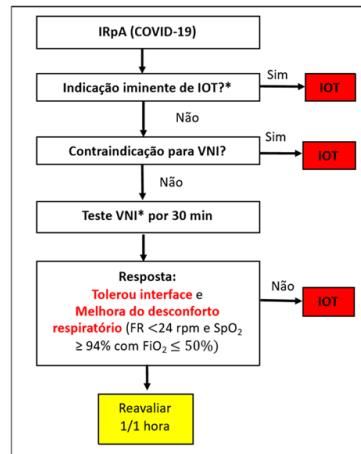
- Step up 1 defines Normal—what you expect, in the sense of a ‘Norm’.
- Step up 2: Make it easy to see the difference between Normal and Abnormal. Step up 2 enables you to see problems!
- Step Up 3: Problem solve (reduce the gap) between Normal and Abnormal.
- Step up 4: Refine the workflow to drive 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 cmH<sub>2</sub>O (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  $30^{\circ}$  and  $45^{\circ}$  (except COVID patients with pronated position)



- Cuff pressure of tracheal cannula between 25-30 cm H<sub>2</sub>O



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## Work Standard Example: Operations and Staff Roles

0.12% chlorhexidine oral solution is effective against gram-positive and gram-negative bacteria, and against fungi and some viruses; Has prolonged bacteriostatic action of more than 12 hours



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		
2.3 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 to help supervisors work with their people to increase production and safety:

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

(3)

**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**

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## 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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## **Adapting Job Instruction in the Maternal Mortality and ICU projects**

The War Manpower Commission developed Job Instruction for war-time factories. A supervisor could build the Job Breakdown Sheet and teach a job skill on the production floor or using a special workstation with production tools and materials. In jobs that involve direct patient care, Paulo's teams adapted how they built and used Job Breakdown sheets . For example, in the 10-hour “learn how to teach the JI way” class , 14 supervisors used mannequins and simulated care settings to learn how to create Job Breakdown Sheets and teach using the Job Instruction outline.

The project team then held weekly sessions with these supervisors to co-design all the Job Breakdown Sheets for each element of the bundles. These Job Breakdown Sheets were again created using simulation care settings and then refined based on direct clinical application to patients.



## **Amplify problems**

### **Work Observation: Kamishibai method**

Kamishibai is a Japanese term:

# KAMISHIBAI

KAMI = PAPER

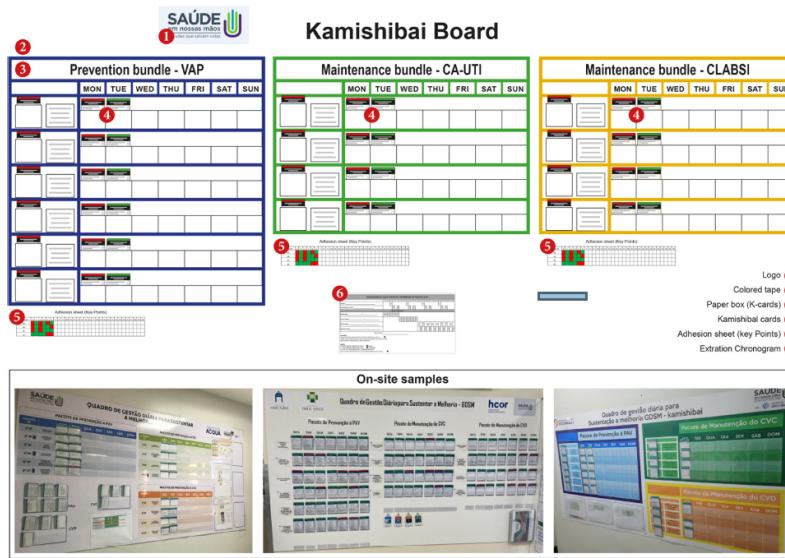
SHIBAI = THEATER

“PAPER THEATER”



- Kamishibai was born in Japan to teach children and illiterate people, telling stories on small stages showing the images;
- The presenter demonstrates the image, and behind the image reads the instructions to tell the story.
- In Improvement Sciences, Kamishibai is used to control quality (deviation of “normal”)

Fonte: <https://theconversation.com/kamishibai-how-the-magical-art-of-japanese-storytelling-is-being-revived-and-promoting-bilingualism>



The image above is from Bravo et al. (2023), which describes how the ICU Phase 2 project team developed and deployed Kamishibai boards in almost 200 hospitals.

## Individual problem reporting

The ICU projects developed a problem report form that anyone can use. The staff person fills out the form and puts it in a folder on the management display board. Problems are reviewed weekly (see next section.)

## 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

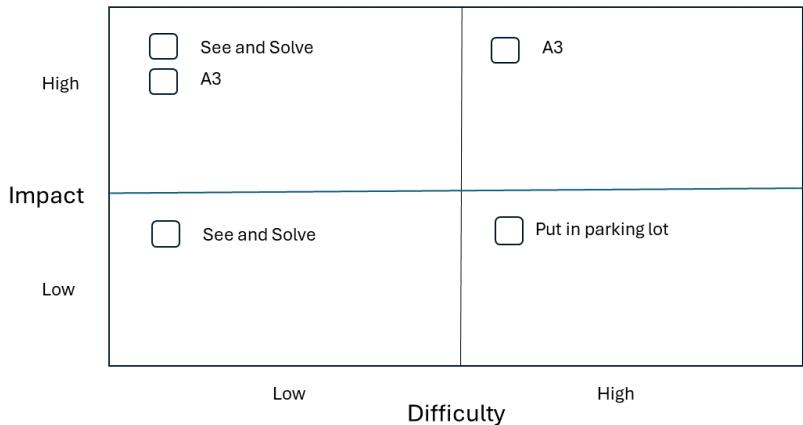
Problem-solving is not an occasional activity in Quality Control. In Paulo's current design, unit teams use a weekly cycle of problem identification and assignment. Problems are divided into See and Solve problems and Structured Problem Solving problems. Structured Problem Solving requires logic and documentation using an [A3 problem-solving template](#).

