Using Evidence-Based Design to Increase Quality and Reduce Risk

Outline

- Questions CEOs and Boards must ask
- The potential of EBD for safety, quality, efficiency
- Process Perspective
- What you might do now
- Discussion of how we might support your effort

Six Questions

Boards & CEOs must ask

1. Urgency
2. Appropriateness
3. Cost
4. Financial impact
5. Sources of funds
6. Decreasing risk

Source: Blair Sadler

Lois J. Zimring, Ph.D.

1923-2005

Hospitals Are Dangerous

44,000-95,000 die each year due to preventable medical errors

IOM, 1999

2,000,000 Hospital-acquired infections a year in U.S.; 88,000 die

IOM, 2000

Infections are more serious:
22% of staph infection were MRSA in 1992
60% in 2005;
70%-90% of patients carrying MRSA are never identified

NY Times 2005

20% Nursing turnover
Nurses average 47+ years old

RWJF, 2005

1. More evidence than expected: **700+** rigorous studies
2. Many designs make hospitals more stressful & riskier for patients, families & staff.
3. A LOT of good evidence is available

Full report:
www.healthdesign.org/research/reports

The State of the Science

Staff effectiveness, stress, fatigue

Bedside computer	7
Air quality	65
Design/POE/Work Flow	29
Others	8

Patient Safety

Falls	30
Infection	118
Error	13+
Others	18

The State of the Science

Patient, family stress & well-being

Light	45
Wayfinding	24
Garden/Visual distractions	48
Noise	135
Visitor	36
Others	35

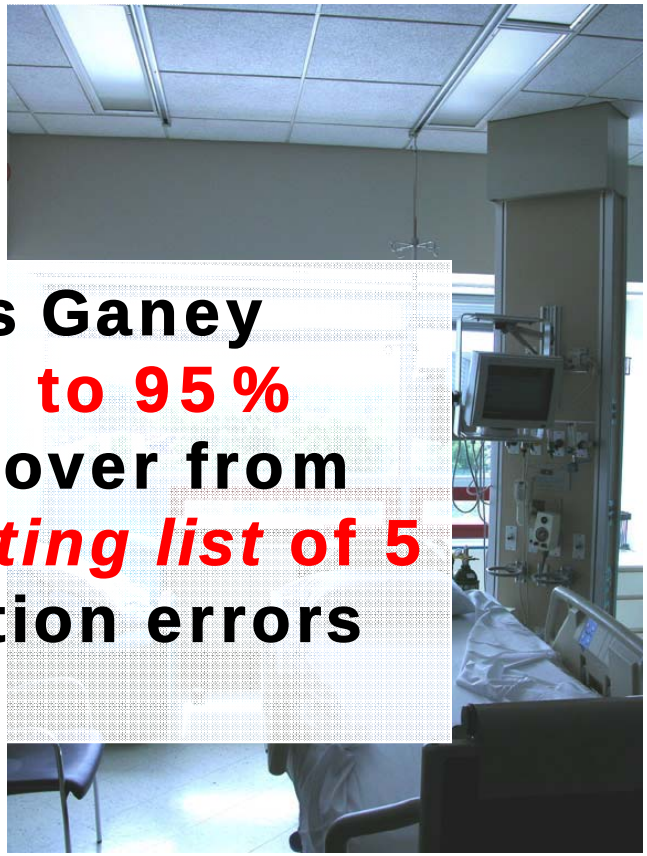
Overall clinical outcomes

Satisfaction	17
Length of stay and others	34

Increasing Satisfaction & Safety

Variable-acuity universal critical care room

350 sq foot with family sleep areas



- **Increase in Press Ganey scores from 10% to 95%**
- **Reduced RN turnover from 12% year to *waiting list* of 5**
- **Reduced medication errors by 62%**

Source: MCG Health, Augusta, GA

Increasing Safety

Acuity-adaptable coronary critical care room

- **Transfers reduced 90%**
- **Medication errors reduced 67%**

Clarian Methodist Hospital, Indianapolis:
BSA LifeStructures

Increasing Safety

Projected costs of patient handling injuries based on cost per injury prior to ceiling lifts.

