MCI – Mass Casualties Incident

Moderate and severe casualties

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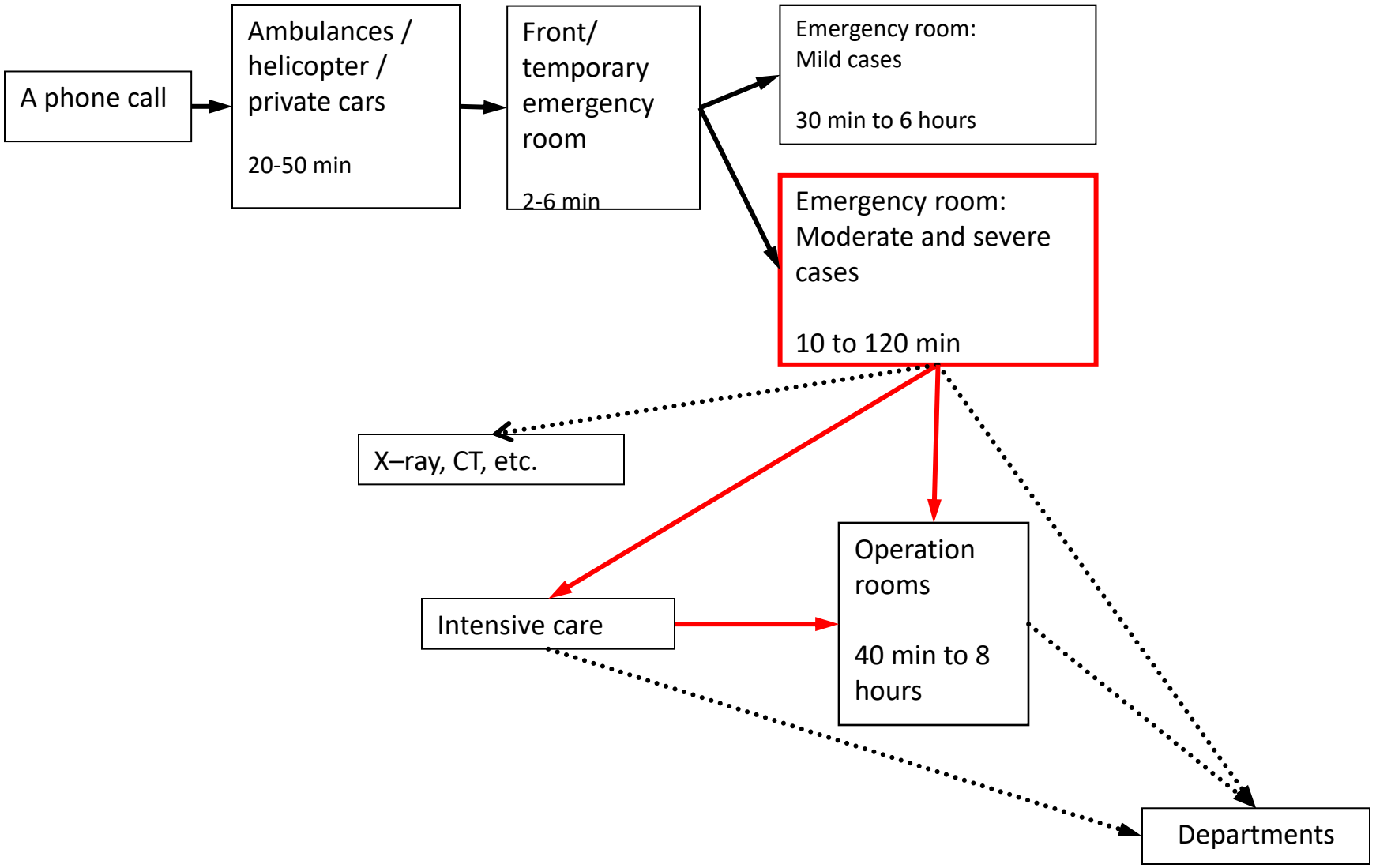
The flow of casualties in MCI – Moderate and severe cases



The Objective

To increase chances of saving more lives

Is it a valid objective?

Time is most crucial for moderate and severe cases and especially for those who need surgery intervention

Is it valid assumption?

How could we evaluate any solution?

