Implementation of Lean and Six Sigma in Magnetic Resonance Imaging:

Optimizing the "End-To-End" Process to Improve the Customer Experience and Operational Efficiency in a Patient Service Center Mode

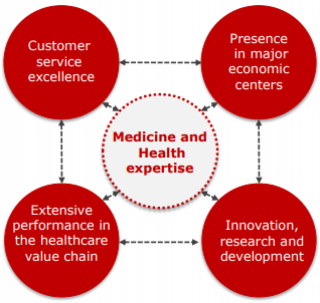
V R Dos Santos, BEng, MBA
J Tsutsui
G Jung, MBA, BEng
G A Machado, BEng
M A de Paula

GrupoFleury

Background

GrupoFleury

Competency Map



Competitive Position

- **Best solution** to customers and physicians.
- Intensification and deepening of the relationship with customers and physicians.
- **Focus on the needs and resolution** of customer and physicians' problems.
- **Unquestionable** quality and offering of innovative products and services.

Operational Excellence Drivers

- **Continuous improvement** of all our operations and administrative activities
- **Simplification** of all key processes.
- Focused in increasing the **customer satisfaction**.
- Based on the **integrated management.**
- **Essential** for the maintenance of **competitive advantage.**

2

Objectives

GrupoFleury

D M A I C

DEFINE

"As-is":
(At four large Patient Service Centers - PSCs)

- **Service productivity** with **opportunities** to be better.
- **High lead times** of execution in imaging exams.
- **Exam schedules** of patients **not met**
- **Complaints** related to waiting time for MRI.
- **Customer Satisfaction bellow** the goals in all the MRI services.

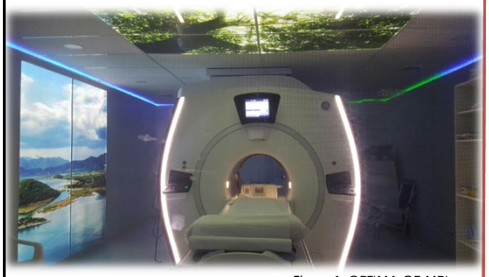


Figure 1: OPTIMA GE MRI

The implementation of Lean & Six Sigma in Magnetic Resonance Imaging (MRI) service:
Key Performance Indicators

Service productivity	How much bigger is the indication that the efficiency is increasing, there are a positive impact in reduce the customer´s permanence in the PSC (Lower lead time).
Complaints	Lower values indicate that service is being faster and better.
Net promoter score (NPS)	Higher values indicate the a positive service is being delivered

3

Methods: DMAIC

GrupoFleury

D M A I C

MEASURE

Value Streaming Mapping

a. "As-is" Map
b. drawing of the future = "to-be" Map

Figure 2:Example from Brigadeiro PSC VSM

ANALYSE

Analytics phase and priorization

a. Stratification of data collect results
b. Identification of potencial problems versus impacts
c. Priorization of the most important issues

IMPROVE

Points of failure reduction

a. Treatment of the problems priorizationed
b. Improvements implementation by using Lean Tools

CONTROL

Standardization of processes

a. Definition and a standardization of new flows and activities
b. Work Team train
c. Implementation of Management frameworks

Routine Management

a. Development of daily reports
b. Start new format of meetings with team
c. Assessment

4

Analyse

GrupoFleury

D M A I C

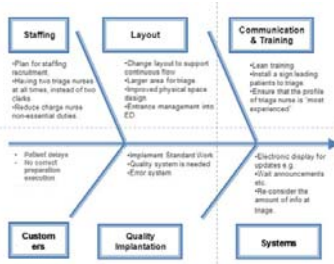
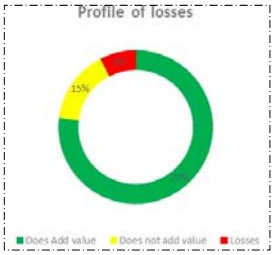


