Applying TOC in a Leading Eye Hospital an experience

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MEVOCON

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- MBA (MDI, Gurgaon), TOCICO Certified Practitioner, MANTOC program (Goldratt School), ISO Certified Lead Auditor
- Mgmt Consulting, IT Delivery, FMCG Manufacturing, Healthcare, Public Sector
- Operational and Biz. Performance improvement with a focus on TOC and Lean, QA, Delivery excellence, Project and Program Mgmt., Strategic Transformation, Change Mgmt.
- IBM, Wipro, HCL-Perot Systems, PWC, HUL and UNWFP, CARE India
- Social Entrepreneurship, Personal Effectiveness

Debashish is the founder and principal consultant of "**mevocon**", a management consulting firm provides services to both for "profit" and for "not for profit" organizations in service sectors (Focus on Healthcare) as well as in manufacturing & in distribution using an integrated approach combining the knowledge and philosophy of Theory of Constraints (TOC), and LEAN, with the Fundamental Management Principles**.**

He is focusing in healthcare with a social purpose

Debashish has over 22 years of experience in Management Consulting, Development Sectors, Manufacturing, Global IT delivery services and in health care. He has worked in various managerial/leadership positions in IBM, Wipro, HCL Perot, PWC, Hindustan Lever Ltd and a very short span in United Nations.

TOC Implementation Case Studies in an Eye Hospital

- Case 1: TOC Implementation in Day Care Eye Surgery

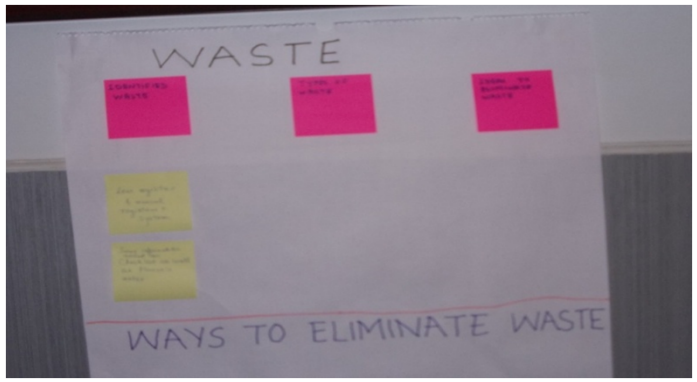
- Case 2: Application of Buffer Management along with Lean in to improve patient flow in "Investigation Process" (*where the patients goes through various tests before a few days of the eye surgery)*

Background

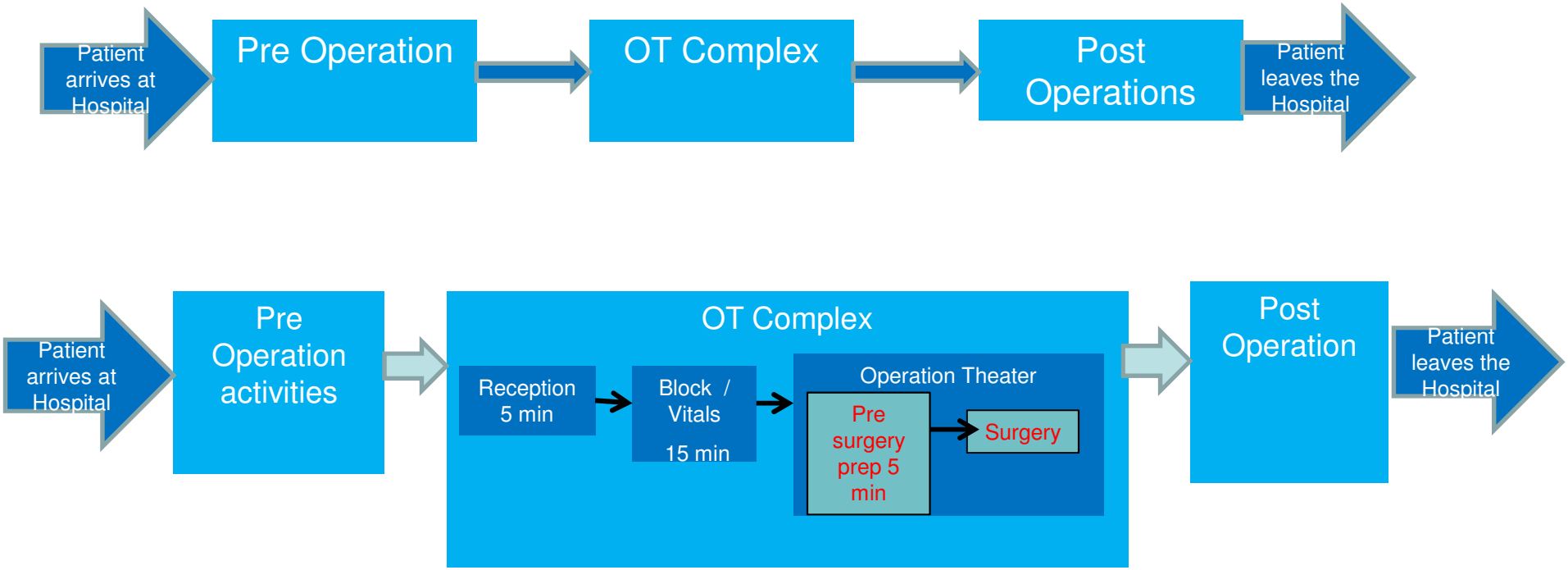
- Consultant explained about TOC to the medical director of an eye hospital and further had a meeting with the CEO
- The CEO thought it is like any other improvement initiative and was reluctant
- We promised that we won't put the organization in any risk and won't bring any kind of employee dissatisfaction
- CEO approved and we took up the project in day care eye surgery process (OT process) as per the suggestion of the medical director

