

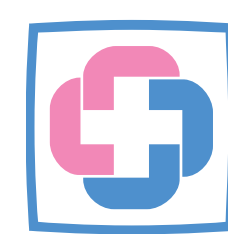


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Analytical Framework for Capacity Planning in the Emergency Department

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BACKGROUND

Patients with varying acuity levels turn up in the Emergency Department (ED) in fluctuating numbers over the course of a day. Patients with high acuity needs to be attended to within a very short timeframe upon arrival. Lower acuity patients can wait their turn. As right-siting of care is important, it is **NOT NECESSARY** to deploy full resources for **ALL** ED patients to be seen in the shortest possible time.

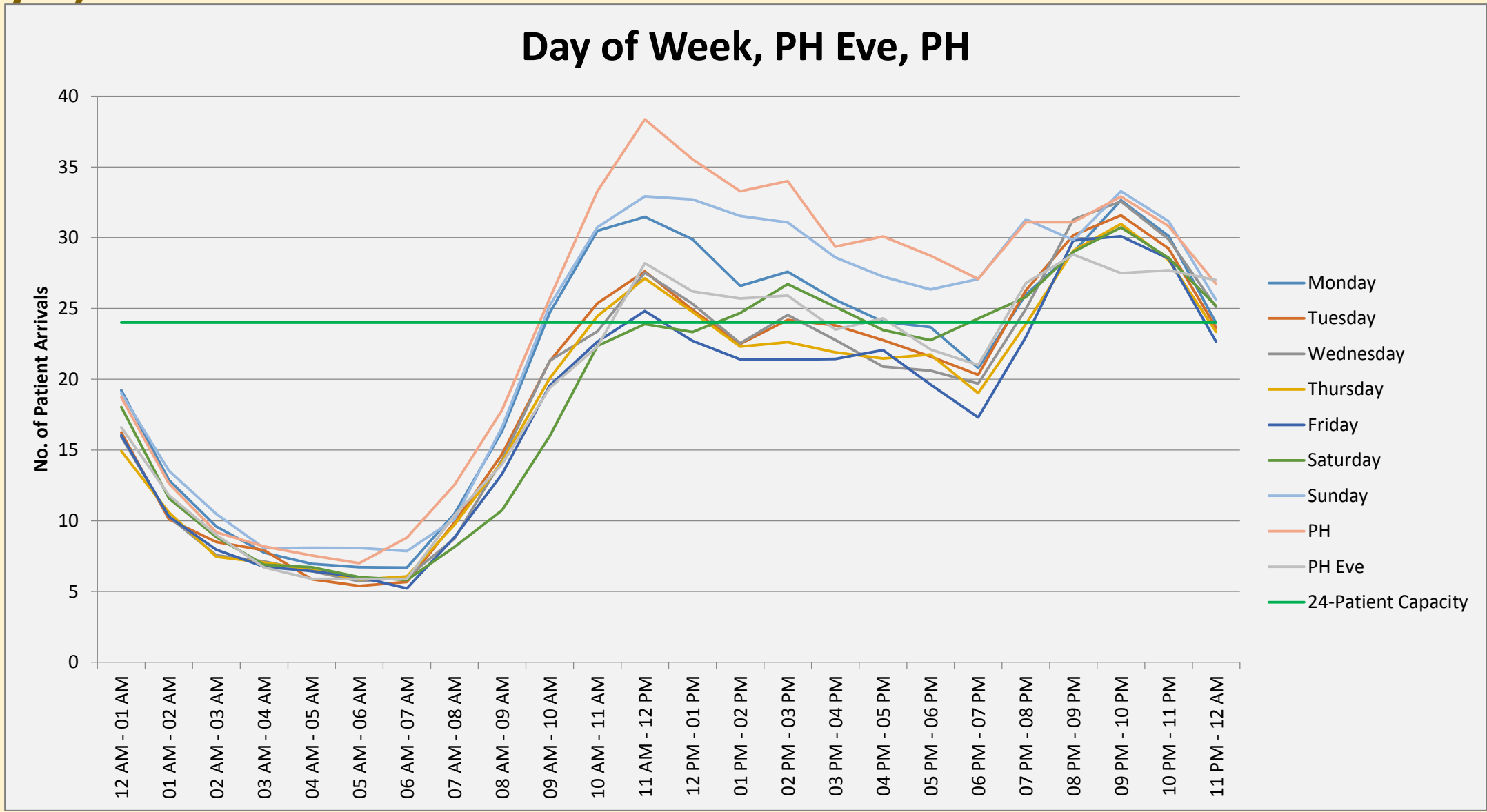
AIM

To ascertain optimal number of consultation rooms to operate

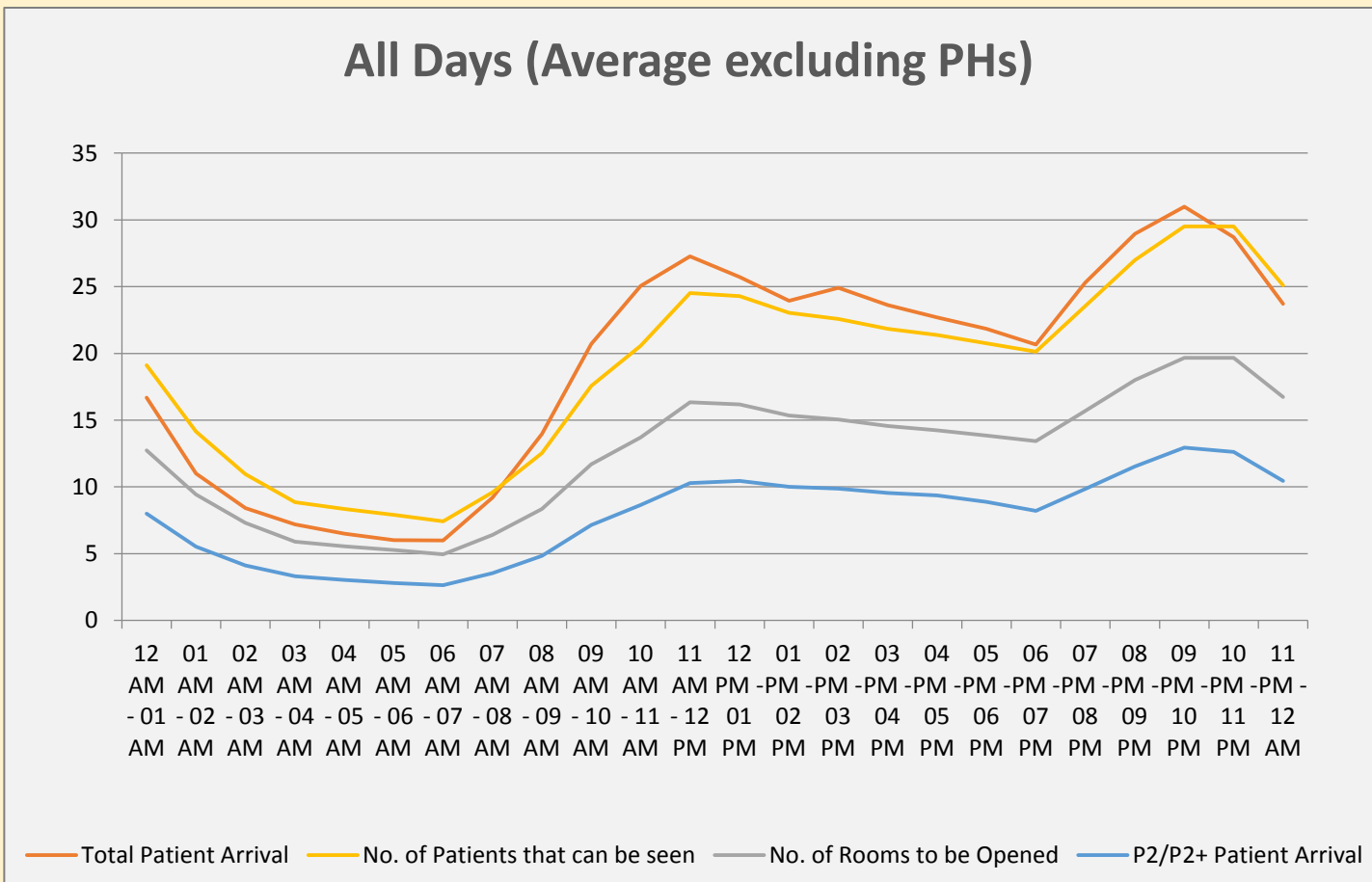
- so that P2/P2+ patients are attended to promptly
- P3 patients are seen faster than currently, but without providing for them to be seen in the shortest possible time
- without staff cutting short their meal breaks, working overtime, and senior doctors seeing patients to help clear patient load instead of focusing on their supervisory role

