



Zorg  
Ondersteuning  
Voor en door de sector

# Jaarcongres

Schaarste in Zorg & Welzijn:  
lean als oplossing

Editie 2023

17 maart 2023

Odisee Campus Sint-Niklaas



# **Novel Principles of Healthcare Management: Doing More with the Same Resources using TOC and Lean**

**Prof. Joseph Pliskin**

Professor Emeritus from the Departments of Health Policy and Management and Industrial Engineering & Management at Ben Gurion University of the Negev, Beer-Sheva Israel.

Adjunct Professor of Health Policy and Management, Harvard T.H. Chan School of Public Health, Boston, MAS USA.

## Winnie the Pooh

by A.A. Milne

“ Here is Edward the bear, he is coming down the stairs. **Boom boom, boom**, he hits the back of his head as he is dragged behind Christopher Robin. To the best of his knowledge, this is **the only way** to go down the stairs, but he sometimes feels that there must also be a **different way** – only if he could **stop for a moment** getting hit on the head and **think** about it...”



# THE HOSPITAL AND CLINIC IMPROVEMENT HANDBOOK

Using Lean and the Theory of Constraints for  
Better Healthcare Delivery

BOAZ RONEN  
JOSEPH S. PLISKIN  
SHIMEON PASS

OXFORD

# Trends in Healthcare: Hospital Care

Care at the hospital  
is expensive  
Care at the hospital  
is unsafe

Care will be pushed  
out of hospitals to  
the home

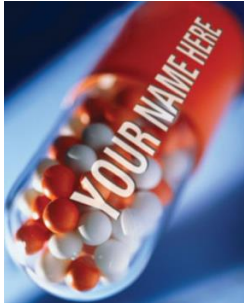
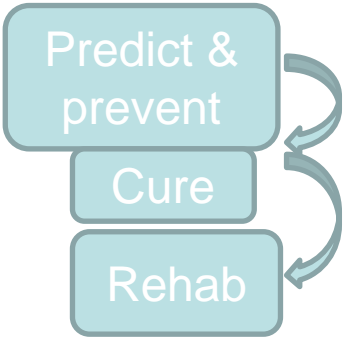
Hospitals will get  
smaller with fewer  
“real” beds and more  
“virtual” beds

Hospitals will  
provide mostly:

- Intensive care
- Complex surgery
- Specialized services

Digital  
health  
innovation

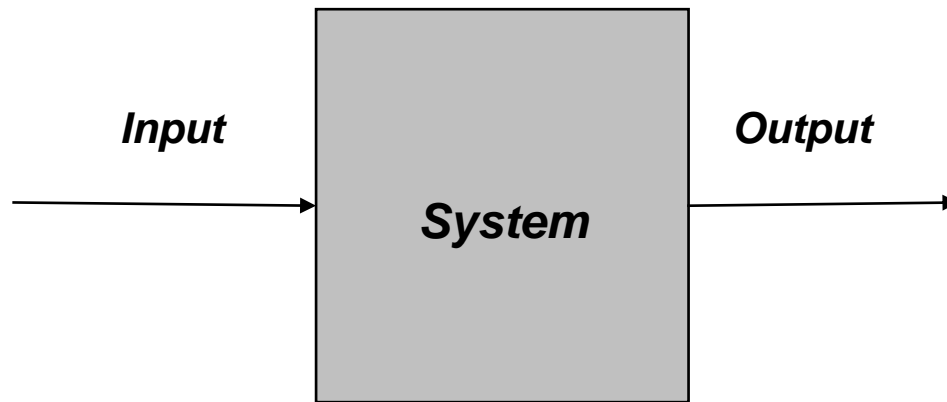
Personalized  
medicine



# Novel managerial approaches

- They are based on "common sense".
- These approaches grew out of practice; only later did they receive academic and scientific validation.
- They are simple
- They break down the myth of the input-output model.

# The myth of the input-output model



# Doing more with what we have

- Value driver I: **Increasing output**
  - can easily increase by 20%
- Value driver II: **Reducing response time**
- Value driver III: **Measuring**
  - people behave the way they are measured
- Value driver IV: **Quality**
  - clinical quality, service quality
  - Reducing the “garbage plant”
- Value driver V: **Cost accounting**
  - Classical cost accounting of the 1920s causes huge financial damage to the organization

# The "Satisficer" versus the "Optimizer"

**Optimizer** – Executive, engineer or decision maker who wants to make the best possible decision, without consideration of time constraints.

**Satisficer** – An executive or decision maker who is satisfied with a "reasonable solution" that will significantly improve the system, and does not look for the optimal solution.