TOC Implementation Case Studies in an Eye Hospital

- Case 1: TOC Implementation in Day Care Eye Surgery



Day Care Eye Surgery OT process

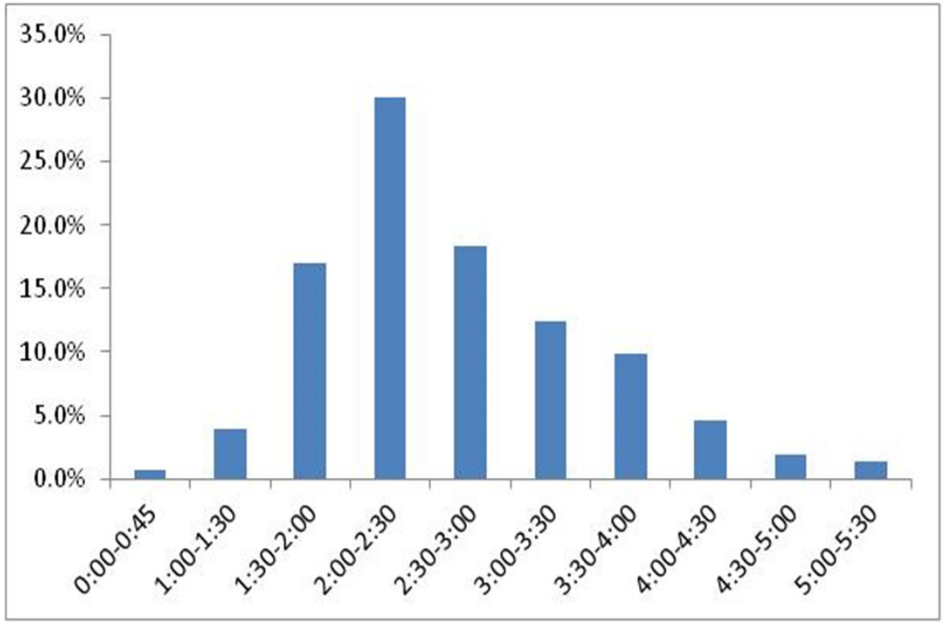


Lead Time before implementing TOC Solution

Total Lead Time OT process_ Pre TOC Solution								
13 th Jan	14th Jan	16 th jan	17th Jan	18th Jan	19th Jan	20th Jan	21st Jan	25nd Jan
03:35	02:45	03:00	02:47	04:40	02:00	02:25	03:50	04:05
04:55	05:30	03:40	02:25	04:15	02:25	03:35	01:51	02:20
03:15	02:15	03:10	02:52	02:35	02:55	02:00	04:10	02:00
03:05	03:07	03:05	03:30	02:50	02:05	01:46	01:45	01:35
02:40	02:10	02:27	02:56	01:45	02:30	04:50	02:30	02:10
03:40	02:20	02:55	02:13	01:44	03:50	02:10	01:35	01:15
03:10	04:00	02:25	02:15	02:10	01:30	02:00	02:45	01:35
03:35	03:15	02:47	02:27	04:20	01:30	03:10	02:30	02:10
02:00	03:00	01:45	03:23	03:05	03:10	03:15	03:00	04:10
01:55	02:45	02:15	02:13	02:20	03:00	02:10	02:03	05:15
04:21	02:17	01:40	03:30	02:50	01:35	01:40	00:45	02:40
03:56	02:20	03:10	02:20	03:00	01:15	02:30	03:35	02:30
02:55	03:50	04:30	02:02	01:45	02:30	01:30	02:10	01:40
02:15		03:50		02:00	02:35	01:50	02:10	02:45
03:45				03:05	02:30	03:20	02:10	01:50
03:25				02:20	03:05	02:35		
02:35				02:00	02:30	02:15		
				02:20	02:10	01:35		
				02:05	02:40	04:00		
				03:50	02:45	02:40		
				02:05	02:20	01:25		
					02:25	01:40		
					02:50			

Data on Lead Time: Before implementing TOC Solution

Data	Pre TOC Solution
Average Lead Time	2 hr:43 min
Max Lead Time	5 hr: 30 min
Min Lead Time	0 hr: 45 min



Lead Time for % of patients (Pre TOC Solution)

For around 79% patients the lead time is more than 2 hr

	45 min to 1 hr	1 hr to 1 hr 30 min	1 hr 30 min to 2 hr	2 hr to 2 hr 30 min	2 hr 30 min to 3 hr	3 hr to 3 hr 30 min	3 hr 30 min to 4 hr	4 hr to 4 hr 30 min	4 hr 30 min to 5 hr	5 hr to 5 hr 30 min
Pre TOC	0.7%	3.9%	17.0%	30.1%	18.3%	12.4%	9.8%	4.6%	2.0%	1.3%

Note: data collected over one week

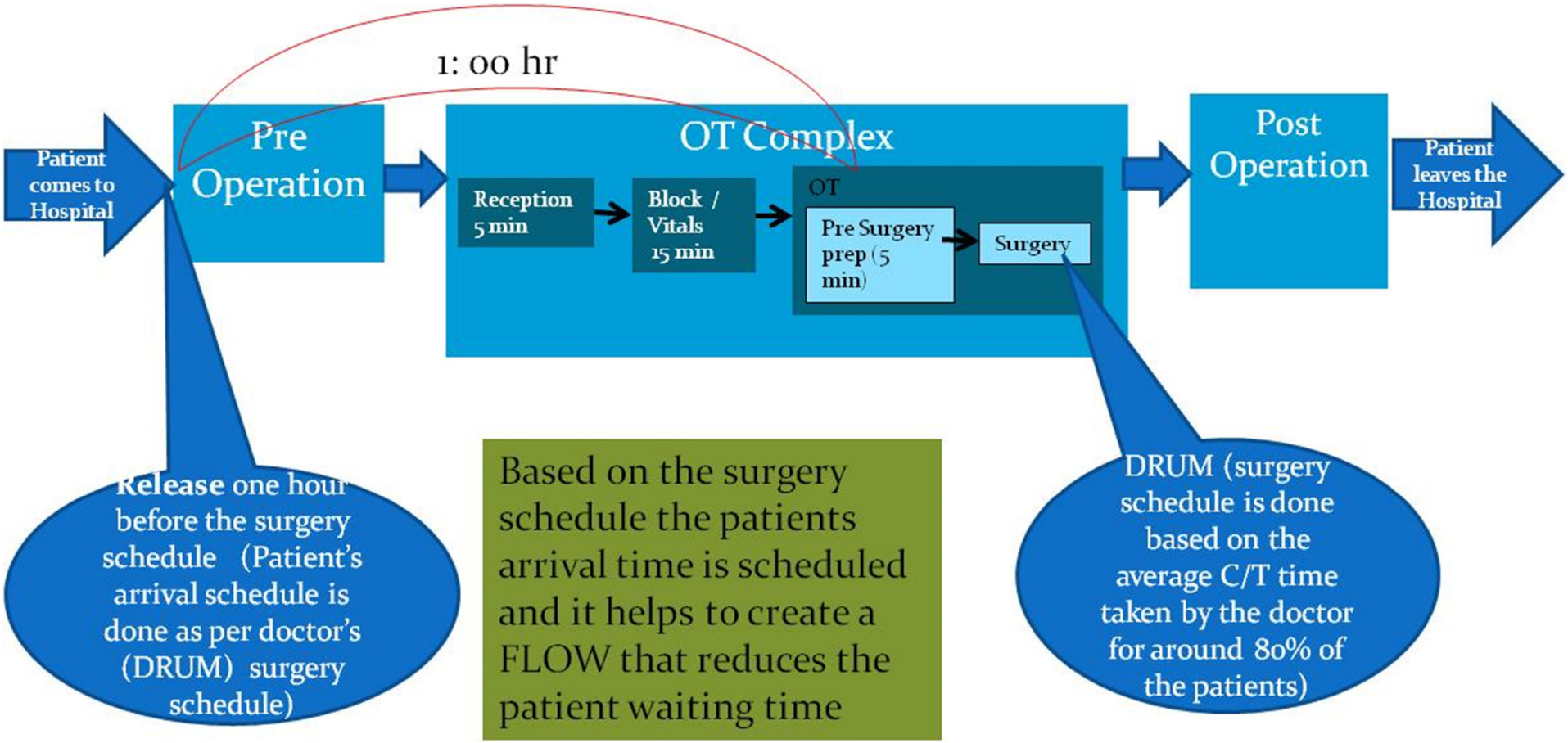
Dilemma

- The OT Floor manager and staff had the following dilemma before the TOC solution and were interested to resolve the dilemma
  - Not to waste the time of doctor, (*i.e. once the surgery starts the doctor should not be idle at any time because patient is not ready/ available at the surgery table)* call all the patients early and they wait
  - To have maximum patient satisfaction ensure patient waiting time is as minimum as possible

Solution Components Summary

- Solution Components: The solution is adaptation of the TOC MTO solution as defined in *"Ever Improve" of Mr. Oded Cohen* and further Lean is integrated with TOC
  - Doctor's surgery time decides the schedule
  - Patients schedule is done as per doctors surgery schedule(so unnecessary waiting of patient is reduced)
  - All others subordinate to surgery time so doctor's time is not wasted
  - Introduce "expedite" principles in OT process area
  - Cycle time of each operation /tasks that subordinate and impact the lead time are reduced or improved on a continuous basis applying Lean philosophy /Kaizen
  - Doctor also put himself on continuous improvement to reduce the surgery time without compromising the quality

