Using Simulation for Hospital Planning
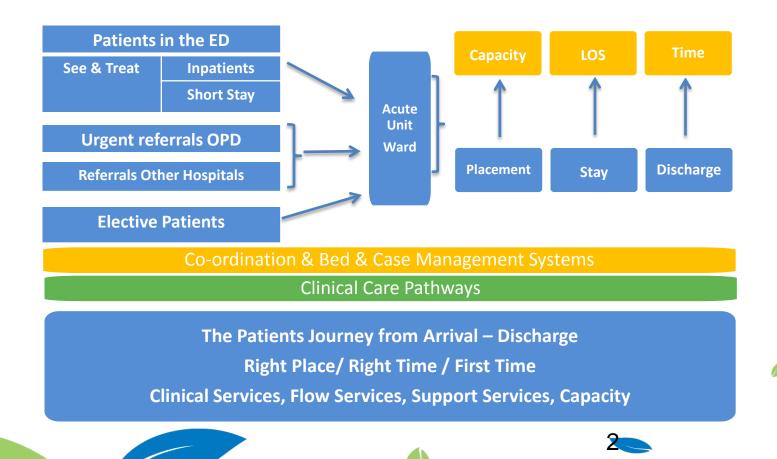
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Patient Flow – A System

Patients in the ED

| See & Treat | Inpatients |
| | Short Stay |

Urgent referrals OPD

Referrals Other Hospitals

Elective Patients

Acute Unit Ward

Capacity — **Placement**

LOS — **Stay**

Time — **Discharge**

Co-ordination & Bed & Case Management Systems

Clinical Care Pathways

The Patients Journey from Arrival – Discharge

Right Place/ Right Time / First Time

Clinical Services, Flow Services, Support Services, Capacity

Understanding the System

Demand – Who Needs the Service	Capacity – Resources Req.
Emergency Admissions	Space in ED
Elective Admissions	Number OR's
Number & Specialty	Number Beds – Specialty
Other Admissions	Staff
Elective Cancellations	Information Systems
Discharges & Timeliness	Access to Diagnostics
IP Length of Stay	Escalation & Coordination Systems

Right Patient - Right Place - Right Time – First Time

Understanding our System – Who Are We?

Hamad Medical Corporation

HMC National System
Great Vision
8 hospitals (more on way)

EMS
Primary Care being developed

HGH

A Busy Tertiary Hospital

Trauma Centre

ED 1500 Attendances Per Day

Elective Procedures

Full Range OPD

So What's the Problem ?

Identifying the Problem – Facts

8am Snapshot Audit

- **45 - 50 Pending Admissions in ED – No Beds**
- **6 Critical Care Patients**
- **10 Cardiology Patients**
- **13 Surgical Patients**
- **13 – 15 Medical Patients**
- **4-5 Psychiatry Patients**
- **Boarders in PACU**
- **Most Electives Cancelled - More than Once**
- **Very Long Waits for Beds**

Understanding the System - Constraints

What We Did not Have !

- PAS Medicom System – Not Fully Utilised
- Electronic Booking Systems - Inpatients
- ED Information Systems
- Bed Management / Co ordination Structures
- System Awareness / Response / Escalation
- High Level Data – Non Specialty Specific
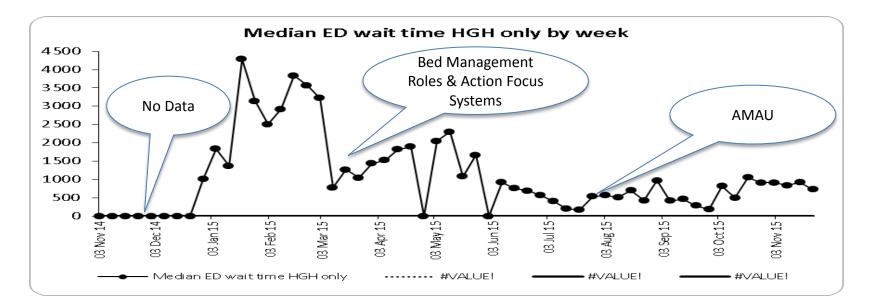
What We Did Have !

- We Keep Lots of Data - All Paper – Everywhere
- Great Staff

- Daily Clinical Flow Management & Coordination
- Acute Medical Assessment Unit
- Relocated long term care patients
- Corporate awareness – New Facilities
  - MICU, SICU, TICU, ED, OR's
  - New Ambulatory / Elective Facilities
- System wide bed management capacity system
- Surgical booking in Urology / Bariatrics

Information

Understanding our System by Modelling

- Started with a vision – Insightful colleagues
- Purchased the software
- Set up a very small team
- Success factor of team
  - Analyst
  - Flow champions & Clinical Operations
  - Clinical lead strategy & planning
- Training sessions in Doha
- Completed a few models
- Middle East Forum 2016