**Waiting...**  
for the  
perfect  
man.

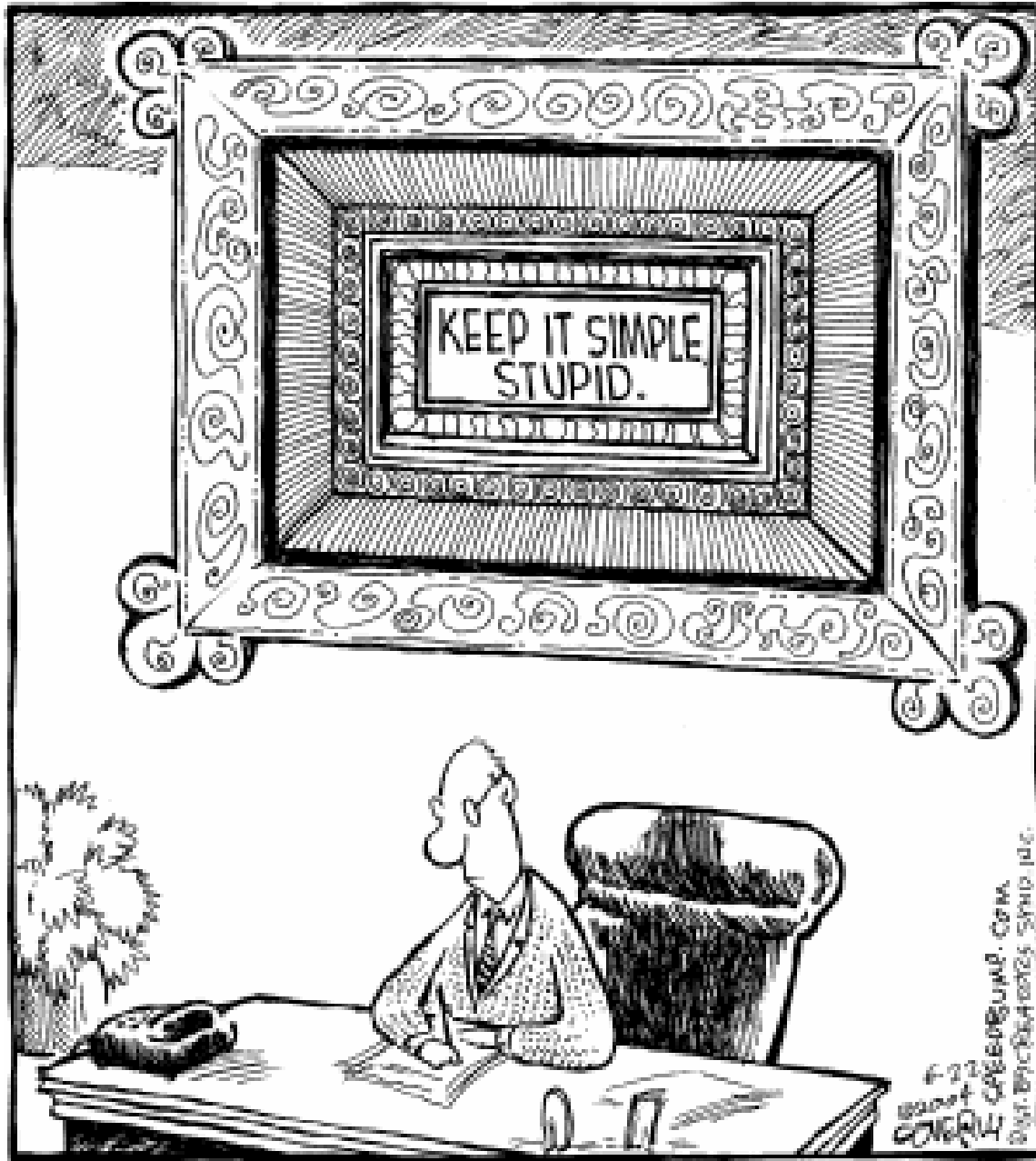


What will not be simple,  
Simply will not be....

# KISS



**Keep It Simple, Stupid**



# Managing by Constraints: The Seven Focusing Steps of the Theory of Constraints

1. Determine the system's goal.
2. Establish global performance measures.
3. Identify the system constraint.
4. Decide how to exploit the constraint; "break" dummy and policy constraints.
5. Subordinate the rest of the system to the constraint.
6. Elevate and break the constraint.
7. If the constraint is broken – return to step 3. Do not let inertia become a system constraint.

# Step 1 – Determine the System's Goal

**Example:** consider the **goals** of an emergency department of a hospital. There could be two approaches to patient management: 1) Make a quick decision on admission or discharge; 2) Provide a comprehensive diagnostic workup. These two goals are actually conflicting ones.

