

# MEMORANDUM

**Date:** March 22, 2006

**Subject:** Good Samaritan Hospital Layout

**To:** Professor Matt Ford

**From:** Jason Streety

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## Introduction

As requested, possible layout of Good Samaritan Hospital has been investigated. Three proposed layouts have been compared in an effort to minimize the total distance traveled by patients.

## Findings

**Cost, Volume, Distance results.** Total daily distance traveled by patients was lowest in Layout C. The difference between the daily total distances of Layout C and other alternatives was due to a significantly low total distance traveled from Cardiology to other departments.

**Recommended layout.** Of the three alternatives, Layout C is recommended. Improvements upon this layout should be investigated in order to minimize the total distance traveled by patients.

## Discussion

**Method.** Distances between six locations in the hospital (A, B, C, D, E, and F) were measured and the number of patient trips between six departments was estimated. Each department title can be found in Table 1. For each location, total distance to other locations was computed. For each department, daily total trips taken to and from were calculated. Three layouts, as seen in Figure 1, were proposed using this data. In Layout A, departments were arranged based on total daily trips taken by patients from each department. Departments with higher total trips from were placed in locations with lower total distance to other locations. In Layout B, departments were arranged based on total trips taken by patients to each department. Departments with higher total trips to were placed in locations with lower total distance to others. In Layout C, departments were arranged based on a combination of total trips taken by patients to each department and total trips taken from each department. Departments with higher total trips taken to and from were placed in locations with lower total distance to other locations. Using the cost, volume, distance approach and the data in Tables 2 and 3, daily total distance traveled by patients was computed for each layout. A sample calculation for Layout C is provided below.

### Total Distance of Layout C

From Department 1 to Others =  $(0 \times 160) + (40 \times 80) + (110 \times 40) + (80 \times 40) + (50 \times 120)$   
 = 16,800

From Department 2 to Others =  $(0 \times 160) + (0 \times 80) + (50 \times 120) + (40 \times 100) + (120 \times 40)$   
 = 14,800

From Department 3 to Others =  $(0 \times 80) + (0 \times 80) + (10 \times 40) + (250 \times 20) + (10 \times 40)$   
 = 5,800

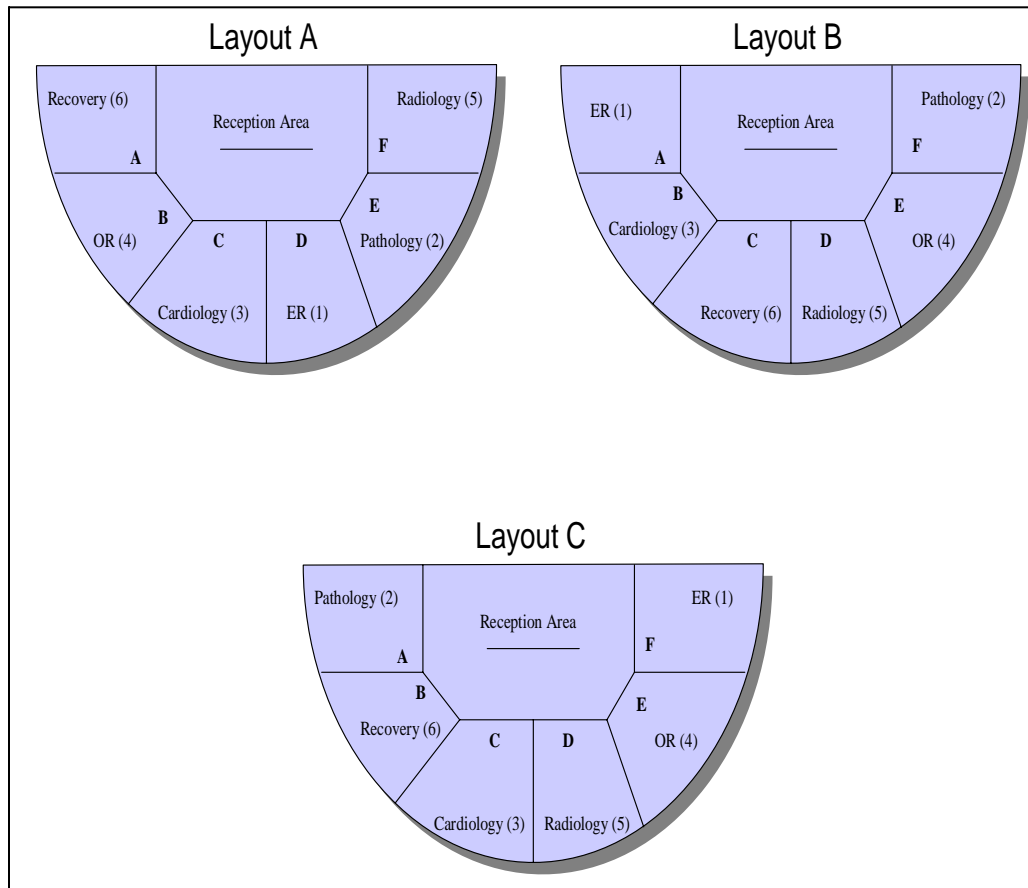
From Department 4 to Others =  $(0 \times 40) + (0 \times 120) + (0 \times 40) + (40 \times 20) + (90 \times 80)$   
 = 8,000