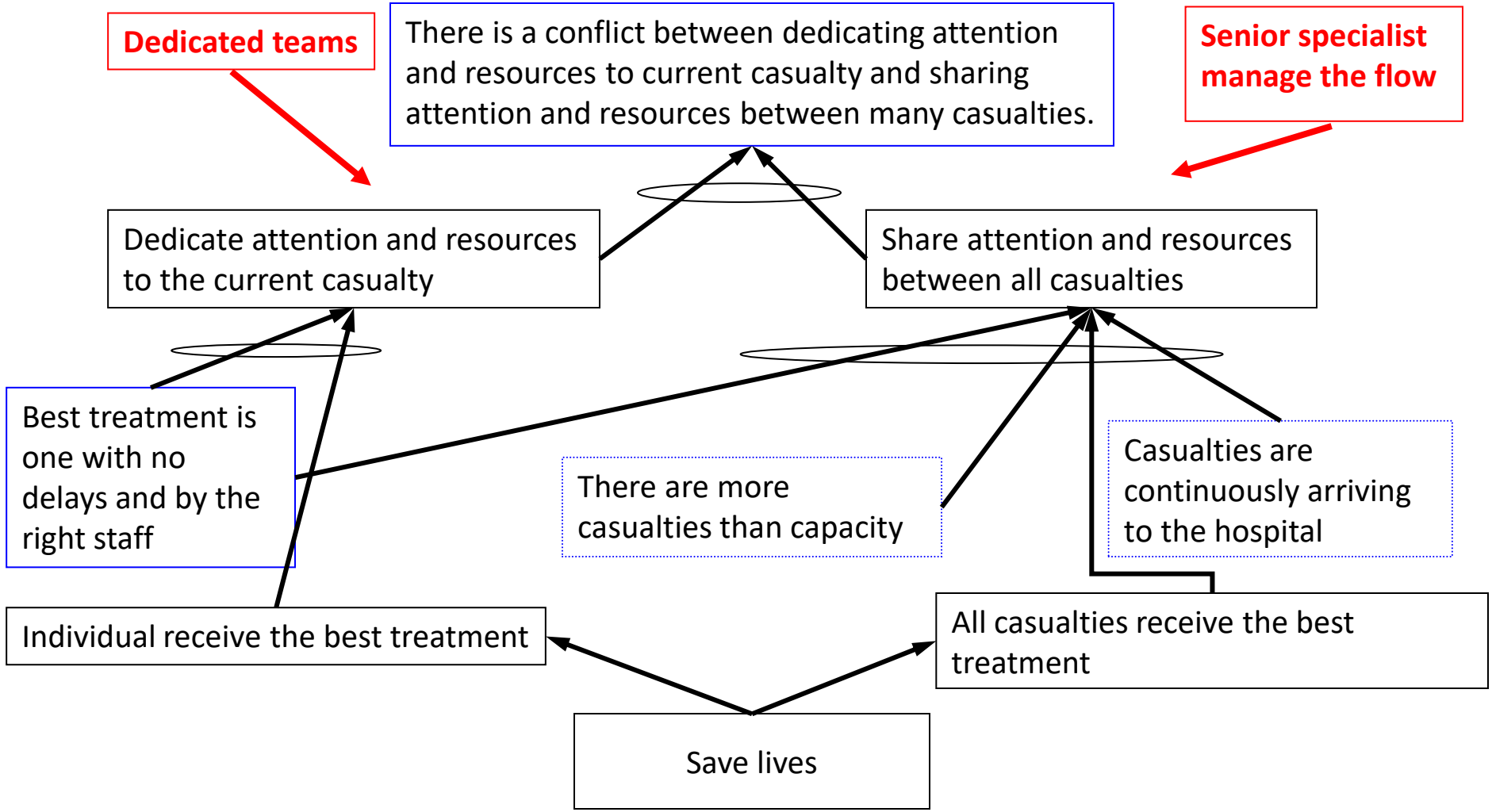
Criteria for a solution:

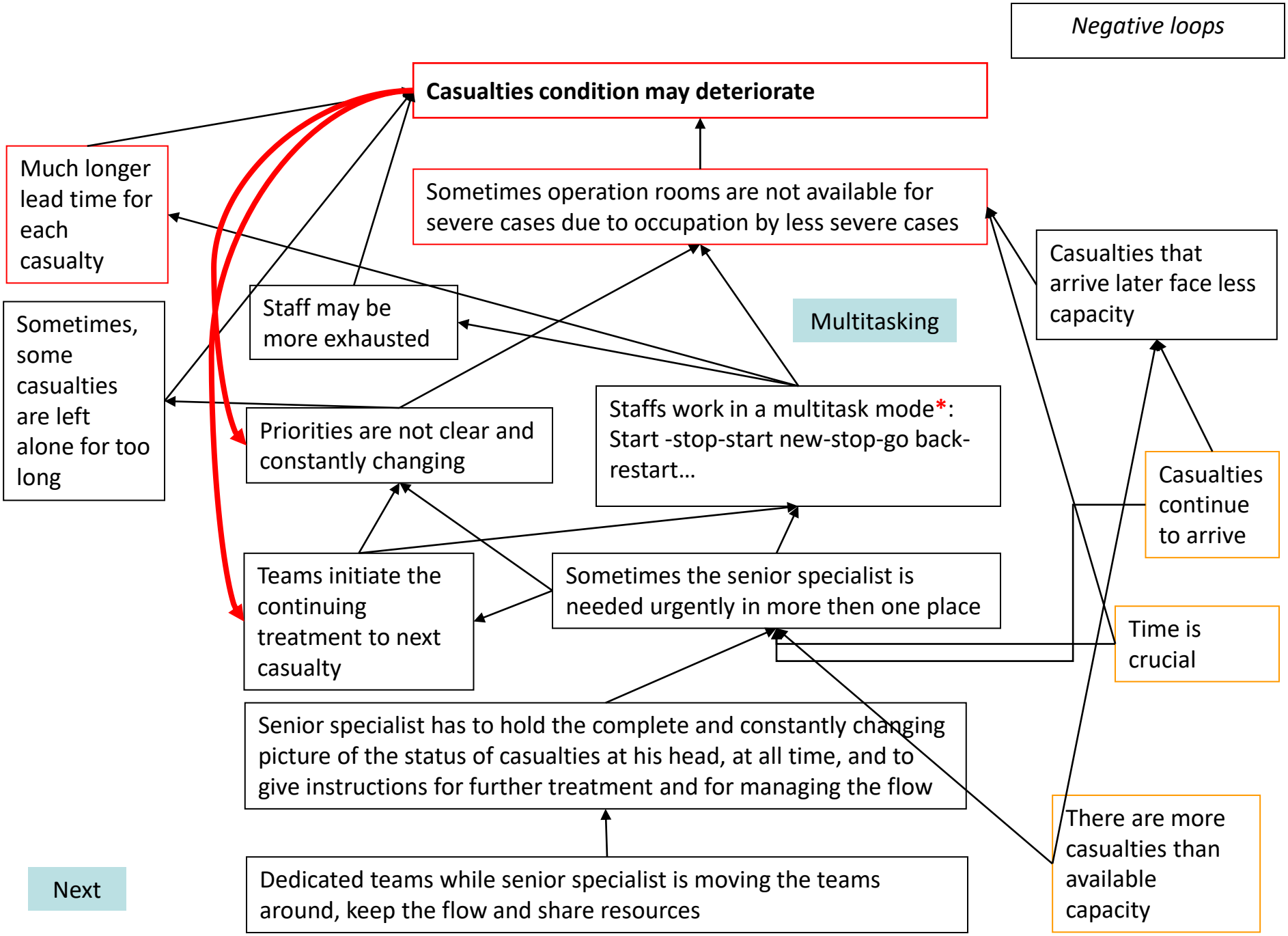
- Increasing chances of saving more lives

(medical criteria / flow of the process)