## Step 2 – Establish Global Performance Measures

1. Throughput – **T**
2. Operating expenses – **OE**
3. Inventory – **I**
4. Response time – **RT**
5. Quality – **Q**
6. Due-date performance – **DDP**

# Step 3 – Identify the System Constraint

**Constraint – any important factor that prevents us from reaching the goal.**

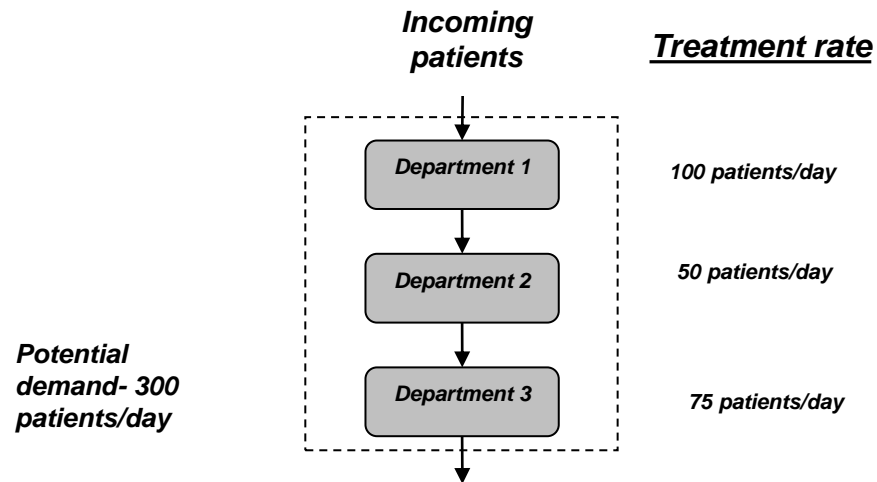
**Resource constraint**

**Market constraint**

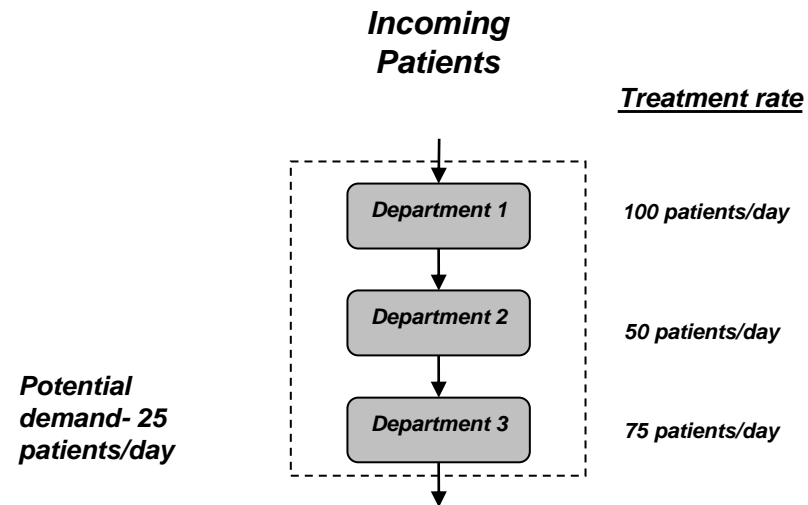
**Policy constraint**

**Dummy constraint**

# Resource Constraint



# Market Constraint



# Policy Constraint

**Policy constraint** – adopting an inappropriate policy that limits system performance and achievement of goal that may also push in a direction which is against the organizational goal. This is also known as "**policy failure**".

**Example:** A hospital director, in an effort to •  
contain costs, decided to forbid any overtime  
work for **all** hospital staff (bottlenecks as well as  
non-bottlenecks). This constrained the number  
of patients that could be operated on daily,  
increased their waiting time for surgery, caused  
some of them to go to another hospital, and  
resulted in adverse effects for some patients.  
This decision is obviously a policy constraint that  
worked against the hospital's goals.

# Dummy Constraint

A **dummy constraint** – a situation where the system bottleneck is a relatively very cheap resource relative to other resources in the system.

This is a situation where system output is constrained because of a resource whose cost is marginal.

**Example:** A hospital operating room used for coronary angiographies was not managing to keep its schedule of procedures. A careful analysis showed that all the needed resources were available – surgeons, radiologists, nurses, surgical kits, etc. Even though the OR staff were available, there were times that the OR was not utilized. It turned out that the unused time resulted from waiting for the cleaning crew to clean the OR between procedures. The problem arose from the desire of management to reduce cleaning costs. Initially there were two cleaners during every shift: one was in the OR and the other in the intensive care rooms. A workflow analysis showed that labor utilization of each cleaner was only 40%. This was very disturbing to management and they laid-off one cleaner, leaving the second responsible for both the OR and the intensive care rooms. When cleaning was needed in the OR, the cleaner was occasionally busy in the intensive care rooms and vice versa. A very cheap resource, the cleaning person, became a system constraint, resulting in reduced OR productivity and output.