Day Care Eye Surgery: OT Process

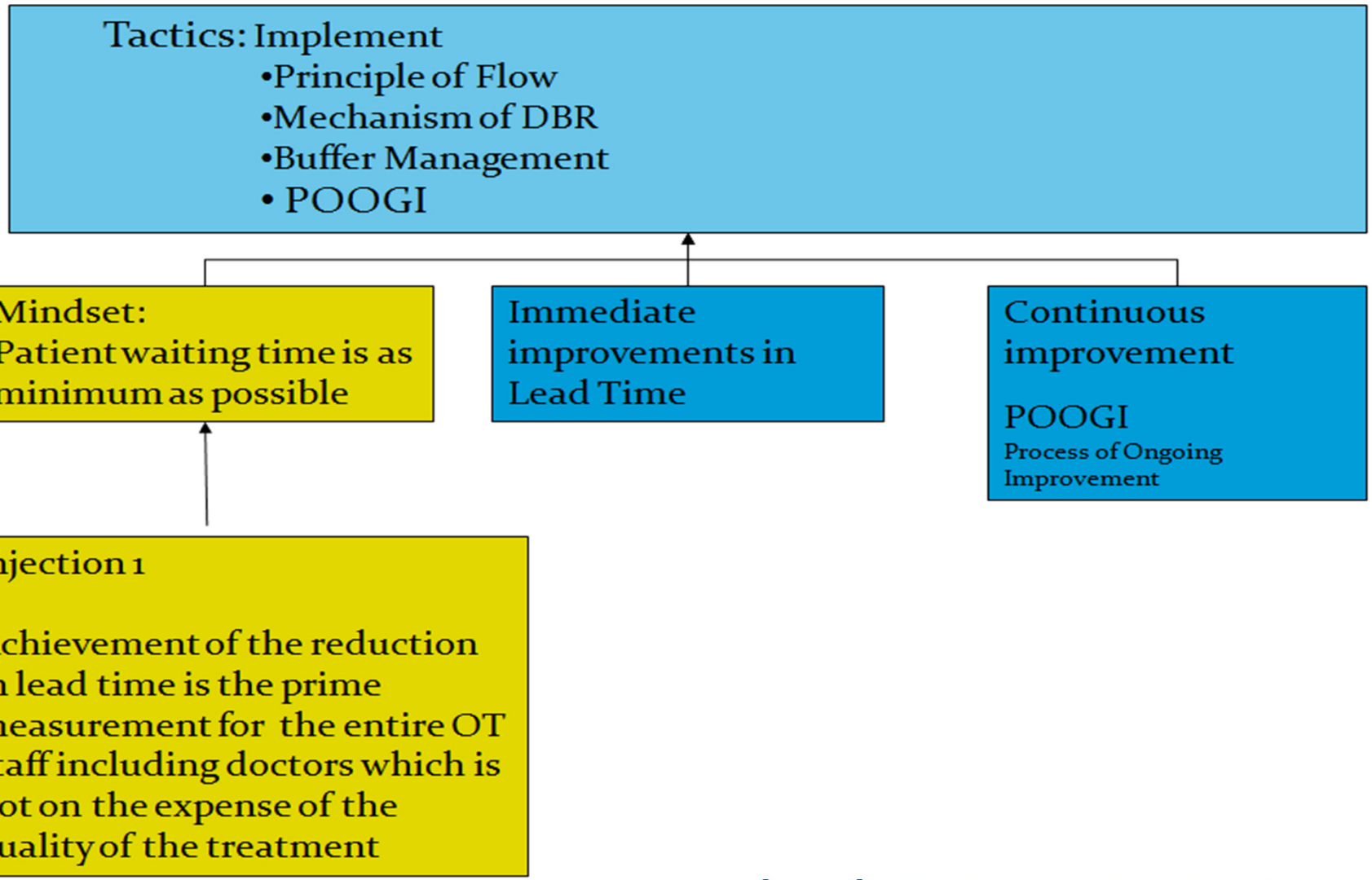


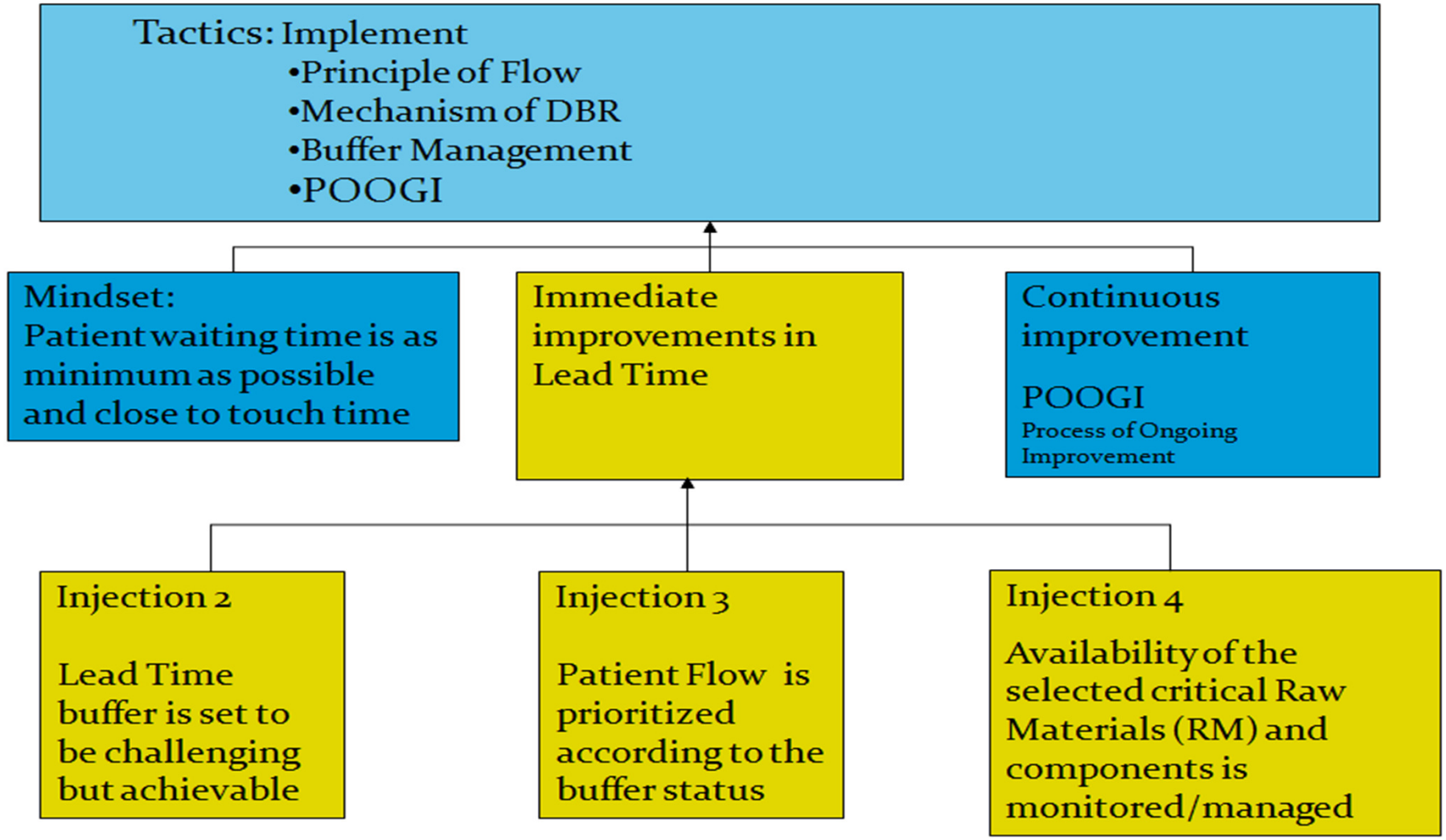
TOC Solution

- Strategy (what do we want to achieve):
  - The patient waiting time is as minimum as possible without keeping the doctor idle at any time during the surgery {Reduce the lead time for day care eye surgery to 1.5 hr/2 hrs from around 2.5 hr/3 hr in the beginning for at least 70% of patients}
  - Why 2 hr was decided to start with in the beginning
    - Actual touch time at present is 80 min to 90 min for the patients who are fit and do not develop high BP/Sugar just before the surgery or do not take a long time for dilation.
    - For Pre dilated patients it is between 40 min to 60 min