Each week the RN and MD leads for the project have a 20 minute meeting. Typically, one front-line representative attends, too. Other people may be invited (e.g. pharmacist). [LINK TO VIDEO?]

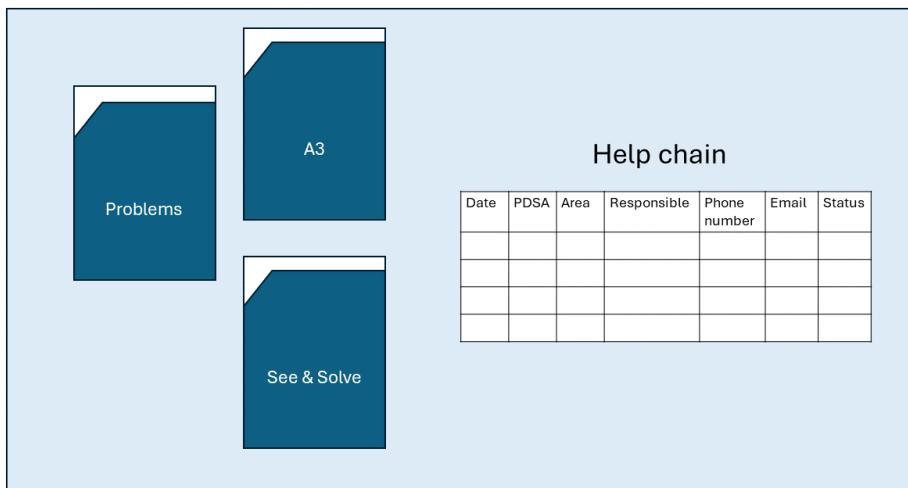
Here's the typical agenda for the problem review session:

1. how many new problems have we gotten since last week?
2. Sort the problems in a 2 x 2 Importance x Difficulty matrix.
3. Decide See and Solve or A3 approach for each problem.
4. Update the Daily Management Board, that shows projects and project management notes–date, status, responsible person.

## Decision Matrix: Sort the Problems



Management Board Schematic



The unit leaders decide how many improvement mini-projects can be “open” at any one time. A limit on the number of projects reinforces the message that it is important to finish a mini-project before adding a new one to the board. In the recent collaboratives most units are able to address between two and five problems at any one time.

### Key points:

- See and Solve reminds you to Go See and catch the problem in action before determining a solution.

- if the same See and Solve problem recurs more than a few times, then this problem is escalated to A3 problem-solving. The recurring problem deserves more analysis and deeper countermeasures.

### **Make performance visible: use an analog display board**

Why not just keep everything about your unit's performance in the computer?

Paulo says: "The system needs to speak to you." A computer is not accessible to everyone on-demand in a clinical unit. You need to log in, find the right place to look among many options...people give up! When the display is on the wall, you can't escape the information. Everyone sees the same thing. The display is the natural location for stand-up huddles.

There are applications of digital displays for bed management that may work well. An analog display does not depend on the IT service team to revise format or update content. No waiting in the IT project queue!

In Paulo's experience, the benefits of the board outweigh the ~10 minutes a day required to keep the display up-to-date.

During the collaborative, the collaborative leader has the job to keep the board updated. After the formal end of the collaborative, the unit leader has the job.

## Appendix

### Tip for improving a management system

Test on a small scale.

For example, start with one bundle related to one condition in the ED project. Develop the Job Breakdown Sheets, determine how Kamishibai method will work with the initial bundle. Don't ask staff to develop Job Breakdown Sheets and instruct for all conditions and all bundle elements. Testing on a small scale builds confidence and reduces risks of failure.

Small tests get you moving fast(er) to learn by trying out your ideas.

### A Note on Quality Planning

If you are familiar with Joseph Juran's Quality Trilogy, Quality Planning complements Quality Improvement and Quality Control. The IHI Whitepaper on Whole System Quality summarizes the three quality components:

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

Quality Planning	Quality Control	Quality Improvement	
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	<b>Patients, Families, and Communities</b>
<b>POINT OF CARE</b>			
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	<b>Clinicians</b>
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	<b>Unit-Level Leaders</b>
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	<b>Quality Department Staff</b>
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	<b>Departmental Leaders</b>
Identify customers, prioritize needs, and develop strategy	Mobilize resources to address emergent and cross-cutting problems	Sponsor and commission prioritized QI projects	<b>Executive Leaders</b>
Ensure organizational strategy is quality-centric	Review quality performance on a regular basis	Review performance of major QI projects on a regular basis	<b>Board of Directors</b>

Quality Planning is the way an organization identifies areas of opportunity and change related to strategy and markets. 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.

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

While we don't address Quality Planning today, we believe that Quality Planning depends on the health and performance of operations, including an effective Quality Control system.

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 Little, 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 the 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.

## Resources

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Scoville R., Little K., Rakover J., Luther K., Mate K. (2016). *Sustaining Improvement*. IHI White Paper. Cambridge, Massachusetts: Institute for Healthcare Improvement. (Available at [ihi.org](http://ihi.org))

**Video:**

*What Is the 5 Step Up Model? Focus on Step Up 1* Lean Frontiers video series presented by Oscar Roche, TWI Institute, <https://www.youtube.com/watch?v=LtFqucRqkY4>