Challenges we Faced

- Recognition – a system issue
- Information
- Chiefs and Chairs
- Hearts and Minds
- Patient Focus
- Perseverance
- Celebrate Success
- Will
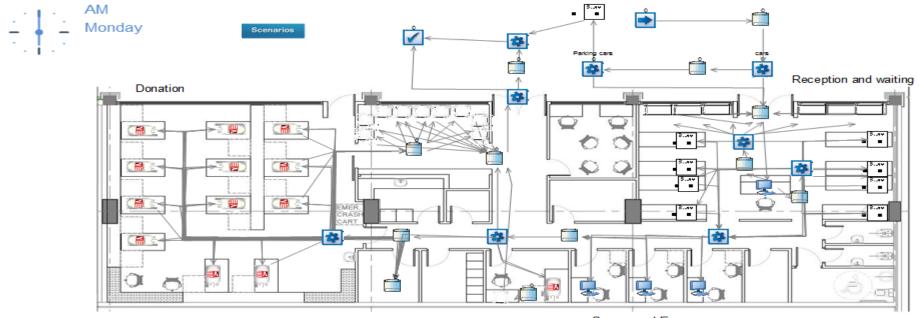
THE BLOOD DONOR UNIT

The National Blood Donation Center

- Receives 50% of all donations for the state of Qatar.

- The current unit is viewed as suboptimal, with its design no longer meeting the needs of the department in providing a high quality service for blood donors.

- A series of emergencies have led to discussions regarding what capacity requirements should be considered in the event of a major disaster.

- An estimate of future capacity requirements

The National Blood Donation Center

1. What is the optimal configuration of the blood donor unit, based on current service demand?

2. What would be the optimal configuration of the blood donor unit based on 30,000 yearly donations at the unit?

3. What would be the optimal configuration of the unit when planning for a major disaster?
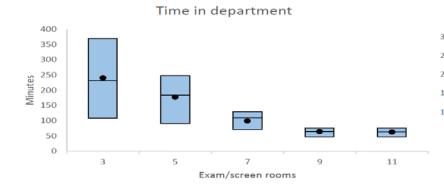
BLOOD DONOR MODEL

The National Blood Donation Center

		Reception	Registration	Screen/ Exam	Donor	Parking
1	Current	4	0	1+1	6	10
2	Recommended	1	5	3	6	8
3	30,000	1	5	3	6	13
4	Disaster	2	5	9	12	75

Time in department

Car parking spaces used

Outcome

- Optimal donor unit configuration identified

- Identified the need for a 'surge' facility in a disaster scenario

- Represented an approximately 30% saving on new build, staffing, operating costs (6 vs.12 chairs)

THE CRITICAL CARE UNIT

The critical care unit

- Current 23-bed capacity

- Inadequate capacity with a high proportion of patients not admitted to the unit

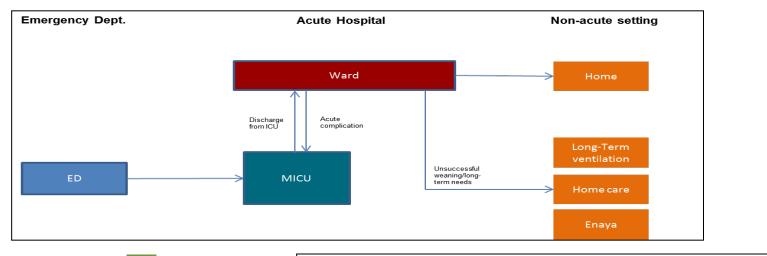- An original plan to expand to a 44 bed facility was postponed indefinitely in Jan 2016
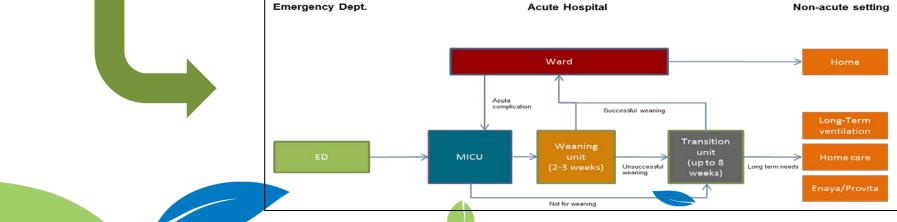
Question:
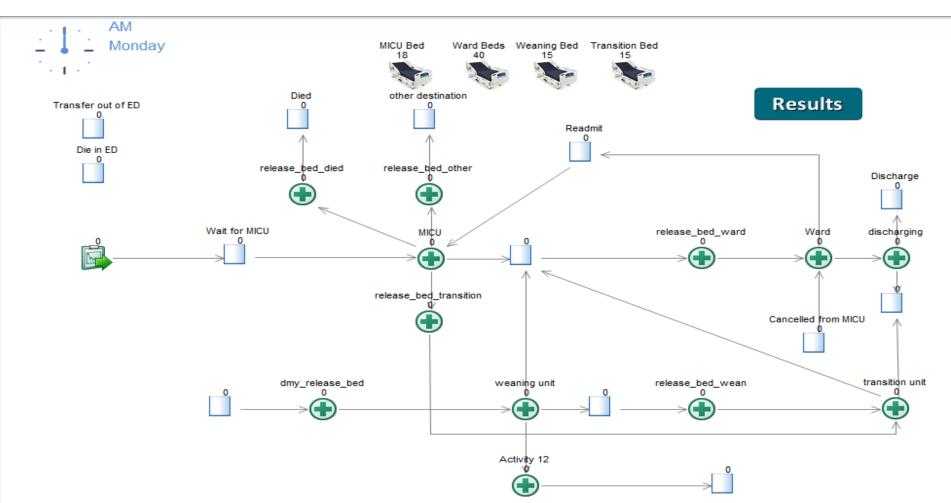- What is the ideal capacity of the critical care unit?