## **Step 4 – Decide how to Exploit and Utilize the Constraint. "Break" Policy and Dummy Constraints.**

- **Efficiency** – Increasing bottleneck utilization to as close as possible to 100%.
- **Effectiveness** – As the bottleneck cannot supply the entire demand, one must decide on the product or service mix which the bottleneck will affect.

# Efficiency – increasing constraint utilization

1. Increasing bottleneck utilization
2. Reducing ineffective time ("garbage time")

**"Garbage time"** is the time when the bottleneck is devoted to activities that do not add value to the customer, the service or the product, or to activities **it** should not perform. This is the ineffective time of the bottleneck.

# Increasing bottleneck utilization

**Example:** The operating rooms (ORs) in a public hospital were a bottleneck and were idle 42% of the time. The main cause for the idle times were the waiting for the cleaning crew ("dummy constraint") and cancelled operations by the anesthetist who discovered that the patients did not undergo all pre-required tests (i.e., arrived with "incomplete kits"). Idle time of the ORs drastically decreased when another cleaning crew was designated for the OR area, and a pre-operative clinic made sure that a "complete kit" was created about one week before the scheduled surgery.



*"Nurse, get on the internet, go to SURGERY.COM, scroll down and click on the 'Are you totally lost?' icon."*

# Effectiveness

**Strategic gating** – a process with prioritization that defines tasks, products, services, projects or customers that are valuable to the organization, and decides **which of them will be carried out** and in which priority, and the **ones that will not be carried out at all**.



# **Prioritization methods – strategic gating**

- 1. Use of a Pareto diagram**
- 2. Use of a focusing table ("easy-important") and a focusing matrix**
- 3. Using "specific contribution"**

# The Pareto Rule

- 20% of the patients in a hospital ward consume 80% of caregivers' time.
- 20% of patients consume 80% of medications.
- 20% of medications account for 80% of pharmaceutical costs.
- 20% of stores in a supermarket chain account for 80% of the chain's profits.
- 20% of company projects produce about 80% of profits.
- 20% of a firm's customers generate 80% of the firm's revenues.

# Initial Prioritization for Monkeypox Vaccination in Israel <sup>\*</sup>

Based on Risk Assessment

Risk Group	Subjects	Risk for MPXV infection
High Risk (A)	2,000	1:100
Moderate Risk (B)	8,000	1:1,000
Very Low Risk (C)	4,800,000	1:1,000,000



Preprints are preliminary reports that have not undergone peer review.  
They should not be considered conclusive, used to inform clinical practice,  
or referenced by the media as validated information.

## Risk Assessment of Human Monkeypox Infections for Vaccine Prioritization

\*Zucker, R., Lavie, G., Sagy, Y. W., Arieh, N. G., Markovits, H., Abu-Ahmad, W., ... & Arbel, R. (2022). Risk Assessment of Human Monkeypox Infections for Vaccine Prioritization.

<https://www.researchsquare.com/article/rs-1904714/v1>

## Example: Drug use in a hospital

Drug	Cost per unit (\$)	No. of units consumed per month	Total contribution to costs (\$)
A	180	361	65,000
B	250	160	40,000
C	950	347	330,000
D	90	389	35,000
E	75	267	20,000
F	560	89	50,000
G	1350	11	15,000
H	650	169	110,000
I	220	114	25,000
J	15	1333	20,000
K	56	1518	85,000
L	150	1367	205,000