From Department 5 to Others =  $(0 \times 40) + (0 \times 100) + (0 \times 20) + (0 \times 20) + (20 \times 60)$   
 = 1,200

From Department 6 to Others =  $(0 \times 120) + (0 \times 40) + (0 \times 40) + (0 \times 80) + (0 \times 60)$   
 = 0

Total Distance =  $16800 + 14800 + 5800 + 8000 + 1200 + 0 = 46,600$  feet

**Figure 1: Proposed Layouts**



Department	Title
1	Emergency Room
2	Pathology
3	Cardiology
4	Operating Room
5	Radiology
6	Recovery

From	To	A	B	C	D	E	F
A		-	40	80	100	120	160
B		40	-	40	60	80	120
C		80	40	-	20	40	80
D		100	60	20	-	20	40
E		120	80	40	20	-	40
F		<u>160</u>	<u>120</u>	<u>80</u>	<u>40</u>	<u>40</u>	-
Total Distance To Other Locations		500	340	260	240	300	440

From	To	1	2	3	4	5	6	Total Trips From Department
1		-	0	40	110	80	50	<u>280</u>
2		0	-	0	50	40	120	<u>210</u>
3		0	0	-	10	250	10	<u>270</u>
4		0	0	0	-	40	90	<u>130</u>
5		0	0	0	0	-	20	<u>20</u>
6		<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	-	<u>0</u>
Total Trips To Department		<u>0</u>	<u>0</u>	<u>40</u>	<u>170</u>	<u>410</u>	<u>290</u>	

**Cost, Volume, Distance Results.** Total distance data comparing layouts A, B, and C can be found in Table 3. Daily total distance for Layout C, 46,600 feet, was lowest of the three alternatives. This total was about 30% lower than Layout A, and about 24% lower than Layout B. However, of the six departments, only total distance traveled by patients from department 3 was lowest in Layout C. Total distance traveled from department 3 to other departments was substantially lower in layout C, and this low distance is responsible for the large difference between the layouts.

Distance	Layout A	Layout B	Layout C
From 1 To Others	15620	26800	16800
From 2 To Others	20000	13200	14800
From 3 To Others	21200	16200	5800
From 4 To Others	6800	4400	8000
From 5 To Others	3200	400	1200
From 6 To Others	<u>0</u>	<u>0</u>	<u>0</u>
Total Distance	<u>66820</u>	<u>61000</u>	<u>46600</u>

**Recommended Layout.** The most favorable alternative is Layout C. Since total distance traveled by patients per day was lowest for Layout C, it is recommended. However, improvements in this layout should be investigated to reduce daily total distance traveled by patients. One such improvement could include further separation of Pathology and Cardiology. The distance between the two departments is 80 feet, but no trips are taken between them. Placing Pathology and Cardiology further from each other

could reduce total distance traveled from the two departments. However, such a change could have negative consequences if the total distance traveled from other departments were to increase as a result.

**Assumptions and Limitations.** Because distance between the reception area and each possible location was constant, distance and volume data for the reception area were ignored. It is also assumed that the cost of movement between all departments is the same. If this were not true, and the cost of movement between departments was different for each department, Layout C may not be the most cost effective alternative. It should also be noted that the provided volume data is based on projected departmental visits by patients. If these estimates are inaccurate, Layout C may not be the preferred alternative.