- Improve quality of treatment
- Improve staff satisfaction and reduce their exhaustion
- Minimal time and money investment for the implementation of the solution
- Achieve sustained and ongoing execution of the solution that can be expanded to all casualties at the emergency room and also to other areas like “Mild Cases Emergency Room”

Understanding the Current Reality

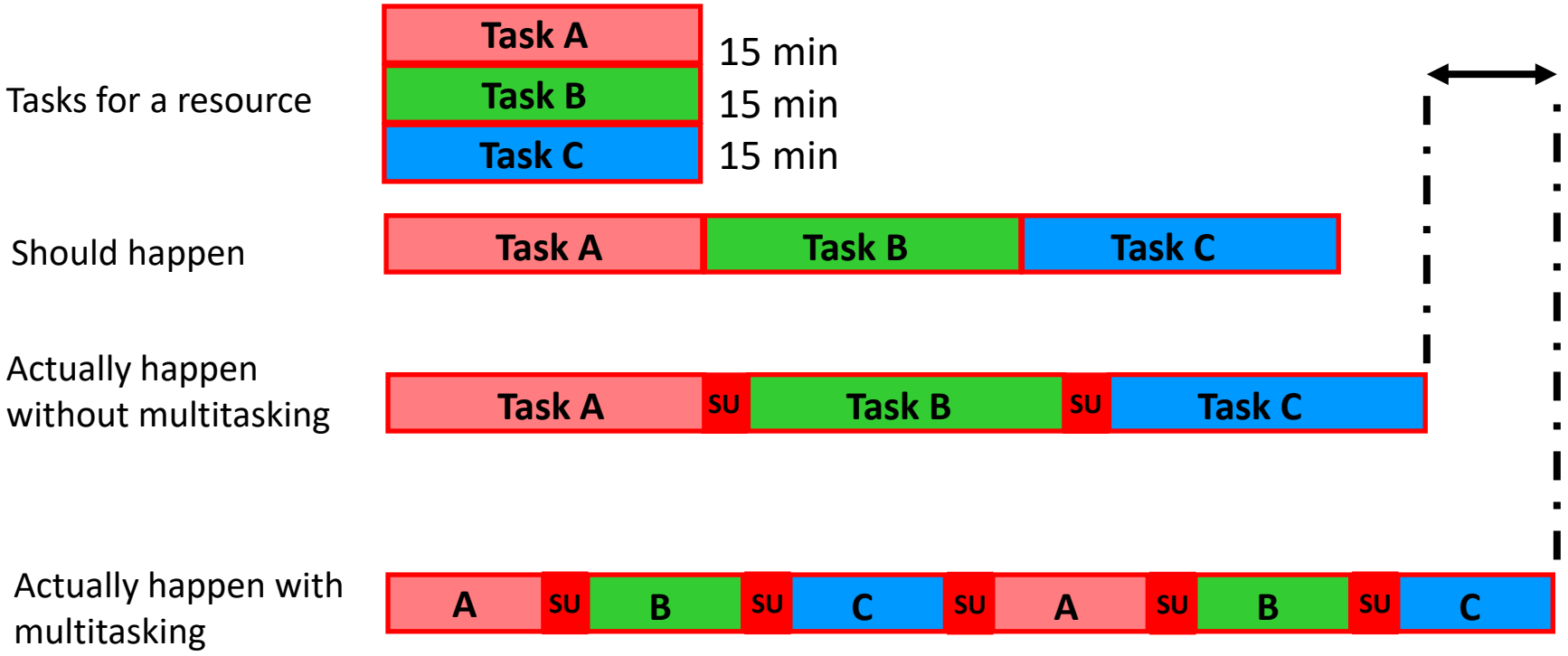



Negative loops
Casualties condition may deteriorate
Much longer lead time for each casualty
Sometimes operation rooms are not available for severe cases due to occupation by less severe cases
Casualties that arrive later face less capacity
Staff may be more exhausted
Multitasking
Sometimes, some casualties are left alone for too long
Staffs work in a multitask mode*: Start -stop-start new-stop-go back-restart…
Priorities are not clear and constantly changing
Casualties continue to arrive
Teams initiate the continuing treatment to next casualty
Sometimes the senior specialist is needed urgently in more then one place
Time is crucial
Senior specialist has to hold the complete and constantly changing picture of the status of casualties at his head, at all time, and to give instructions for further treatment and for managing the flow
There are more casualties than available capacity
Dedicated teams while senior specialist is moving the teams around, keep the flow and share resources
Next

Multitasking

Transfer time from one task to the other **su**

Lost output for the system



Without multitasking:

A 15 A = 15 = 0.25h

SU 5

B 15 B = 35 = 0.58h

SU 5

C 15 C = 55 = 0.92h

With multitasking:

Assuming only one change

A 10

SU 5

B 10

SU 5

C 10

SU 5

A 5 A = 50 = 0.83 h

SU 5

B 5 B = 60 = 1 h

Assuming two change

A 5

SU 5

B 5

SU 5

C 5

SU 5

A 5

SU 5

B 5

SU 5

C 5

SU 5

A 5 A = 65 = 1.08 h

SU 5

B 5 B= 75 = 1.15 h

SU 5

C 5 C = 85 = 1.4 h

A completion time 430% longer
B completion time 200% longer
C completion time 150% longer

Back

* Can we prevent deterioration of the condition of the casualties and increase chances to save more life?

* Can we prioritize better so the more sever casualties have higher chances to be operated at the right time?

* Can we make sure senior specialist has the more complete, constantly changing priorities, during the event, *while all other staffs* (and also headquarter, operation rooms, labs, X-ray, etc.) are aware of the same priorities and subordinate to it?