Figure 2: Ishikawa



Activities Analyzes X Tools of Lean Service for application

Activities	Analysis					Lean Service Tools								
	Equipment status	Time classification	%LT	Estimated improvement for activities	Total Impact on patient lead time of experience	Point-of-Use Storage and Work Standardization	Kaizen Blitz	SMED	Pull & Synchronous Scheduling	Work Balancing	Lean Flow Planning - Sub-micro Layout	Pokayoke	Setup Reduction	Total Productive Maintenance
MRI exam execution	in progress	Does Add value	73%	5%	4%	x				x	x			x
Accommodate customer and communication of instructions	on charge	Does not add value	10%	60%	5%	x	x				x	x	x	
Unit Prioritization - appointment scheduled	stoped	Losses	5%	60%	3%	x	x	x	x					
Setting the table	stoped	Does not add value	3%	35%	1%	x					x			
Last set-up to customer liberation	on charge	Does not add value	2%	35%	1%	x	x					x	x	
No-show exam (customer not present)	stoped	Losses	2%											
Waiting time to the image starts	on charge	Does Add value	2%											
Puncture / Contrast application	on charge	Does Add value	1%											
Image adjustment for MRI routines	in progress	Does Add value	1%											
Upload information to the system	on charge	Does not add value	0%											
Customer Delay (to exam starts)	stoped	Losses	0%											
Total					14%									

Figure 3: Lean Matrix

Improvements

GrupoFleury

D M A I C

They triggered immediate actions in different phases of the service delivery process, from the customer´s arrival, registration, exam processing and finalization of the test, when the client went away from the PSC.

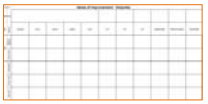


Figure 4: Board to estimule "Quick & Easy kaizen"

Figure 5: Point-of-Use Storag Kanban

Figure 8: Pull & Synchronous Scheduling

Figure 6: services route

Figure 7: Process Map Optimized

Losses X Improvements examples

6

Standardization of processes & Routine Management

GrupoFleury

D M A I C

Figure 9 - **In-Station Quality Control:** Prevents defects from passing to downstream processes and ensures immediate feedback for correction of quality problems.

Figure 11 - **Statistical Process Control (SPC):** Improve quality and process capability using statistical methods.

Figure 13 – **Assessments:** sustain the new processes and improvements implemented

Kaizen Blitz: Improve localized production areas quickly and dramatically and overcome inertia common to many organizations.

Figure 10 - **Self Directed Work Teams (SDWT):** SDWTs are the ultimate form teams for managing daily work.

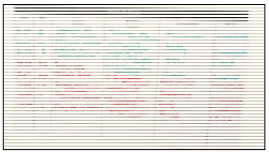


Figure 12 - **Jidoka ("LogBook"):** Prevents problems on one station of a production line from building inventory and also creates urgency to find permanent solutions.

Figure 14 - **Team Development:** To provide motivation, improved coordination, reduce management requirements and exploit the knowledge of employees.

7

Results

GrupoFleury

Service productivity

How much bigger is the indication that the efficiency is increasing, there are a positive impact in reduce the customer´s permanence in the PSC (Lower lead time).

Complaints

Lower values indicate that service is being faster and better.

Net promoter score (NPS)

Higher values indicate the a positive service is being delivered

KPI	After (Feb16) X Before Results (Oct16)			
	Unit A	Unit B	Unit C	Unit D
Service productivity	+56 pp	+17 pp	+23 pp	+27 pp
MRI complaints	-47 pp	-3 pp	-65 pp	-31 pp
Net promoter score (NPS)	+ 4,1pp	+ 6,4 pp	+ 3,6 pp	+ 11,8 pp

8

More results

GrupoFleury

Extra Revenue

How much bigger is the Equipment Productivity, it open new exam scheduling opportunities and more Revenue (if there are over demand).

Adherence to Scheduled Time

Higher values indicate positive adhesion between the patient scheduling time and the time of the exam realization.

KPI	After (Feb16) X Before Results (Oct16)			
	Unit A	Unit B	Unit C	Unit D
Revenue (from more Productivity of MRI Equipments)	R$ 57,9 K	R$ 71,2 K	R$ 473,4 K	0*
Sheduling Adherence	+ 16 pp	+ 13,6 pp	+ 1 pp	+ 7,7 pp

R$ - Brazilian Money

* No new more scheduling opportunities

9

Conclusion

GrupoFleury

- Lean & Six Sigma tools were very important to identify and promote continuous improvement in many “end-to-end” processes.
- In this process, all the requirements and standards of quality were met, ensuring the differentials established at our organization.
- Moreover, with more controlled and effective non-technical processes, it was possible to find other opportunities for improvement in MRI: review of technician´s schedule and time duration of exams, resulting in increased revenue from MRI service.

Improved overall efficiency

Improved customer´s satisfaction

Helped to promote more competitive advantage

10