TOC Solution

- Tactic (how are we going to achieve the strategy):
  - Implement
    - Principle of Flow
    - Mechanism of DBR
    - Buffer Management
    - POOGI


Tactics: Implement
•Principle of Flow
•Mechanism of DBR
•Buffer Management
• POOGI
Mindset:
Patient waiting time is as minimum as possible
Immediate improvements in Lead Time
Continuous improvement
POOGI
Process of Ongoing Improvement
Injection 1
Achievement of the reduction in lead time is the prime measurement for the entire OT staff including doctors which is not on the expense of the quality of the treatment


Tactics: Implement
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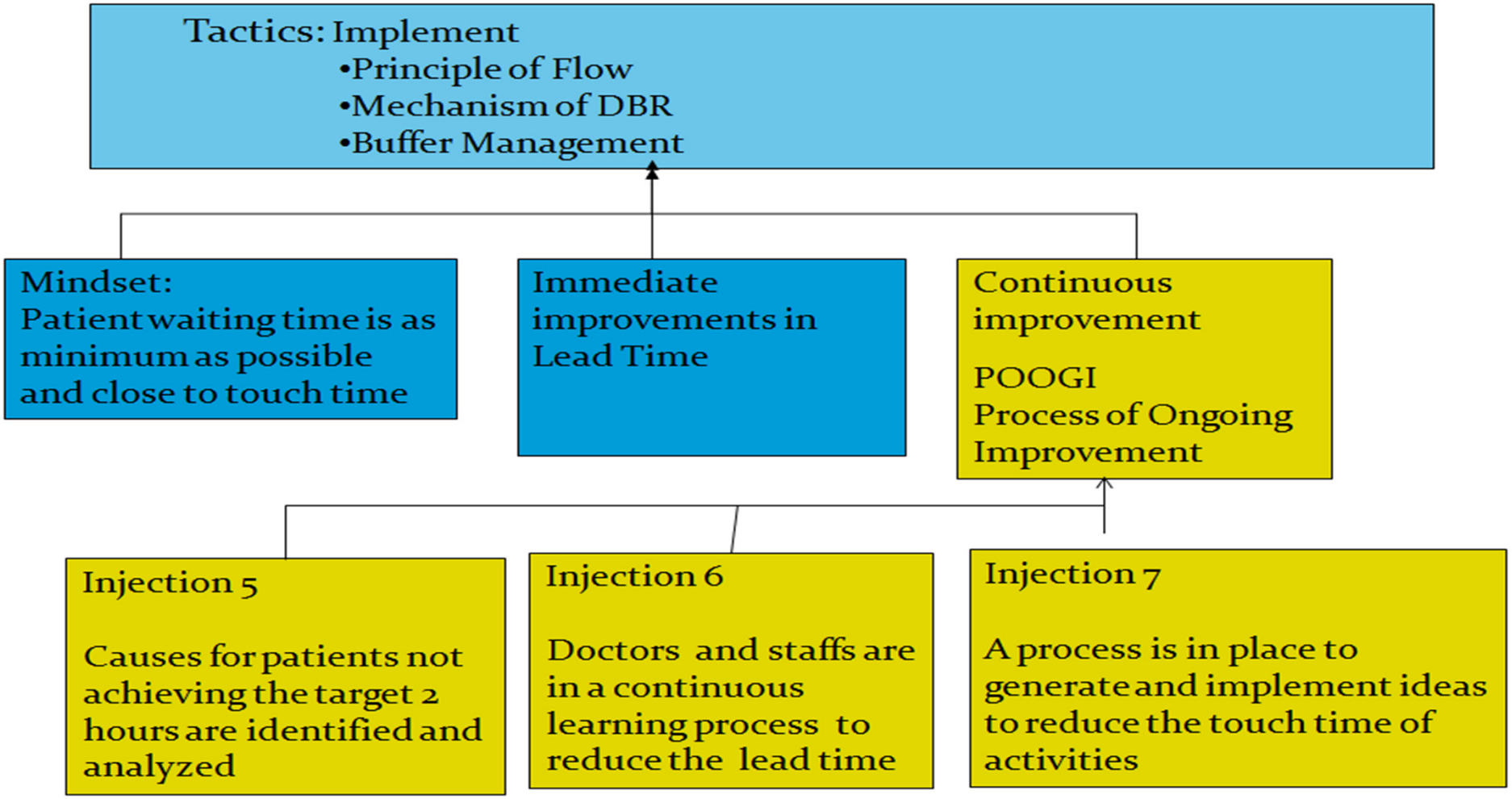
Mindset:
Patient waiting time is as minimum as possible and close to touch time
Immediate improvements in Lead Time
Continuous improvement
POOGI
Process of Ongoing Improvement
Injection 2
Lead Time buffer is set to be challenging but achievable
Injection 3
Patient Flow is prioritized according to the buffer status
Injection 4
Availability of the selected critical Raw Materials (RM) and components is monitored/managed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Injection 5
Causes for patients not achieving the target 2 hours are identified and analyzed
Injection 6
Doctors and staffs are in a continuous learning process to reduce the lead time
Injection 7
A process is in place to generate and implement ideas to reduce the touch time of activities

Injection 1

Achievement of the reduction in lead time is the prime measurement for the entire OT staff including doctors which is not on the expense of the quality of the treatment

- 70 to 80% of patients will be through (arrival>Pre Operation activities>Surgery>Post Operation care>departure) within 2 hours
- It creates a common mind set for the entire OT staff (Pre Operation activities and Surgery) with a single measurement
- This is in addition to the quality of clinical service and dealing with patients

Injection 2

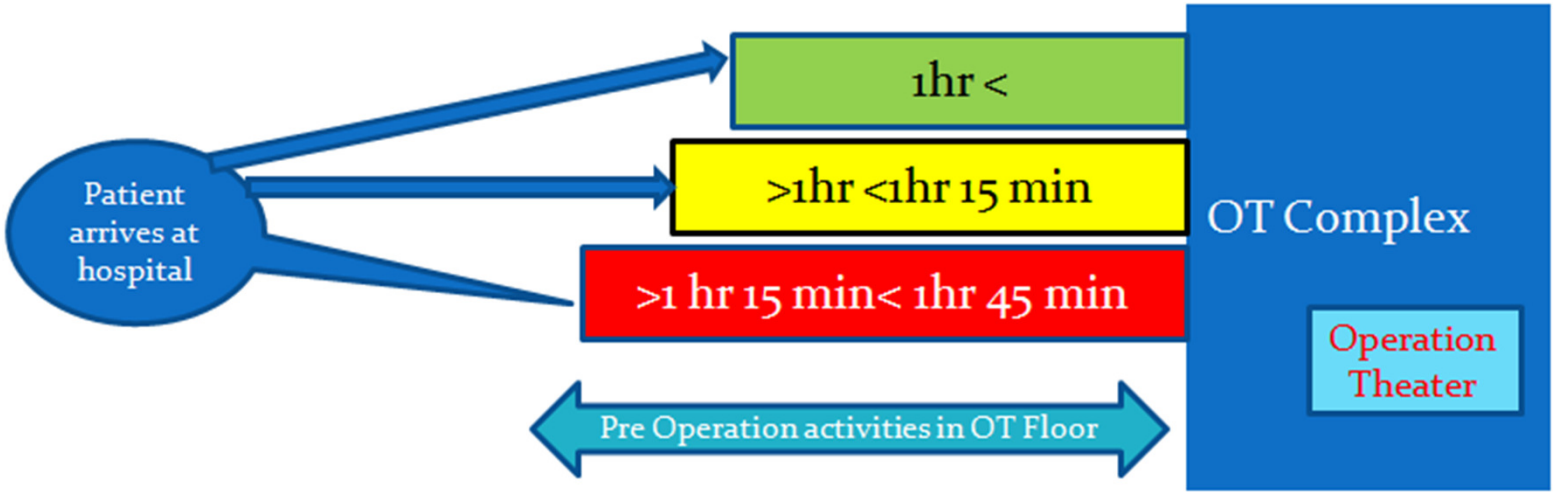
Lead Time buffer is set to be challenging but achievable