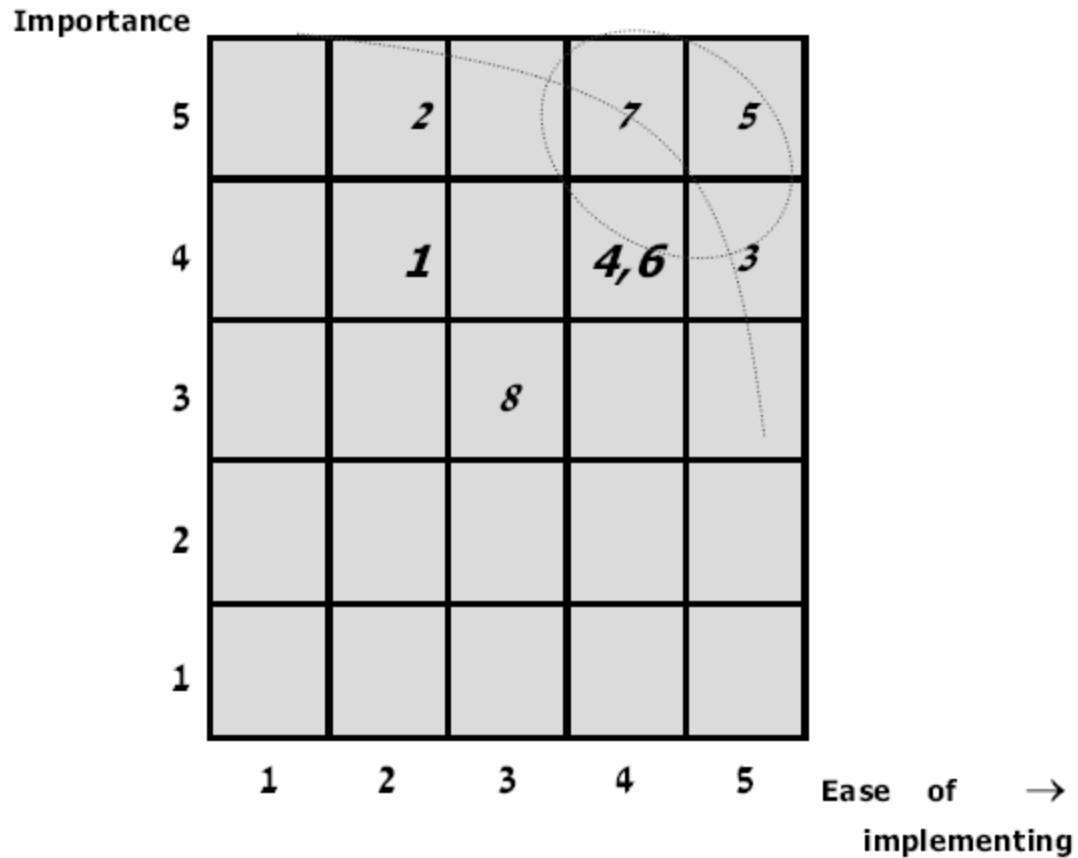
# Example (Cont.)

<b>Drug</b>	<b>Contribution to Costs (\$)</b>
C	330,000
L	205,000
H	110,000
K	85,000
A	65,000
F	50,000
B	40,000
D	35,000
I	25,000
E	20,000
J	20,000
G	15,000