Unit	Direct Cost *	# Injuries	Avg direct cost per injury	Avg indirect cost (2x) **	Total Cost one injury	Avg # injuries per year	Total Annual Cost
Neuro	$222,646.	15 (3 yrs)	$14,843.	$29,686	$44,529	5	$222,645
ICU	$ 95,003	10 (2 yrs)	$9,500.	$19,000	$28,500	5	$142,500
subtotal							**$365,145**

***Direct costs of just patient handling injuries**
**** Indirect costs include light duty salaries, replacement salaries, and training costs**

Actual savings after ceiling lifts are installed and used.

Unit	Direct Cost	# Injuries	Avg direct cost per injury	Avg indirect cost (2x)	Total Cost one injury	Avg # injuries per year	Total Annual Cost
Neuro	$ 43,728	6 (2 yrs)	$ 7288	$14,576	$21,864	3	$ 54,660
ICU	$ 0	0 (2 yrs)	$ 0.	$ 0	$ 0	0	$ 0
subtotal	$ 43,728	6 (2 yrs)	$ 7288	$ 14,576	$ 21,864	3	$ 54,660

Cost for 234 lifts and 75 lift-ready rooms: $1.6M

Payback: **2.5 years**

Lighting

More light!

Lighting

Sunlight affects analgesic use

Patients exposed to 46% more natural sunlight (lux/hours):

- **22% fewer analgesics**
- **20% lower drug costs**
- **Less pain, stress**

Walch et al (2005)

Lighting

Sunlight affects length of stay and death rate

Patients in a Cardiac Intensive Care Unit

- **Women stayed one day less in sunnier room (2.3 v 3.3 days)**
- **Death rate was 70% higher in dull rooms (39/335 v 21/293)**

Source: Beauchemin & Hays (1998)

Lighting

Sunlight affects staff

Alaska: 2 times higher error rate in darker months

Booker & Roseman (1995)

State of the Evidence

- A large and growing body of evidence
- Scattered and idiosyncratic
- Limited infrastructure for research, translation and application

Evidence-Based Design is the conscientious, explicit and judicious use of current best evidence in making planning and design decisions that advance the needs of patients, staff, families and organizations.

Evidence-Based Design

Share Results

↑

Evaluate

↑

Vision ↔ Performance-based planning & Design ↔ Evidence

↑

Identify Design Drivers

↑

Transformational Collaboration

Design Drivers, Design Responses, Outcomes

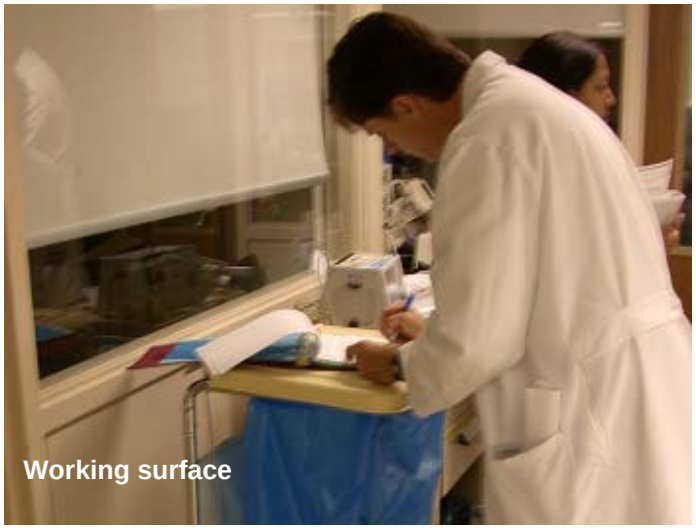
Design Driver	Design Responses	Hypothesized Outcomes
Support more procedures at the bedside	• Larger variable patient rooms • Overhead booms • Improved ergonomics • Increased power, cabling, storage	• Reduced patient transfer complications and costs • Fewer errors • Shorter stays • More time spent by ICU staff in the ICU area

Case Study:
Emory University

Emory Neuro ICU (existing)