METHODOLOGY

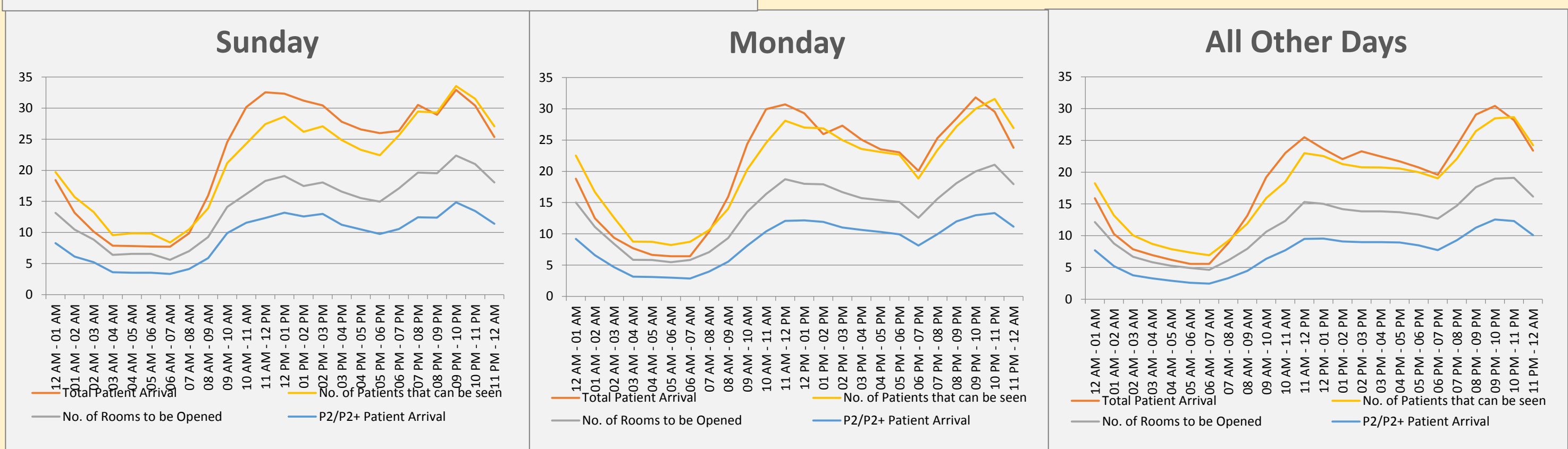
- Hour-by-hour patient arrival trends determined that analysis to be split by patient category and by Sundays, Mondays and Other Days (being Tuesdays to Saturdays, and eve of public holidays)



- Through matching number of patients that can be seen per hourly block, operating rooms at 2 Sigma above Mean of P2+/P2 patient arrivals in each hour was identified as the best demand-supply combination



- ✘ Operating more rooms than P2+/P2 patient arrivals ensures 97.7% of P2+/P2 patients are seen without delay
- ✘ Operating rooms at slightly lower capacity than there are total number of patient arrivals ensures P3 patients are seen in a shorter time than currently but still with some waiting



- Simulate and compare actual waiting times between the current and revised room levels

RESULTS

- Improvement across all categories on all days

Patient category	Day	Simulation of current resource allocation (hh:mm:ss)	Simulation of rooms at 2 Sigma above P2+/P2 patient arrivals (hh:mm:ss)	% Improvement over current status
P2+/P2	Sunday	0:14:09	0:06:55	51%
	Monday	0:09:40	0:07:37	21%
	Other Days	0:08:40	0:08:26	3%
	All Days	0:10:50	0:07:39	29%
P3	Sunday	13:19:53	4:18:54	68%
	Monday	9:05:27	4:53:42	46%
	Other Days	4:50:32	3:54:58	19%
	All Days	9:05:17	4:22:31	52%