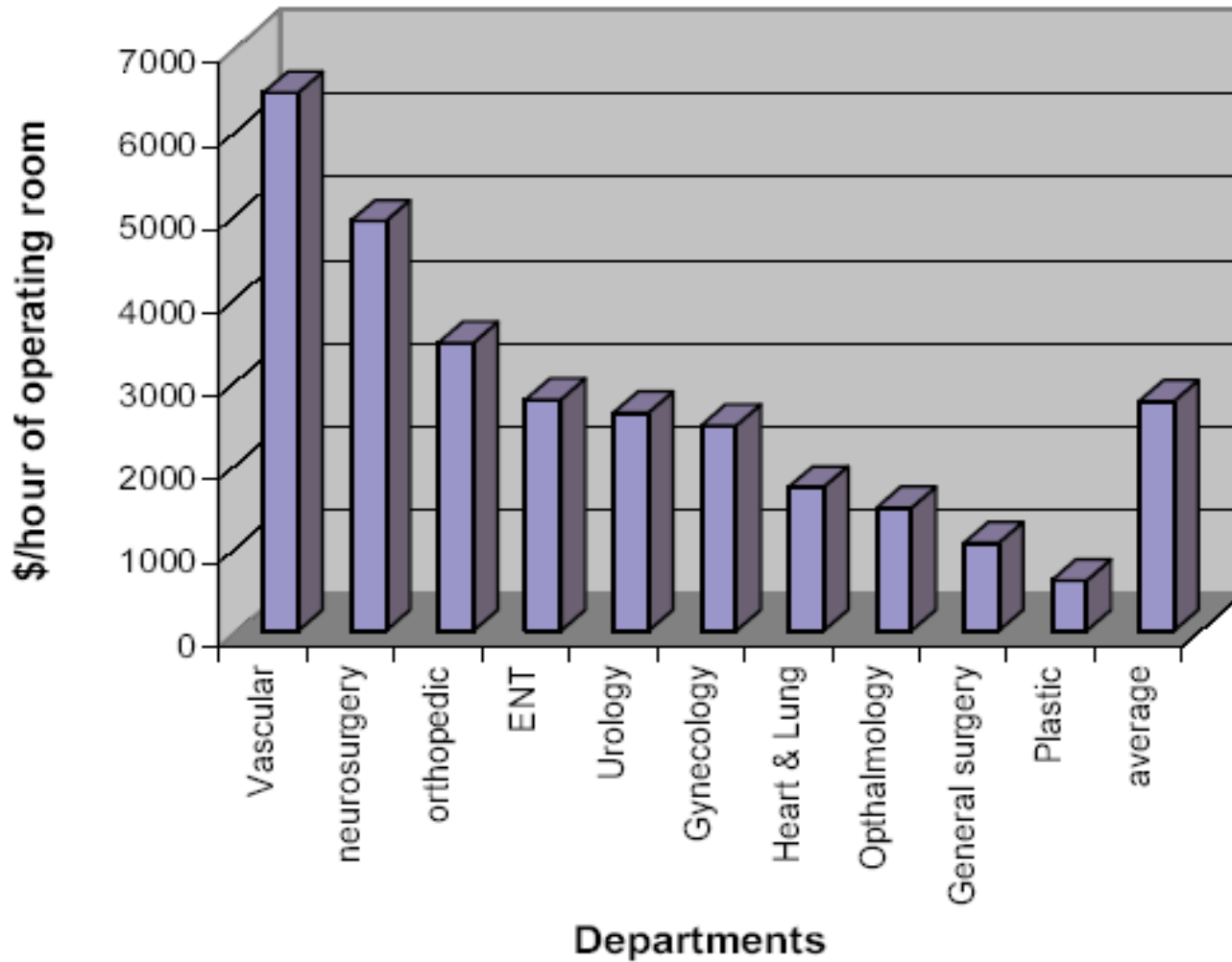
# The Focusing Table: Improving the ED

Number	Suggestion	Importance	Ease of implementing
1	Separate ED into surgical and internal wards	4	2
2	Change strategy regarding amount of testing	5	2
3	Open additional imaging room using same personnel	4	5
4	Increase frequency of visits by specialists	4	4
5	Increase frequency of lab workup	5	5
6	Measure average waiting times	4	4
7	Shorten discharge procedure	5	4
8	Redesign admission process	3	3

# The Focusing Matrix



### Specific contribution by departments



# Step 6 – Elevate and Break the Constraint

- Elevating involving financial investment.
- Elevating that does not need investment with the use of the offloading mechanism.

**Offload** – relaxing the burden from the bottleneck by transferring some of the work load to a non-critical resource.

# Financial Investing

- Recruiting additional staff.
- Purchasing additional equipment.
- Working additional shifts.
- Working overtime.
- Hiring sub-contractors.
- Out-sourcing.

