

Smith Hager Bajo, Inc. Simulation Modeling Case Study – Children's Services

The Problem:

A large children's hospital in Florida was in the planning stages for renovations to their existing facility. Smith Hager Bajo was engaged to complete a bed need analysis by type of unit, functional space programming and operational analysis for children's services. The bed need and operational analysis were completed during the same time frame. The analysis included the following components.

- **Volume Projections:** A) validate the volume projections by unit (General Pediatrics, PICU, PSCU, Peds Cardiac, Peds Cardiac Stepdown, Peds Hem/Onc and Peds ED)
- **Facility Review:** A) review quantity and mix of pediatric beds by unit, taking into account functional relationships and B) provide input on general flow and layout of preliminary drawings
- **Operational Analysis:** A) analyze current operational processes and provide input on opportunities to improve efficiency and productivity and B) provide design implications on future staffing and operations

The Analysis:

Smith Hager Bajo worked with the leadership team and caregivers to complete the project. The detailed volume analysis was completed first. Then their computerized simulation model, designed specifically for pediatric services, was used as the tool for the children's facility bed need and staffing analysis.

Computerized simulation modeling was used to complete the analysis for several reasons:

- Ability to include key variables such as the impact of scheduled procedures, seasonal variability and discharge times (could not be evaluated with former bed need prediction model)
- Flexibility to compare/contrast the results of a variety of scenarios

During discussions with the operational work groups, it was discovered that the pediatric residency rounding practices significantly impacted the discharge times on the children's units as well as the newborn nursery. Detailed analysis showed that because of these practices the majority of children were being discharged between 3pm and 9pm, a six-hour window of time.

Benchmarking calls to other children's hospitals confirmed that this practice was not common in their hospitals. In fact, most experienced a twelve-hour discharge window of time.

Simulation modeling was used to compare the impact of a six-hour window of time with a twelve-hour window of time. The results showed that an additional 16 pediatric beds were needed if the majority of discharges continued to occur in that short six-hour window of time. The leadership team decided to revise the discharge process and not add the 16 beds, resulting in a substantial savings in facility costs.

The Results:

- The results confirmed the need for 8 cardiac, 15 cardiac stepdown, 21 Hem/Onc, 14 PICU, 29 pediatric stepdown, 64 general pediatric and 8 observation beds
- The unit will need 36 pediatric ED beds, 16 Fast-Track/Urgent Care and 16 ED/Trauma

The model generated three types of results. They include:

- Bed need by type of bed
- Patient overages and days all beds full
- Room utilization

Predicted Bed Need Results Summary

ROOM COUNT SUMMARY	1	2	3	4
95% Confidence Level	Current Level	4% Growth	22% Growth	8% Growth
Peds Cardiac	6	7	7	8
Cardiac Stepdown	12	12	14	15
Hem/Onc	17	17	20	21
PICU	11	11	13	14
PSCU	22	23	27	29
General Pediatrics	49	50	60	64
Peds Observation	6	6	7	8

Predicted Bed Need Results by Scenario

Scenario 1 - 2001 Volume and ALOS							
				Mean + 1.285 Std. Dev.	Mean + 1.645 Std. Dev.	Mean + 2 Std. Dev.	
Room Type	Max	Mean	Std. Dev.	90% Conf. Level	95% Conf. Level	97.5% Conf. Level	
Peds Cardiac	9	3.38	1.59	5.42	6.00	6.56	
Cardiac S/D	15	7.93	2.3	10.89	11.71	12.53	
Hem/Onc	24	10.57	3.35	14.87	16.08	17.27	
PICU	15	5.95	2.71	9.43	10.41	11.37	
PSCU	28	15.31	3.78	20.17	21.53	22.87	
Gen Peds	58	37.73	6.47	46.04	48.37	50.67	
Peds Obs.	8	3.37	1.54	5.35	5.90	6.45	

Scenario 2 - 2001 - 2005 Projected Volume and ALOS (4% Increase)							
				Mean + 1.285 Std. Dev.	Mean + 1.645 Std. Dev.	Mean + 2 Std. Dev.	
Room Type	Max	Mean	Std. Dev.	90% Conf. Level	95% Conf. Level	97.5% Conf. Level	
Peds Cardiac	9	3.52	1.61	5.59	6.17	6.74	
Cardiac S/D	15	8.22	2.3	11.18	12.00	12.82	
Hem/Onc	25	10.86	3.43	15.27	16.50	17.72	
PICU	15	6.2	2.75	9.73	10.72	11.7	
PSCU	16	16.01	3.89	21.01	22.41	23.79	
Gen Peds	60	39.09	6.59	47.56	49.93	52.27	
Peds Obs.	8	3.46	1.54	5.44	5.99	6.54	

Scenario 3 - 2005 - 2010 Projected Volume and ALOS (22% Increase)						
				Mean + 1.285 Std. Dev.	Mean + 1.645 Std. Dev.	Mean + 2 Std. Dev.
Room Type	Max	Mean	Std. Dev.	90% Conf. Level	95% Conf. Level	97.5% Conf. Level
Peds Cardiac	10	3.96	1.73	6.18	6.81	7.42
Cardiac S/D	18	9.29	2.47	12.46	13.35	14.23
Hem/Onc	28	13.29	3.76	18.12	19.48	20.81
PICU	18	7.75	3.11	11.75	12.87	13.97
PSCU	33	19.32	4.5	25.10	26.72	28.32
Gen Peds	69	47.12	7.52	56.78	59.49	62.16
Peds Obs.	10	3.98	1.71	6.18	6.79	7.4

Scenario 4 - 2010-2015 Projected Volume and ALOS (8% Increase)						
				Mean + 1.285 Std. Dev.	Mean + 1.645 Std. Dev.	Mean + 2 Std. Dev.
Room Type	Max	Mean	Std. Dev.	90% Conf. Level	95% Conf. Level	97.5% Conf. Level
Peds Cardiac	12	4.49	1.86	6.88	7.55	8.21
Cardiac S/D	18	10.43	2.58	13.75	14.67	15.59
Hem/Onc	29	14.13	3.9	19.14	20.55	21.93
PICU	19	8.36	3.2	12.47	13.62	14.76
PSCU	35	20.64	4.69	26.67	28.36	30.02
Gen Peds	74	50.43	7.9	60.58	63.43	66.23
Peds Obs.	11	4.2	1.73	6.42	7.05	7.66

Conclusion:

The hospital is moving forward with its planned renovation for the children's hospital. Operational issues related to the discharge process are being resolved. Other recommended operational changes that were identified in the analysis and can be made prior to the completed renovation have implementation plans and timetables.