KPIs:
- 99% of patients admitted to unit
- Patients admitted to unit within 1 hour of decision to admit
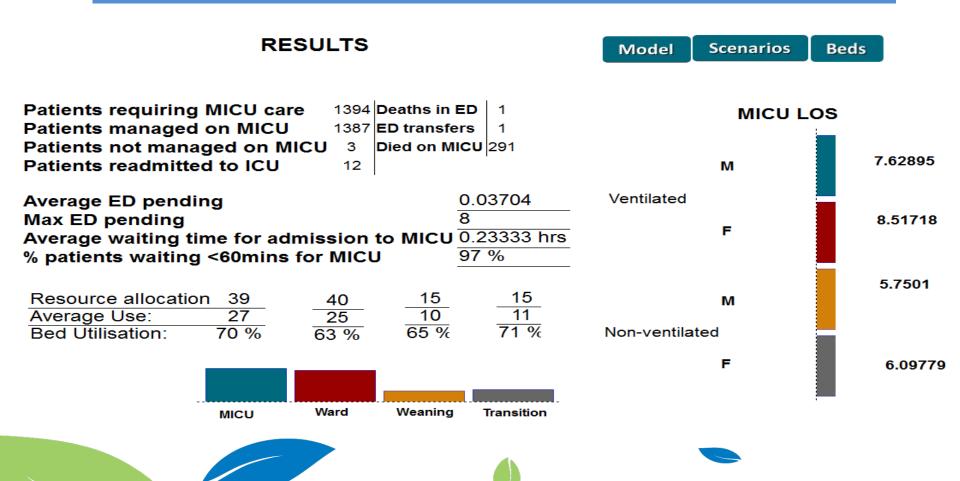
The critical care unit

CRITICAL CARE MODEL

Results

RESULTS

Model	Scenarios	Beds

Patients requiring MICU care	1394	**Deaths in ED**	1
Patients managed on MICU	1387	**ED transfers**	1
Patients not managed on MICU	3	**Died on MICU**	291
Patients readmitted to ICU	12		

Average ED pending	0.03704
Max ED pending	8
Average waiting time for admission to MICU	0.23333 hrs
% patients waiting <60mins for MICU	97 %

Resource allocation	39	40	15	15
Average Use:	27	25	10	11
Bed Utilisation:	70 %	63 %	65 %	71 %

MICU   Ward   Weaning   Transition

MICU LOS

Ventilated	M	7.62895
	F	8.51718
Non-ventilated	M	5.7501
	F	6.09779

Outcome

- Optimal configuration identified

- Results informed a business plan that was approved

- A new pathway and reconfiguration of capacity will be undertaken

- Multi-disciplinary working

Using SIMUL8 to Educate

- Make flow a game – Middle East Forum
- Using it to explain simple flow concepts -
- Simple flow models (IHI forum) teach basic concepts such as
  - Variation
  - Occupancy
  - Bed capacity

What is the ideal bed occupancy?

What is occupancy and why does it matter?

Occupancy: proportion of utilized beds in a ward – normally quoted as an average

- 2000 admissions at 5 days each = 10,000 bed days = 27.3 beds
- 27.3/30 = 91% occupancy

Commonly quoted target acute ward occupancy of 85%

High occupancy has been linked to increased risk to patient care.

Low occupancy mean less cost-effective services

The Simulation

Question

How many beds do we need to ensure 100% of patients wait less than the target?

A: 85

B: 90

C: 95

D: 100

What determines the ideal bed occupancy?

Demand pattern
- Unscheduled vs. scheduled
- Variation in admission rate

Acuity (target wait times)
- How long can patients afford to wait in ED?

Discharge pattern
- Variation in length of stay and discharge

Our Lessons Learnt

- Visual Impact really important
- The make up of the modelling team is critical
- The team requires time to learn and build models
- Executive support & buy in is essential
- Models should align with corporate objectives
- It is a great tool for teaching principles of flow

Summary

- To truly perform well we have to understand the whole system

- It is important to analyze our system scientifically.

- We need to be able to test solutions to our problems without increasing patient risk