- This injection introduces the concept of Lead Time Buffer (similar to Production Buffer) keeping the “uninterrupted patient flow” in mind
- The injection contains the following components:
  - The definition of Buffer (the Lead Time -patient arrival till departure)
  - The size (length) of the Buffer
  - Time status of the Buffer
  - Patient Release into the system (similar to Material Release - the signal to start working on the order)

Injection 2

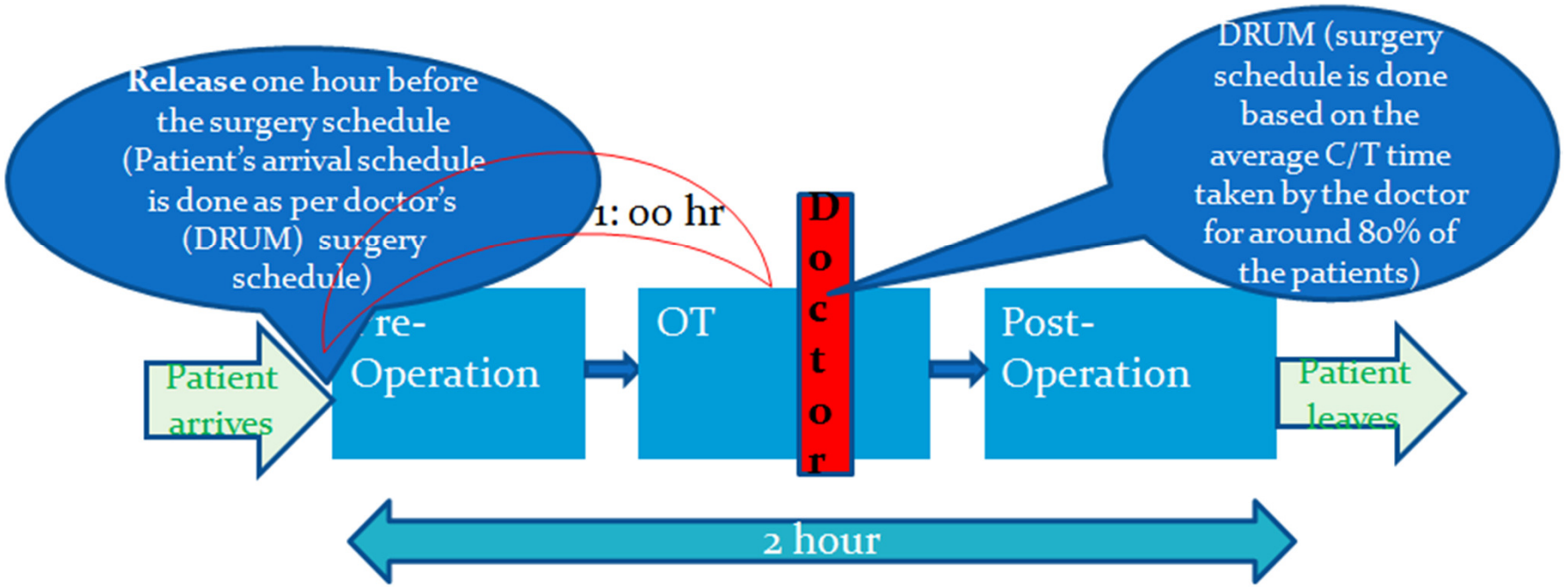
Lead Time buffer is set to be challenging but achievable

- Colour code for prioritization and expediting
- The colour code is determined for the patient based on the time spend in Pre operation activities and accordingly the OT complex In -charge does the prioritization and expedites in side the OT Complex to ensure that patient is through within the defined lead time of 2 hours



Injection 2

Lead Time buffer is set to be challenging but achievable: Patient Release in to the system (similar to Material Release - the signal to start working on the order)



Injection 3

Patient Flow is prioritized according to the buffer status

- Patient Flow to Inside Operation Theater is prioritized in OT complex by the OT complex In- charge according to the Buffer Status/Colour code
- Inside OT complex the OT complex In- charge calculates the expected completion time (By calculating the number of patients ahead in the queue + preparation time + average time for surgery) and accordingly prioritizes to ensure that the patient would be through within 2 hour of lead time
- The OT complex in charge is empowered to take decision to whom to send inside the Operation Theater, while considering the clinical factors and lead time already spent

Injection 4

Availability of the required materials and components is monitored

- There is a person who is responsible for keeping ready all the necessary things before one day of surgery (Like Full Kit manager in project management)

Injection 5

Causes for patients not achieving the target 2 hour are identified and analyzed

- Causes for patients not achieving the target lead time of 2 hour are identified and analyzed
  - The process is established to identify the causes for which certain patients are not through within the target lead time of 2 hour
  - For each patient who are getting delayed more than 2 hour, the OT floor manager finds and note down the causes
  - Once in a week the OT staff sit together and discuss on how to improve on the lead time

Injection 6

Doctors and staffs are in a continuous learning process to reduce the lead time

- Doctors and staffs are in a continuous learning process to reduce the touch time of certain activities

Injection 7

A process is in place to generate and implement ideas to reduce the touch time of activities

- As a continuous process keep on generating ideas and implement to reduce the waste in the value stream and also reduce the touch time through innovative ideas /processes/technologies
- Take the learning to other process areas

Implementation: Immediate

- Developed the procedures/guidelines for making schedule
- Establish process to ensure adherence to schedule procedures/guidelines
- Measurement: Establish the measurement (within 2 hours patients are through) and measure the lead time of each patient everyday
- Identify the reasons for delay and find out root cause and solutions
- Modify the schedule guidelines based on the result
- Introduce “expedite “process and ensure that it is followed properly