Next

Positive loop

Better condition of casualties

Shorter treatment time for casualties

More available capacity

Operation rooms operate more of the right casualty at the fight time

Less exhaustion

Senior specialist can manage the flow better

Less rework

Less set ups

Headquarter has priority and availability list

All involved know whom to treat first based on the priorities

All involved can prepare ahead of time

Staff need senior specialist less often

There is valid updated priority list of all casualties, which is based on condition and time passed, that is known to all involved

Screen image

There are 3 criteria of casualties at the emergency room:
Immediate
Urgent
To be urgent

There is time allocation to each criteria
Immediate –Treatment in 0-30 min
Urgent –Treatment in 60 min
To be urgent –Treatment in 90 min

Senior specialist allocate criteria to each casualty

Colored time scale is showing the situation of each casualty vs. its colored criteria: Green is OK, Yellow is OK but pay attention, Red is pay immediate attention now and black is too much behind time

Buffer Management Screen image

10:45

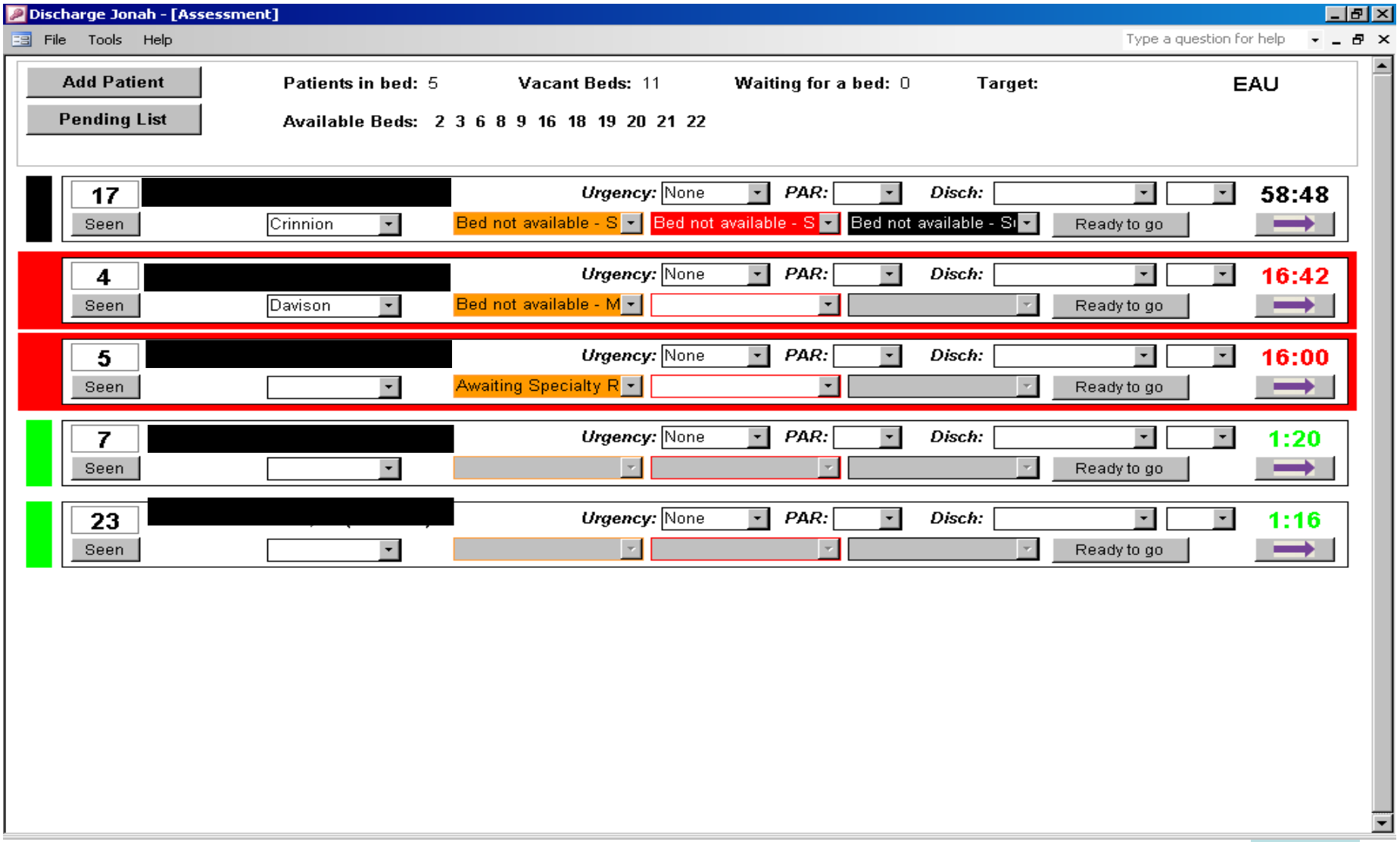
Casualty #	Casualty Name	Time of arrival	Initial status	Current Status	Current Status	Current Status	Current Status
2	Joe Smith	10:34	Very Urgent	9			
4	James Roberts	10:36	Very Urgent	8			
5	Peter Jackson	10:34	Urgent		6		
7	Jack Peterson	10:36	To be Urgent			4	

Buffer Management Screen image

11:15

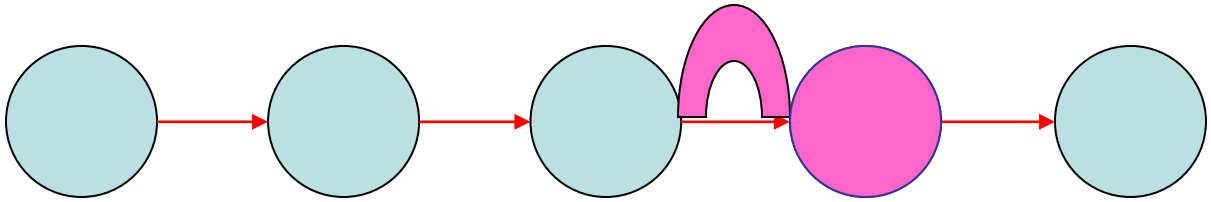
Casualty #	Casualty Name	Time of arrival	Initial status	Current Status	Current Status	Current Status	Current Status
2	Joe Smith	10:34	Very Urgent				
4	James Roberts	10:36	Very Urgent				
5	Peter Jackson	10:34	Urgent		16		
7	Jack Peterson	10:36	To be Urgent			4	