- Hour-by-hour waiting time for P2+/P2 patients

Time of Patient Arrival	Sunday Current Waiting Time	Sunday Revised Waiting Time	Monday Current Waiting Time	Monday Revised Waiting Time	Other Days Current Waiting Time	Other Days Revised Waiting Time
12 AM - 01 AM	0:08:15	0:06:53	0:10:27	0:06:37	0:10:34	0:08:16
01 AM - 02 AM	0:10:03	0:06:52	0:15:30	0:06:57	0:13:43	0:08:22
02 AM - 03 AM	0:09:10	0:07:47	0:13:31	0:09:24	0:15:36	0:11:26
03 AM - 04 AM	0:09:21	0:12:11	0:08:08	0:12:08	0:16:48	0:16:11
04 AM - 05 AM	0:02:05	0:03:20	0:03:11	0:04:37	0:05:31	0:05:37
05 AM - 06 AM	0:02:47	0:05:12	0:03:35	0:07:44	0:05:58	0:08:51
06 AM - 07 AM						0:11:44
07 AM - 08 AM						0:09:19
08 AM - 09 AM						0:07:22
09 AM - 10 AM						0:05:32
10 AM - 11 AM						0:05:34
11 AM - 12 PM						0:06:23
12 PM - 01 PM						0:09:07
01 PM - 02 PM						0:09:35
02 PM - 03 PM	0:33:03	0:08:39	0:14:39	0:07:32	0:10:39	0:07:17
03 PM - 04 PM	0:22:38	0:06:53	0:07:38	0:05:55	0:08:03	0:06:36
04 PM - 05 PM	0:23:16	0:06:32	0:06:35	0:06:32	0:06:58	0:06:57
05 PM - 06 PM	0:24:41	0:11:56	0:12:32	0:12:15	0:12:13	0:13:27
06 PM - 07 PM	0:17:01	0:08:27	0:09:02	0:12:58	0:08:13	0:10:24
07 PM - 08 PM	0:14:11	0:07:25	0:08:22	0:08:53	0:07:24	0:07:25
08 PM - 09 PM	0:12:57	0:06:48	0:07:00	0:06:31	0:06:52	0:06:34
09 PM - 10 PM	0:09:39	0:07:10	0:07:07	0:06:22	0:07:08	0:06:27
10 PM - 11 PM	0:08:43	0:06:42	0:07:22	0:06:33	0:07:11	0:06:24
11 PM - 12 AM	0:08:18	0:07:05	0:09:32	0:07:53	0:08:40	0:07:27
Average	00:14:09	00:06:55	00:09:40	00:07:37	00:08:40	00:08:26
Improvement		51%		21%		3%

29% reduction in waiting time for P2+/P2 patients

- Hour-by-hour waiting time for P3 patients

Time of Patient Arrival	Sunday Current Waiting Time	Sunday Revised Waiting Time	Monday Current Waiting Time	Monday Revised Waiting Time	Other Days Current Waiting Time	Other Days Revised Waiting Time
12 AM - 01 AM	11:51:45	6:58:55	22:37:11	10:59:38	14:48:22	10:27:49
01 AM - 02 AM	12:39:43	6:45:15	21:59:52	10:46:04	15:13:02	10:46:23
02 AM - 03 AM	13:38:57	6:25:09	21:16:18	9:57:24	14:25:48	10:14:46
03 AM - 04 AM	14:15:03	6:09:01	20:18:25	9:41:14	13:34:25	9:20:07
04 AM - 05 AM	0:01:58	0:03:52	0:02:37	0:05:07	0:07:59	0:10:12
05 AM - 06 AM	0:03:39	0:09:38	0:05:35	0:14:10	0:16:17	0:33:40
06 AM - 07 AM	0:12:09	0:16:05	0:04:22	0:08:09	0:15:47	0:37:47
07 AM - 08 AM						0:34:39
08 AM - 09 AM						0:24:30
09 AM - 10 AM						0:31:16
10 AM - 11 AM						0:57:17
11 AM - 12 PM						1:41:27
12 PM - 01 PM						2:20:44
01 PM - 02 PM						2:43:57
02 PM - 03 PM						3:27:28
03 PM - 04 PM	18:15:17	4:52:24	8:37:25	4:58:25	3:36:36	3:48:43
04 PM - 05 PM	19:26:50	5:01:20	8:38:30	4:55:41	3:35:09	3:49:02
05 PM - 06 PM	20:42:48	5:13:39	9:10:07	4:51:04	3:34:16	3:46:59
06 PM - 07 PM	21:48:15	5:27:11	10:09:01	5:11:17	3:36:59	3:44:25
07 PM - 08 PM	22:48:24	6:14:03	11:06:59	5:54:47	3:52:08	3:33:44
08 PM - 09 PM	23:01:49	7:21:20	11:54:04	6:55:45	4:39:47	3:50:08
09 PM - 10 PM	23:28:40	8:38:37	12:58:43	7:44:32	5:36:35	4:26:44
10 PM - 11 PM	23:18:37	9:48:39	14:09:25	9:14:29	7:46:14	5:37:40
11 PM - 12 AM	23:01:29	10:45:22	14:42:27	10:00:25	9:55:18	6:29:44
Average	13:19:53	04:18:54	09:05:27	04:53:42	04:50:32	03:54:58
Improvement		68%		46%		19%

52% reduction in waiting time for P3 patients

CONCLUSION

- The analytical framework provides a clear basis to evaluate demand for services and determine optimal supply levels within deliberately set constraints and parameters.
- With simulation studies incorporated into the framework, the feasibility/impact of proposed changes can be ascertained to facilitate decision-making.