Lead Time after implementing TOC Solution

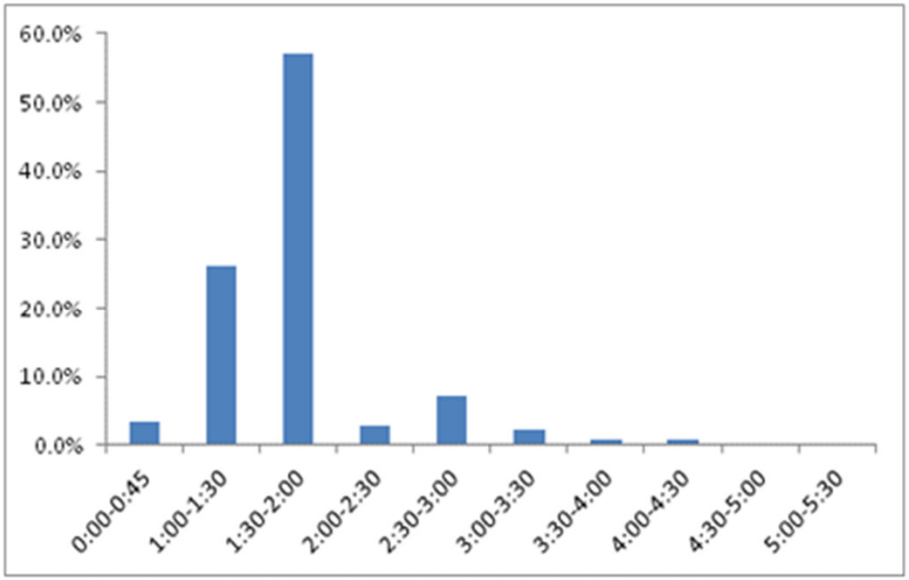
Total Lead Time OT process_Post TOC solution							
26th Mar	27th Mar	28th Mar	29th Mar	30th Mar	31st Mar	5th April	6th April
2:00	1;55	1:45	1:15	1:40	0:55	1:55	4:05
2:00	2:00	1:50	0:45	2:00	1:25	1:30	1:40
2:00	1:50	2:00	1:40	2:00	1:30	0:55	1:30
2:00	1:10	1:55	2:45	1:25	1:50	1:40	1:55
2:00	1:25	2:15	1:55	1:35	1:50	1:20	1:50
3:20	2:30	1:50	1:25	1:55	1:55	1:20	1:05
3:35	2:00	2:00	1:25	1:50	2:00	1:35	2:45
2:35	1:40	2:00	1:15	1:50	2:00	1:35	0:55
2:00	1:40	2:00	1:30	2:00	2:00	3:00	1:00
1:10	1:40		2:00	1:50	2:40	1:50	1:20
1:40	1:25		2:00	1:15	2:00	1:05	2:00
1:20	1:25		2:25	1:25	1:55	1:50	1:45
1:45	2:40		1:25	1:50	1:55	1:35	1:55
01:55	01:30		1:10		2:00	1:20	2:00
1:40	2:40		1:15		2:00	1:55	3:25
02:35	01:30		1:10		1:55	1:30	
01:50	01:45		1:10		1:25	1:55	
01:35			1:05		1:50	2:00	
01:50					2:35	2:00	
01:55					2:50	1:45	
01:50						1:55	
03:10						1:55	
02:00						2:25	
						1:25	
						1:30	
						2:00	
						1:25	

Data on Lead Time: After implementing TOC Solution

Data	Post TOC Solution
Average Lead time	1 hr: 57 min
Max Lead Time	4 hr: 05 min
Min Lead Time	0 hr: 45 min

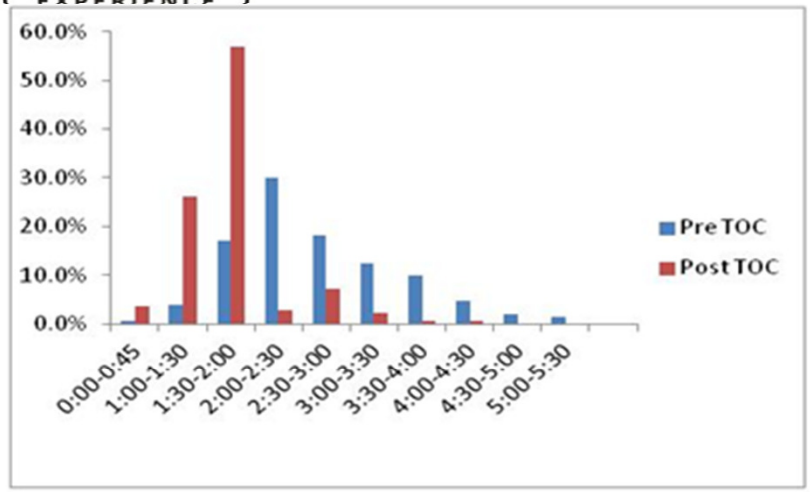
Around 86% patients are through within 2 hour (improved from 22%)

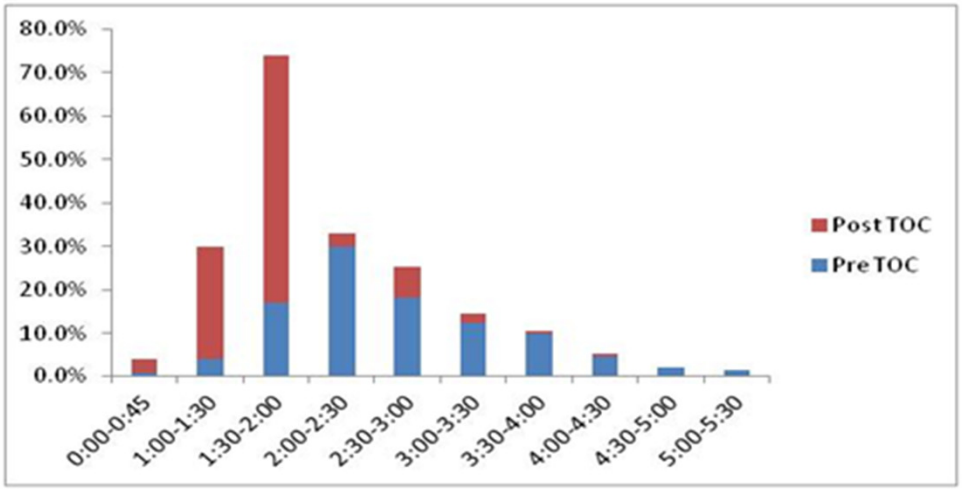
Lead Time for % of patients (Post TOC Solution)



	45 min to 1 hr	1 hr to 1 hr 30 min	1 hr 30 min to 2 hr	2 hr to 2 hr 30 min	2 hr 30 min to 3 hr	3 hr to 3 hr 30 min	3 hr 30 min to 4 hr	4 hr to 4 hr 30 min	4 hr 30 min to 5 hr	5 hr to 5 hr 30 min
Post TOC	3.5%	26.1%	57.0%	2.8%	7.0%	2.1%	0.7%	0.7%	0.0%	0.0%

Data on Lead Time: Pre and Post TOC Solution





Data	Pre TOC Solution	Post TOC Solution
Average Lead time	2 hr:43 min	1 hr: 57 min
Max Lead Time	5 hr: 30 min	4 hr: 05 min
Min Lead Time	0 hr: 45 min	0 hr: 45 min

Lead Time for % of patients (Pre and Post TOC Solution) **Average lead Time reduced by 28%**

HH:MM	0:00-0:45	1:00-1:30	1:30-2:00	2:00-2:30	2:30-3:00	3:00-3:30	3:30-4:00	4:00-4:30	4:30-5:00	5:00-5:30
Pre TOC	0.7%	3.9%	17.0%	30.1%	18.3%	12.4%	9.8%	4.6%	2.0%	1.3%
Post TOC	3.5%	26.1%	57.0%	2.8%	7.0%	2.1%	0.7%	0.7%	0.0%	0.0%

- Pre TOC, for around 49% patients the lead time was more than 2 hour 30 min and Post TOC for around 86% patients the lead time is less than 2 hour