Example: Drum



Back

Capacity Constraint Resource



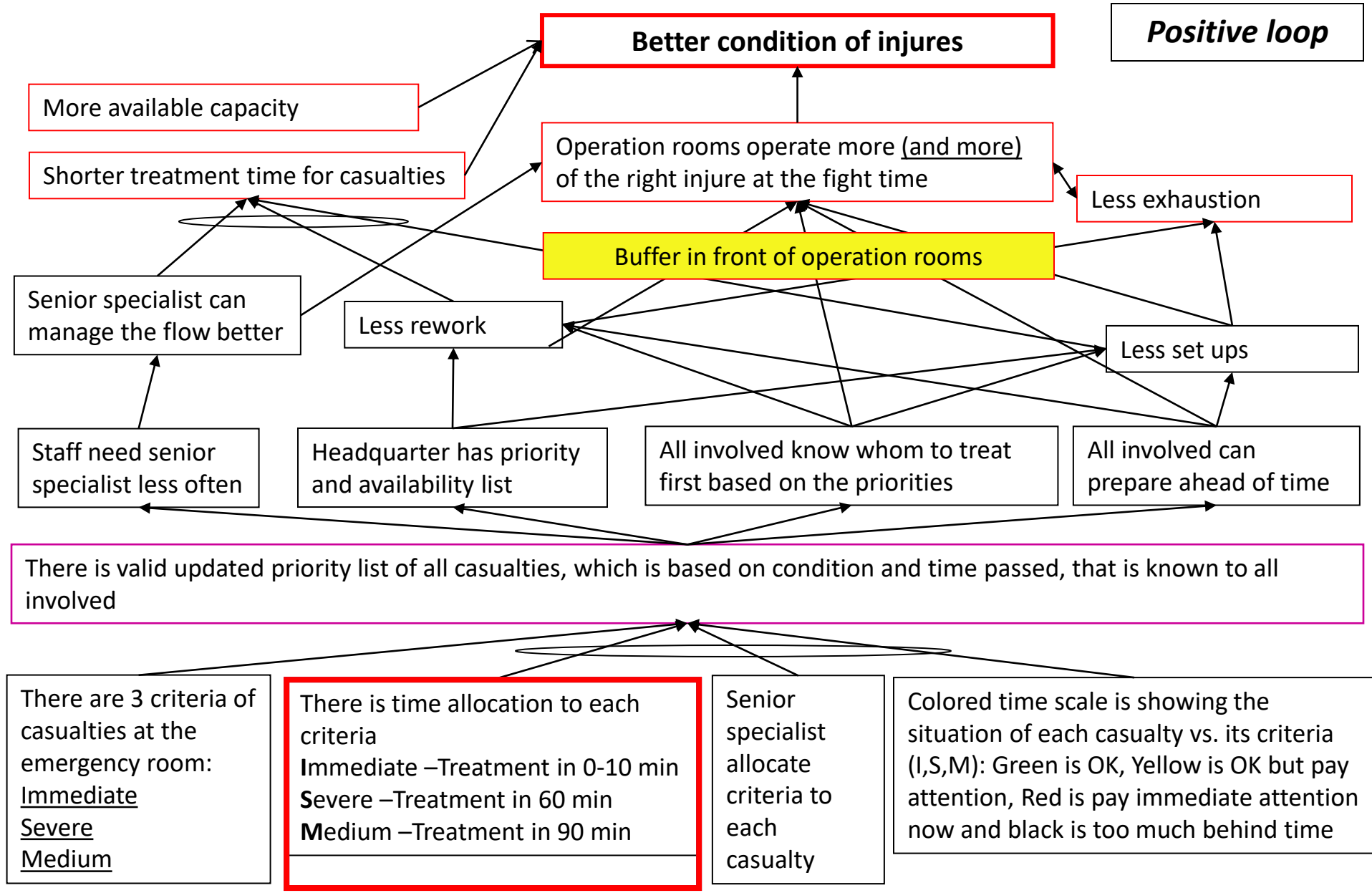
* How can we make sure the bottleneck is not ideal ?

➢Sometimes operation rooms are the bottleneck

➢Is this a valid assumption?

➢Since our objective is to increase the chances of saving more lives, what is the impact of the above on our priority list?

➢Ongoing updating priority list based on the buffer in front of operation room


Positive loop
Better condition of injures
More available capacity
Shorter treatment time for casualties
Operation rooms operate more (and more) of the right injure at the fight time
Less exhaustion
Buffer in front of operation rooms
Senior specialist can manage the flow better
Less rework
Less set ups
Staff need senior specialist less often
Headquarter has priority and availability list
All involved know whom to treat first based on the priorities
All involved can prepare ahead of time
There is valid updated priority list of all casualties, which is based on condition and time passed, that is known to all involved
There are 3 criteria of casualties at the emergency room:
Immediate
Severe
Medium
There is time allocation to each criteria
Immediate –Treatment in 0-10 min
Severe –Treatment in 60 min
Medium –Treatment in 90 min
Senior specialist allocate criteria to each casualty
Colored time scale is showing the situation of each casualty vs. its criteria (I,S,M): Green is OK, Yellow is OK but pay attention, Red is pay immediate attention now and black is too much behind time