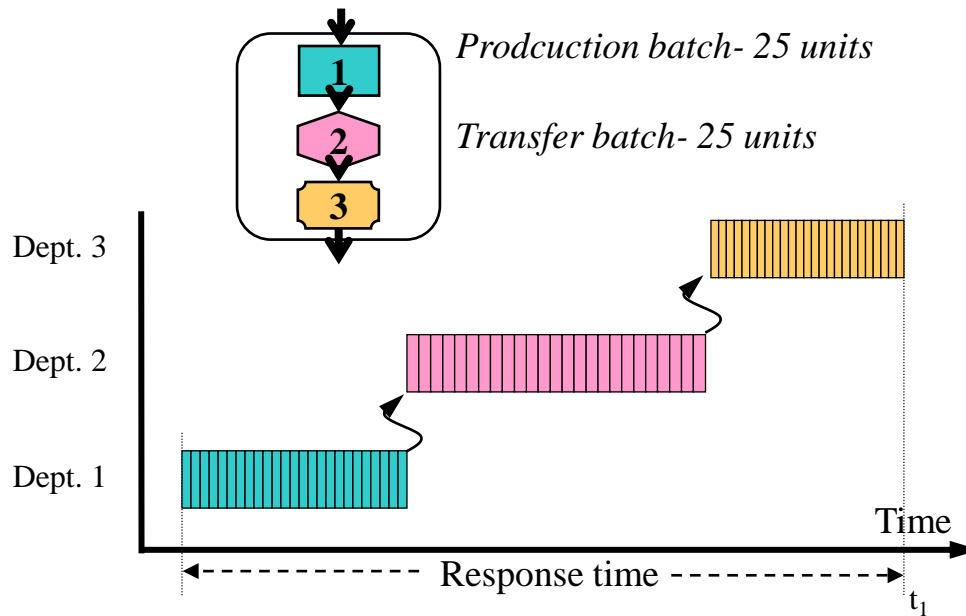
# Offloading

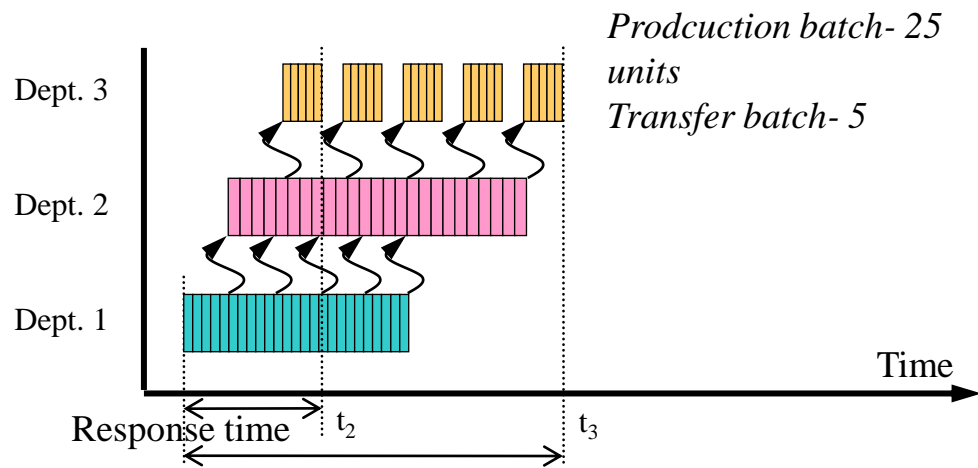
- A dental hygienist relieves the burden from the dentist by performing some of her tasks.
- In a supermarket during peak times, the number of registries is the bottleneck. Adding packers at each registry offloads some of the cashiers' work to a less expensive resource.
- In university hospitals, teaching assistants and research assistants serve as offloads for the expensive resource of the professors and senior researchers who do both clinical and academic work.
- In many complex surgeries, the beginning of the operations as well as the ending ("closing") is performed by junior surgeons.

# Just in Time (Lean)

- **Rule I of JIT:** work only on what is needed in terms of time, quantity and requirements of the specifications.
- **Rule II of JIT:** Work in small, appropriate, and smart batches.
- **Rule III of JIT:** avoid wastes and activities that do not add value to the organization.

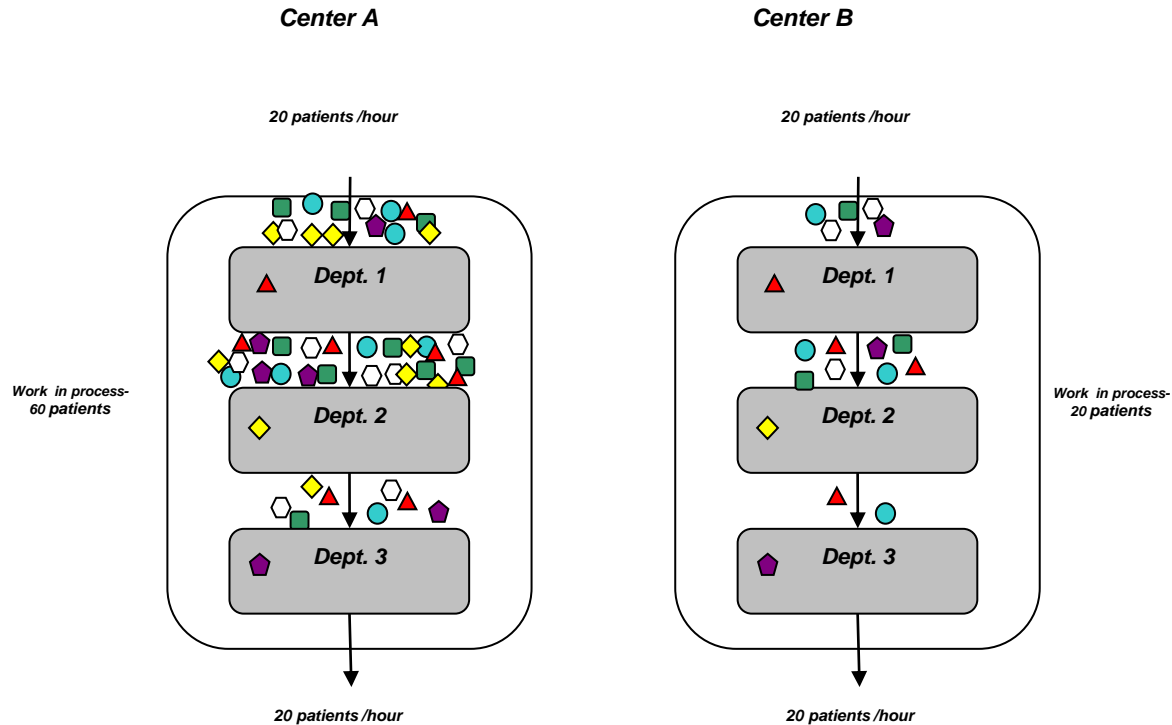
# Rule II of JIT: Work in small, appropriate, and smart batches