Sustainability and Progress

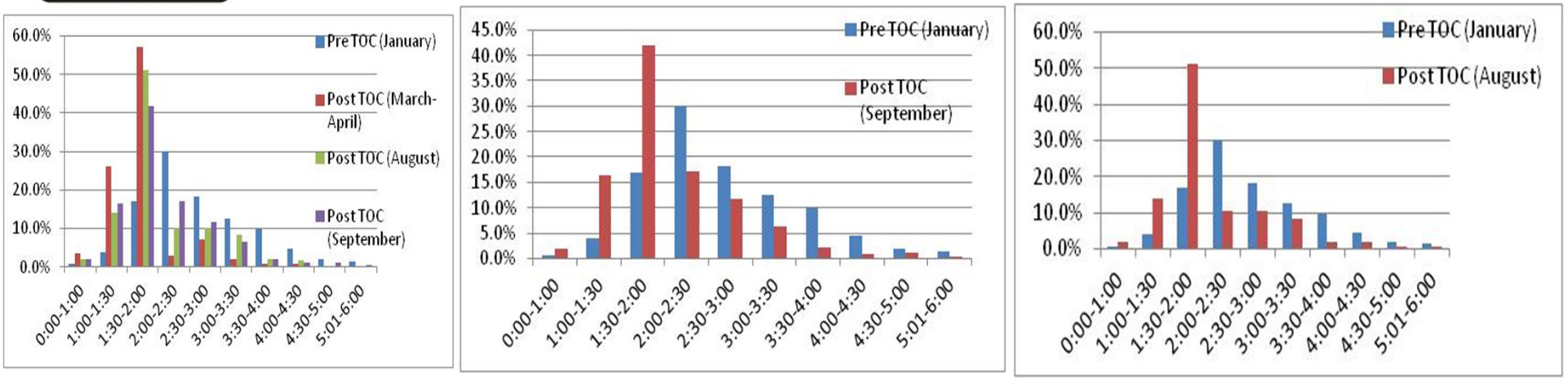
Data	Pre TOC Solution	Post TOC Solution (March-April)	Post TOC Solution (July)	Post TOC Solution (August)	Post TOC Solution (September)
Average Lead time	2 hr:43 min	1 hr: 57 min	2 hr: 18 min	2hr: 07 min	2 hr: 07 min

Table1 : Average Lead Time Pre and Post TOC solution

HH:MM	0:00-1:00	1:00-1:30	1:30-2:00	2:00-2:30	2:30-3:00	3:00-3:30	3:30-4:00	4:00-4:30	4:30-5:00	5:01-6:00
Pre TOC (January)	0.7%	3.9%	17.0%	30.1%	18.3%	12.4%	9.8%	4.6%	2.0%	1.3%
Post TOC (March-April)	3.5%	26.1%	57.0%	2.8%	7.0%	2.1%	0.7%	0.7%	0.0%	0.0%
Post TOC (August)	1.9%	14.1%	51.0%	10.3%	10.3%	8.2%	2.1%	1.7%	0.2%	0.2%
Post TOC (September)	1.9%	16.4%	41.9%	17.2%	11.7%	6.4%	2.1%	0.9%	1.1%	0.4%

Table 2 : Lead Time of % of Patients Pre and Post TOC solution

Sustainability and Progress



Lead Time: Pre and Post TOC Solution

- Progress:
  - The OT department is updating the existing IT system with the buffer signaling system
  - The staffs in other departments are now showing interest to Apply Buffer management to reduce patient waiting time
- Conclusion
  - TOC solution brings improvement and the improvement also sustains once the defined rules become part of the process

Sustainability and Progress

- *Operations Manager's communication to senior management in September 2012*
  - *From 183 minutes(Approx over 3 hours) in Dec 2011 & Jan 2012, the Average time spent by a patient on OT floor on the surgery day, in July 2012 stood at 138 minutes and in August 2012 at 127 minutes.*
  - *It is indeed commendable as we have not just reduced the waiting period, but also done it when the Cataract surgery numbers have increased by over 80% compared to last year (Aug 2012 vs Aug 2011) and with extremely good patient feedback (Out of the top 7 staff recognised in Aug 2012, 4 are from the OT floor)*

Leveraging the improvement

- As a continuous improvement process, start working on how to bring more patients and do more surgery with the existing resources, increase the revenue and profit and lower the cost without compromising quality

Benefits derived from the project

- Reduction in Lead time
- Entire OT staff started working as One Team
- Increase in Patient satisfaction
- A few measurement that drives improvement and hence does not create any confusion
- Bringing further improvement becomes easy as team knows where to Focus
- Many small issues got resolved
- Team feels motivated
- CEO is quite happy and now showing interest to take the journey forward
- Doctors and staffs are able to visualize more capacity
- And many more…..

TOC Implementation Case Studies in an Eye Hospital

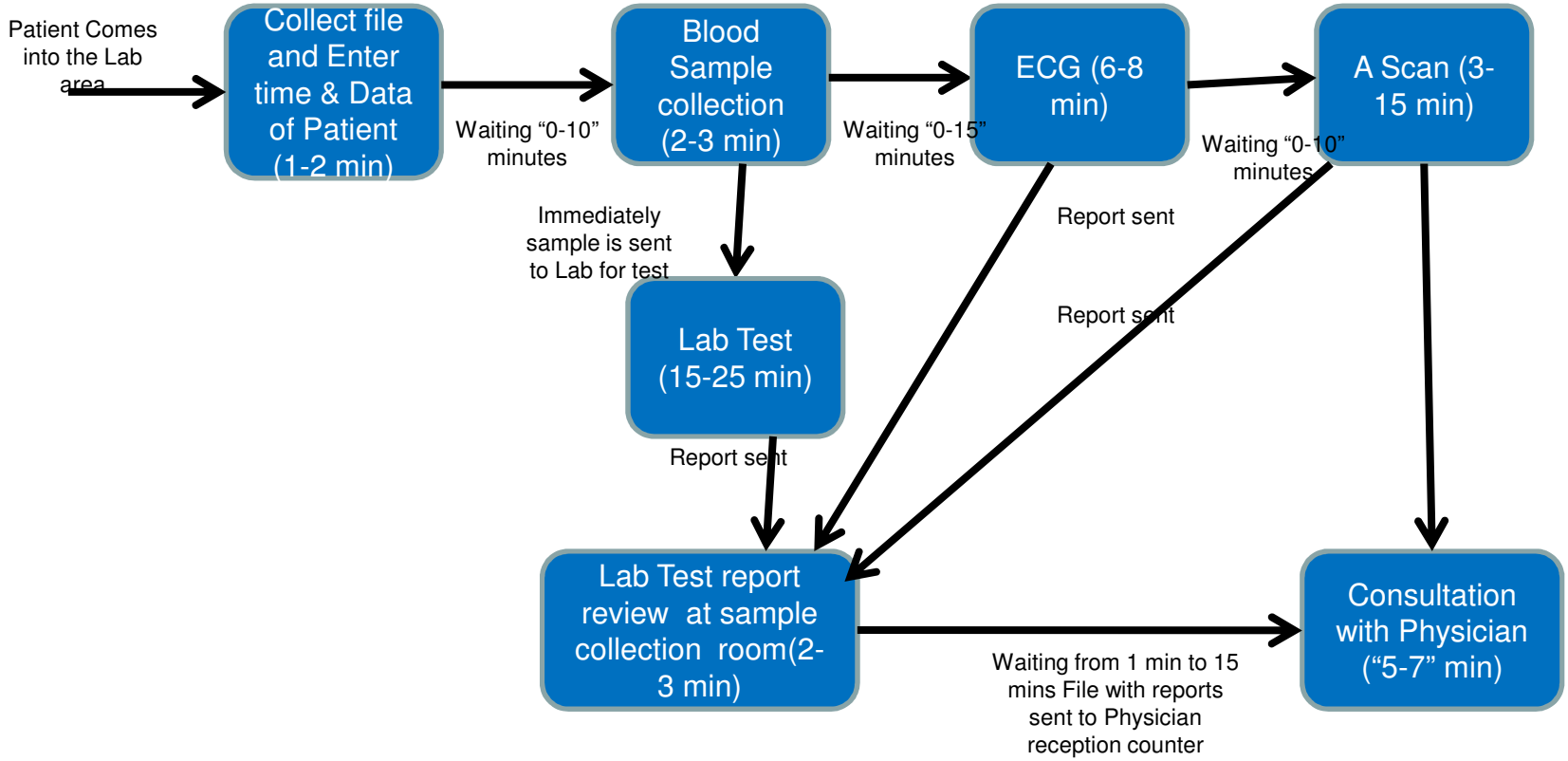
- Case 2: Application of Buffer Management along with lean in to improve patient flow in “Investigation Process” (*where the patients goes through various tests before a few days of the eye surgery)*