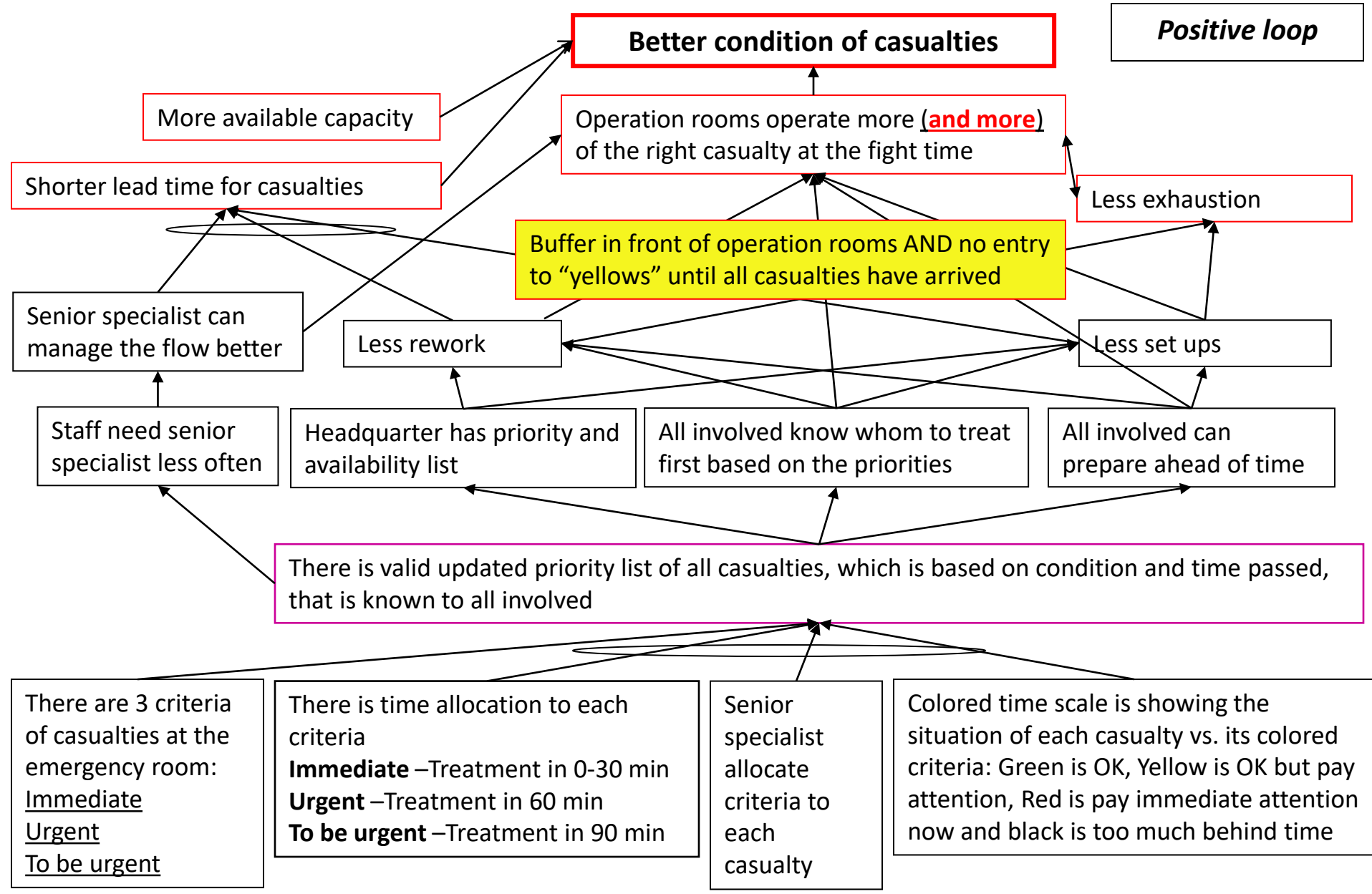
There is no entry to the emergency room for “yellows” until all casualties have arrived and classified.

Operation rooms are blocked for “Immediate” that arrive later by “To be urgent” that arrived before them

Sometimes operation rooms are the bottleneck

Casualties are continuously arriving to the hospital

There is time allocation to each criteria
Immediate –Treatment in 0-30 min
Urgent –Treatment in 60 min
To be urgent –Treatment in 90 min


Positive loop
Better condition of casualties
More available capacity
Operation rooms operate more (and more) of the right casualty at the fight time
Shorter lead time for casualties
Less exhaustion
Buffer in front of operation rooms AND no entry to "yellows" until all casualties have arrived
Senior specialist can manage the flow better
Less rework
Less set ups
Staff need senior specialist less often
Headquarter has priority and availability list
All involved know whom to treat first based on the priorities
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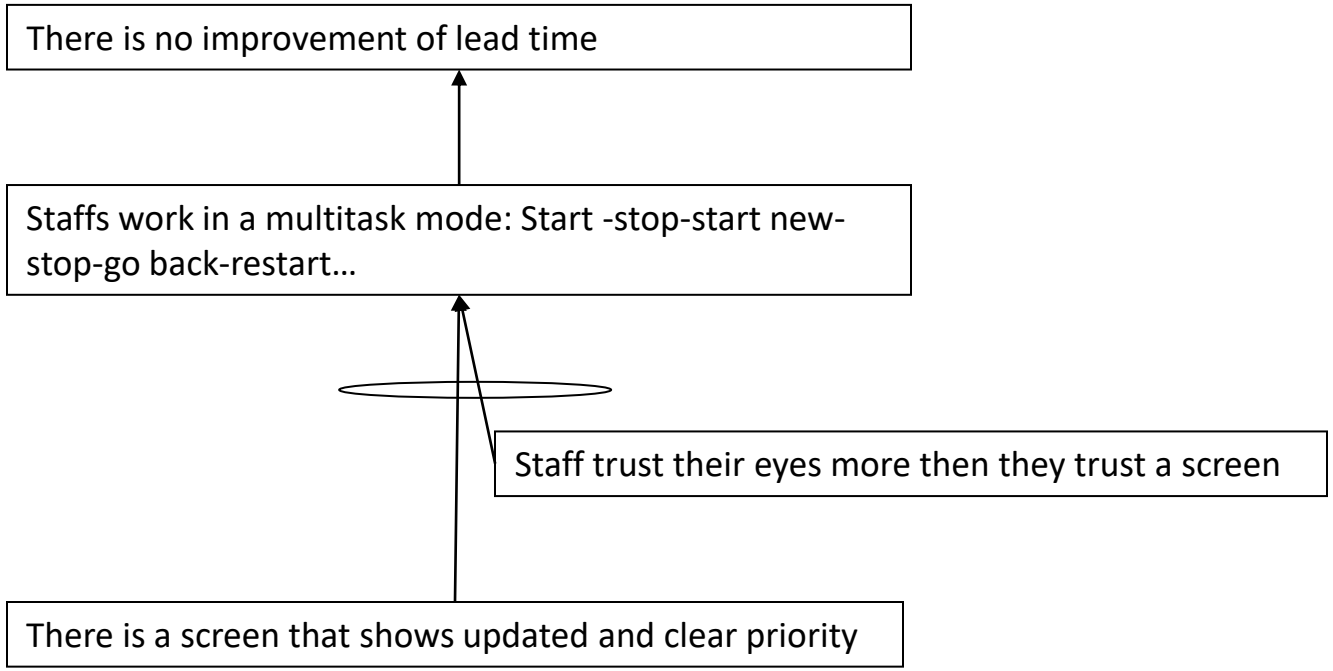
Data feeding and transfer