# WIP/Response-time



Copyright Ronen & Pliskin



# Response time?



*"Age? You mean now or when we first sat down?"*

# The "evils" of an incomplete kit

- More work-in-process (WIP)
- Longer response time (RT)
- High variance of quoted and planned response times
- Poor quality and more rework
- Decline in throughput
- Decline in productivity
- More operating expenses
- Decline in staff motivation
- Increase in complexity and control
- Less effort to ensure arrival of the missing kit item

Never begin a project without  
verifying that all resources are  
available...



שיעור בניהול

לעולם ועל תתחיל פרוייקט לפני שבדקת שכל המשאבים זמינים

# Successful applications in the UK

## A. Milton Keynes General Hospital

### Objectives:

1. Discharge patients from the emergency arena in less than 4 hours
2. Reducing delayed admissions (trolley waits) that exceeded 12 hours

### Results:

1. 35% improvement in less than 4 hours throughput in the emergency arena  
2002: 68.0% patients discharged in < 4 hours  
2003: 92.2% patients discharged in < 4 hours
2. No 12 hour trolley waits
3. 91% reduction in > 4 hour trolley waits  
(13, September 2002; 12, September 2003)

## Successful applications in the UK (Cont.)

### B. Buckinghamshire Hospitals: Wycombe Hospital; Stoke Mandeville Hospital

#### Objective:

1. Increase the percentage of patients who wait less than 4 hours in the emergency arena.

#### Results:

1. Wycombe percentage increased from 74% to 92%
2. Stoke Mandeville increased from 71% to 89%.
3. Patient buffer size reduced to 3 hours

# **Successful Application - USA**

**St. Joseph's Regional Medical Center,  
Patterson, NJ**

**The Nuclear Cardiology Lab**

# GOALS (St. Joseph's)

- Improve nuclear scan quality  
(decrease # of false positive scans)
- Improve service quality to patients  
and physicians
- Decrease back log of patients waiting  
for testing
- Decrease duration of testing
- Increase laboratory availability
- Improve patient, physician and employee satisfaction

# Results (St. Joseph's)

## Appendix 6 PERFORMANCE MEASURES

	Pre Intervention	Post Intervention
Response Time	5.5 hrs	3.3 hrs
Work In Progress	10 pts	8 pts
Quality of Service		
% False + Tests	~25%	~5%
Patient Satisfaction	poor	good
Physician Satisfaction	fair	very good
Capacity	16	27
Capacity Utilization	59% avg (94% peak)	pending
Throughput	5-15 pts/day (10/day avg)	pending

Copyright Ronen & Pliskin

## Results (Cont.)

“the employees and patients are  
the happiest I have ever seen”

Robert Faillace, MD

# Successful Application - Israel

## Assuta Medical Center – Tel Aviv

- Number of operations increased 20% within 9 months
- Profits increased more than 100% (fixed costs accounted for 80% of costs so additional operations were very profitable)
- Waiting times for operations decreased by 20%
- Queues for operations and imaging tests decreased by more than 20%
- Improved clinical quality and service quality

# Ophthalmology ORs – Nahariya Hospital

Within 4 months:

- Throughput – Up 43%
- Operating expenses – Unchanged
- Waiting time for surgery – Decreased 41%
- Response time – Decreased 14.5%
- Quality – Up 20%
- Garbage time – Decreased 16%

# Mar – Medical Imaging Centers

CT Unit – Jerusalem branch

System goal: enhance value by maximizing profits while maintaining high clinical value and high service quality

CT Unit goals: High quality CT imaging while maintaining patient satisfaction

# Mar (cont.)

Bottleneck: CT scanner, 50% ineffective time

## Causes:

- Lack of dressing room
- Undefined distribution of tasks
- Patients arrive late

# Mar – Dummy constraints

Dummy constraints:

- Every worker was entitled to a taxi ride after 10PM. They wanted to save money so they decided to end the shift at 9:30 PM.
- Dressing room not used because lack of lead protection. CT room served as dressing room.





Zorg  
Ondersteuning

Zorgondersteuning vzw

Zelzatestraat 62

9960 Assenede

BE 0830.216.763

[info@zorgondersteuning.be](mailto:info@zorgondersteuning.be)

[www.zorgondersteuning.be](http://www.zorgondersteuning.be)