Applying "Buffer Management" *along with* Lean to improve *Patient Flow*

- Process : Lab Investigation
  - From Blood Sample collection till Physician Consultation
- Lab Investigation consists of
  - Blood Sample collection
  - Lab Test
  - ECG
  - A Scan
  - Review of Lab Test Report
  - Physician Consultation

Process: Lab Investigation

Process : Lab Investigation



- *Majority of patients were taking between 70 to 90 minutes*

Process: Lab Investigation

- The waiting time depends on the number of patients visiting Lab at the same time/ Many patients visiting at a peak time
- End to End lead time in Lab Investigation for a patients going through the entire cycle of Lab Investigation: 45 min to 90 min, and in very few cases it takes 120 min
- Around 60-70% patients complete between 70 to 90 min
- In any urgent cases the End to End Lead Time 30-35 min (without any waiting at any work station)
- Capacity is overloaded during peak time (1-2 hours in a day)

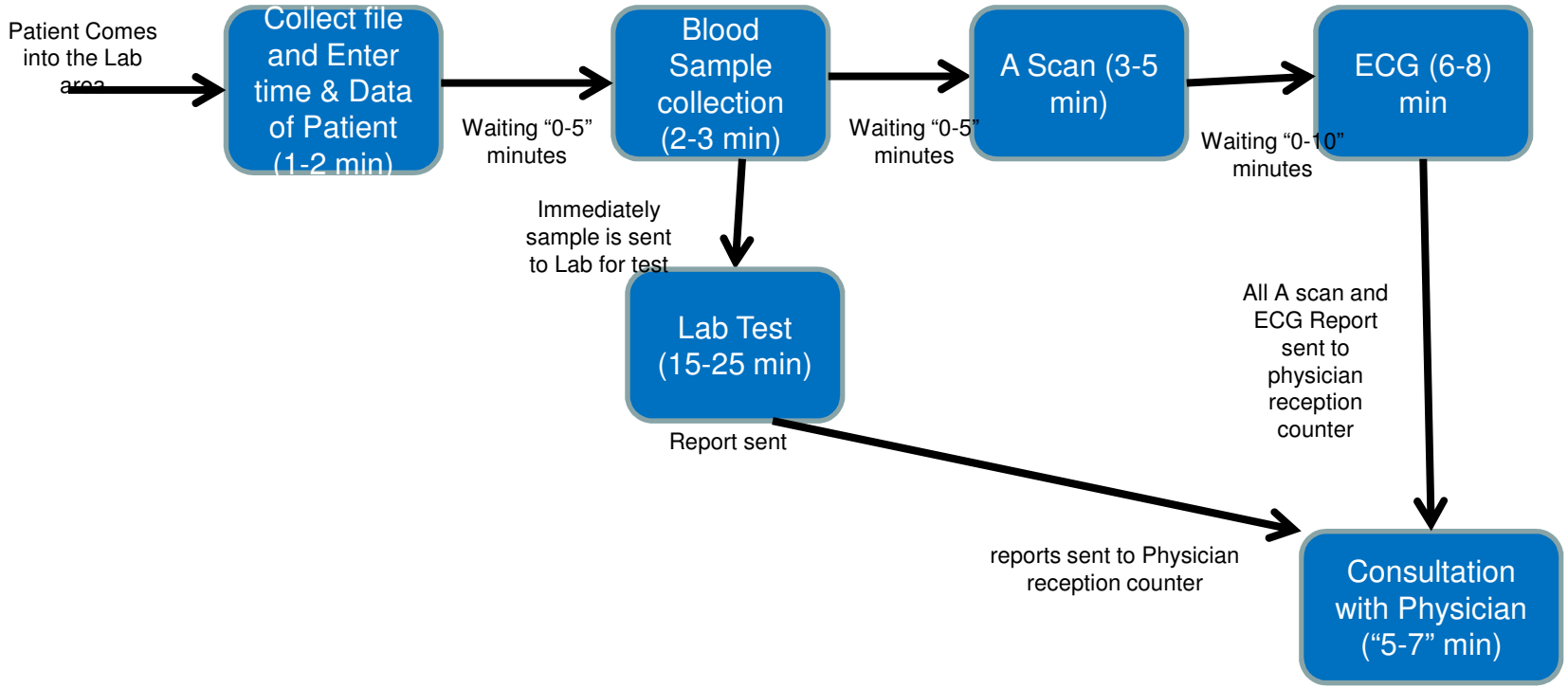
Objective and Solution

- Objective:
  - Improve patient flow
  - Reduce Lead time
  - Reduce patient waiting time and increase patient satisfaction
- Solution:
  - Reduce waste applying Lean principles and accordingly modify the process
  - Implement rules based on the functions of **Buffer Management** *(Prioritize, Expedite, Escalate, and Continuous Improvement Identifying and resolving the repeated causes)* and set the target of 60 minutes

Reducing Waste

- Reduce waste applying Lean principles and accordingly modify the process
  - Waste Identified:
    - For one activity i.e. A scan (kind of eye test) patients were moving to a different floor and again coming back to the common floor
    - The test report from the lab was coming to the sample collection room for verification and it was getting delayed there as the sample collector was busy for collecting blood sample
  - Waste Eliminated:
    - The specific activity (A scan) is moved to the floor where all other activities of that process is conducted
    - The verification process got moved to reception where all the reports get consolidated before the consultation

Process : Lab Investigation : The New Process



- "A Scan" moved from other floor to the common floor where the other activities are performed
- The new process combined with the rules for prioritize, expedite, escalate, and identification of common causes, resulted in more than 90% patients are through within 60 min

Solution Implementation

- Implement ***Rules*** based on the functions of **Buffer Management** *(Prioritize, Expedite, Escalate, and Continuous Improvement Identifying and resolving the repeated causes)* and set the target of 60 minutes

  - ***Prioritize :*** The floor manager and the receptionist who consolidate the reports and sends patients to Physician ***Prioritize*** the patients based on the time spent by the patients in investigation process
  - ***Expedite:*** After 45 minutes of patient's entry into investigation process if the all reports are not received at reception then the floor manager finds out where it is getting delayed and expedite the process by communicating the specific department
  - ***Escalate:*** If there is any challenge in any department and for which things are getting delayed then the floor manager escalate to the higher authority in weekly meeting
  - ***Continuous Improvement:*** For the patients getting delayed the common causes are documented and analyzed and improvement action is taken with the help of senior management and team responsible for that activity.

Post improvement benefits

- Become more predictable
- Reduced Lead time
- Reduced patient waiting time
  - Pre Implementation of solution: For around 60-70% patients the lead time was between 70 to 90 min
  - Post implementation: For around 90% patients the lead time is within 60 min
- All the departments understood the two measurement lead time and quality so no stress on local optima…a good team work
- Management is able to visualise more available capacity and planning to put effort in marketing

The Key to TOC

- Develop a Mindset for continuous improvement
- My learning:
  - Focus
  - Drive through Measurement
  - Engage people and get buy in
  - Think on how to achieve Flow and exploit constraint
  - Work out simple solution: the key to success
  - Bring change/improvement
    - through realization, acceptance and respect
    - buy In from all the stakeholders in the end to end process
  - Challenge the fundamental assumption and the way things are done

How a hospital can benefit from TOC & Lean Integration

- Improve patient flow and reduce waiting time
- Establish Right measurement for better performance
- Focused approach to Service Delivery Excellence *(Achieve Operational Excellence and build a competitive edge)*
- Increase satisfaction of patients and all other stakeholders
- Holistic improvement of the system(Improving quality and reducing cost)
- Harmony in the system (motivated employee and integrated departments)
- Improve in “culture of continuous improvement”
- Treat more patients with the existing resources

Improve financial performance

Thank You