Staff has a complete understanding and thus ownership over the priority list

Senior specialist knows that when staff approach him, it is with awareness and consideration to the priority list on the screen and thus he listen very carefully



Other positive ramifications of the solution

During MCI:

* Better golden/first hour

* Better priority at the operation rooms

* More available capacity

* Earlier transfer

* Earlier closing

* POOGI - Register main causes for blockages and improve accordingly

Measurements -
Rational (1)

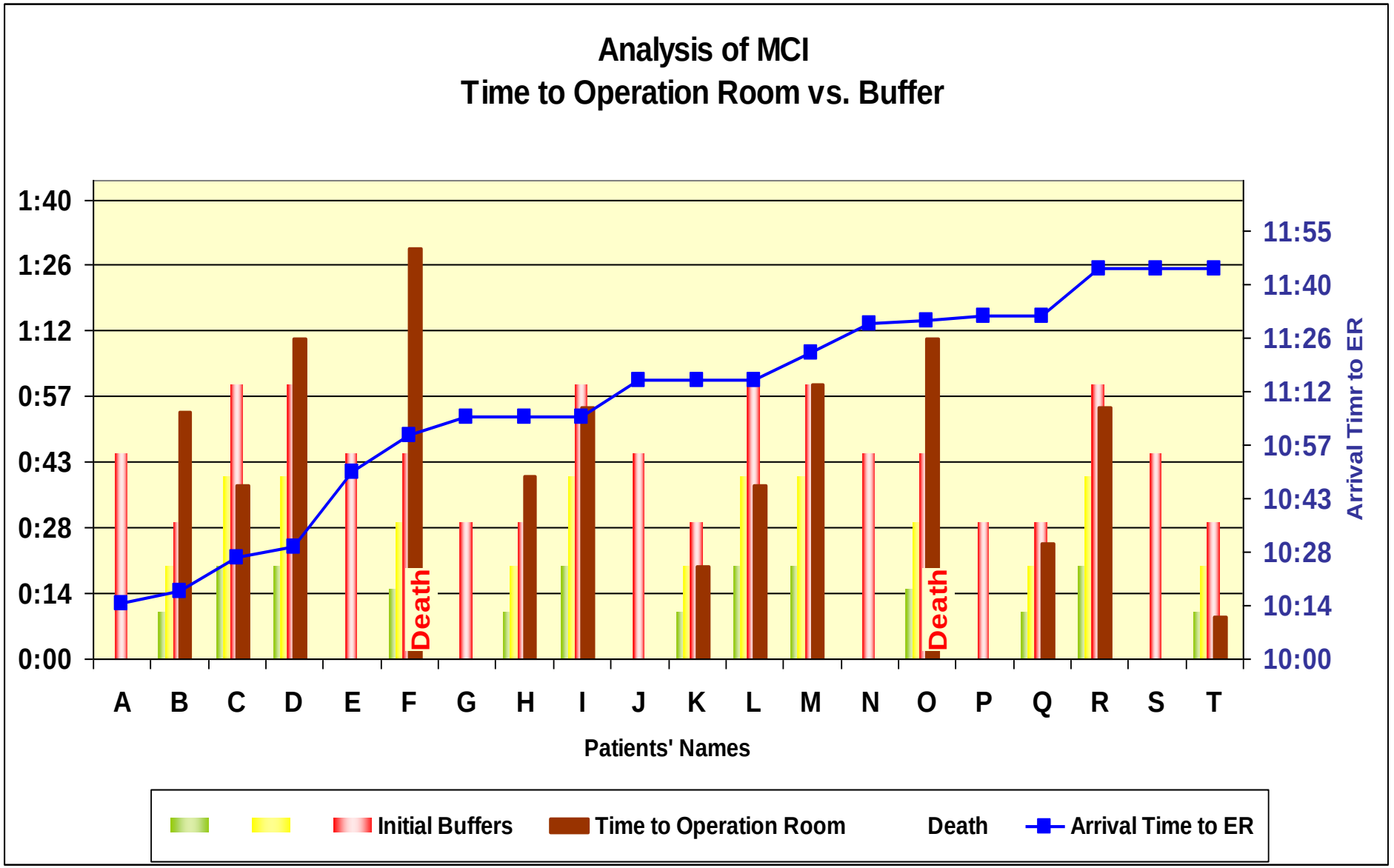
"Operational measures should measure our execution of the strategy"

Type 1: Reliability – doing what should be done

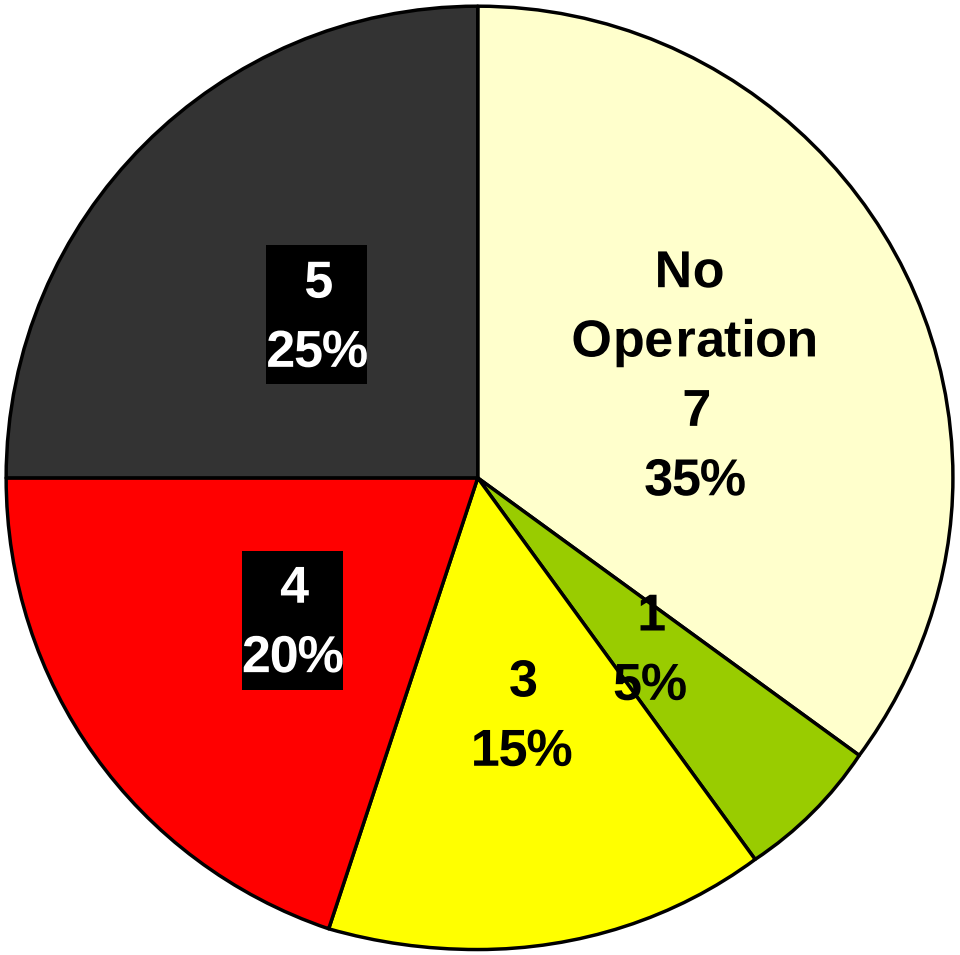
Type 2: Effectiveness – things I should not have done and did anyway" (2)

Sep 2007

#	Name	Initial Buffers	Arrival Time to ER	Time to Operation Room	Buffer Color			Need Surgery	Death
1	A	0:45:00	10:15					No	
2	B	0:30:00	10:18	0:54	Black	0:10	0:20	Yes	
3	C	1:00:00	10:27	0:38	Yellow	0:20	0:40	Yes	
4	D	1:00:00	10:30	1:10	Black	0:20	0:40	Yes	
5	E	0:45:00	10:50					No	
6	F	0:45:00	11:00	1:30	Black	0:15	0:30	Yes	Death
7	G	0:30:00	11:05					No	
8	H	0:30:00	11:05	0:40	Black	0:10	0:20	Yes	
9	I	1:00:00	11:05	0:55	Red	0:20	0:40	Yes	
10	J	0:45:00	11:15					No	
11	K	0:30:00	11:15	0:20	Yellow	0:10	0:20	Yes	
12	L	1:00:00	11:15	0:38	Yellow	0:20	0:40	Yes	
13	M	1:00:00	11:22	1:00	Red	0:20	0:40	Yes	
14	N	0:45:00	11:30					No	
15	O	0:45:00	11:31	1:10	Black	0:15	0:30	Yes	Death
16	P	0:30:00	11:32					No	
17	Q	0:30:00	11:32	0:25	Red	0:10	0:20	Yes	
18	R	1:00:00	11:45	0:55	Red	0:20	0:40	Yes	
20	T	0:30:00	11:45	0:09	Green	0:10	0:20	Yes	


Analysis of MCI
Time to Operation Room vs. Buffer
1:40
1:26
1:12
0:57
0:43
0:28
0:14
0:00
11:55
11:40
11:26
11:12
10:57
10:43
10:28
10:14
10:00
Arrival Timr to ER
Death
Death
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
Patients' Names
Initial Buffers
Time to Operation Room
Death
Arrival Time to ER

Statistics about Buffer Penetration



Mean time and standard deviation from arrival to moderate and severe cases emergency room to operation room:

Mean time to arrival to Operation Room	**00:48:00**
Standard Deviation to arrival to Operation Room	**00:22:34**

Summary of MCI

Event took place on September 2007 , from 1000-1200

- 20 casualties arrived to moderate and severe emergency room
- 2 casualties died at the operation room
- 7 casualties (35%) did not need an operation
- 13 (65%) needed an operation

Buffer management Report

* 5 out of the 13 arrived to operation in a good time:

4 enter to operation room in Red
1 enter in Green, when there were no Yellow or Red

* 8 out of 13 did not arrive to operation room at good time:

3 enter too early, in Yellow, before all casualties have arrived
5 enter in black

* Deviation was too broad

POOGI

1. Collect statistics about the causes for ***delay*** to arrive to operation rooms
2. Identify the main cause (Pareto analysis)
3. Take actions to correct the main cause.
4. Collect statistics about the causes for ***too early*** entry to operation room
5. Identify the main cause (Pareto analysis)
6. Take actions to correct the main cause.

Summary

- Time is most crucial in MCI , especially for moderate and severe injures who needs operation
- Since the capacity of the operation rooms is limited, priority that is based of condition is crucial.
- Multitasking cause very late completion for each individual task and constant change in priority that lead to deterioration of injures' condition
- Buffer Management reflects timely and updated priority list, that all staff involved, can follow and support
- Managing the flow with Buffer Management bring more of the right injure at the right time to the operation room.
- staff has to understand and own buffer management
- BM is a natural next step to the current reality
- BM can be implemented in all emergency rooms
- BM directs a process of ongoing improvement by showing where to focus attention and resources.

Appendix 1
Current MCI Measurements System

Seven areas and above 100 different activities:

- Preparation of capacity of staff
- Preparation of medical instruments
- Preparation of space

General nurse management

Social health services management

Front emergency room management

Entrance management

Documentation and reporting procedures

Security management

Staff management

Example of a MCI current reporting page:

#	Subject	The standard	Items to check	Source of data	Within 10 min	Within 12 min	Within1 5 min	Above1 5 min	/
1									
2									
3									
4									
5									
6									
7									