Family waiting space

Patient room

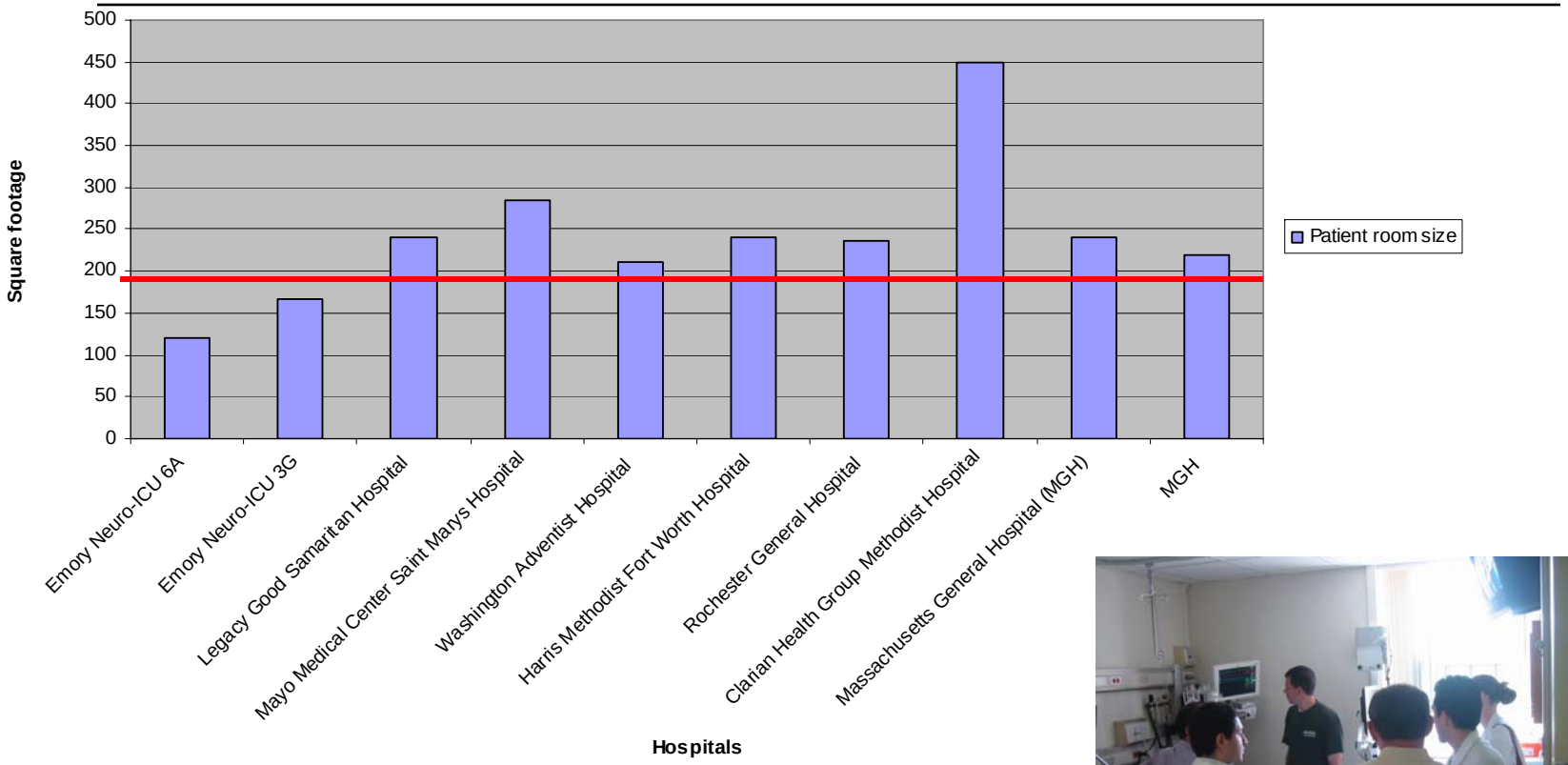

Working surface

Storage area

Design Drivers, Design Responses and Outcome Measures

Support families	•Family zone in patient room •Kids' room •Lockers & showers •Family quiet room	•Greater satisfaction on Press Ganey and Emory ICU survey •Fewer complaints & litigation
Support more procedures at the bedside	•Medical gas booms •Larger patient zone •Improved ergonomics	•Less patient transfer complications and costs •Fewer errors •Shorter stays •More time spent by ICU staff in the ICU area
Reduce infection	•Numerous rubs and handwashing stations	•Improved handwashing compliance •Lower MRSA and nosocomial infection rate
Reduce medical errors and increase patient safety	•Improved ceiling tiles •Carpet where appropriate •Charting niches •Zoned caregiver zone	•Fewer medical and medication errors •Less litigation •Reduced self-extubation •Decreased falls and injuries related to patients leaving beds

Patient Room Size Analysis

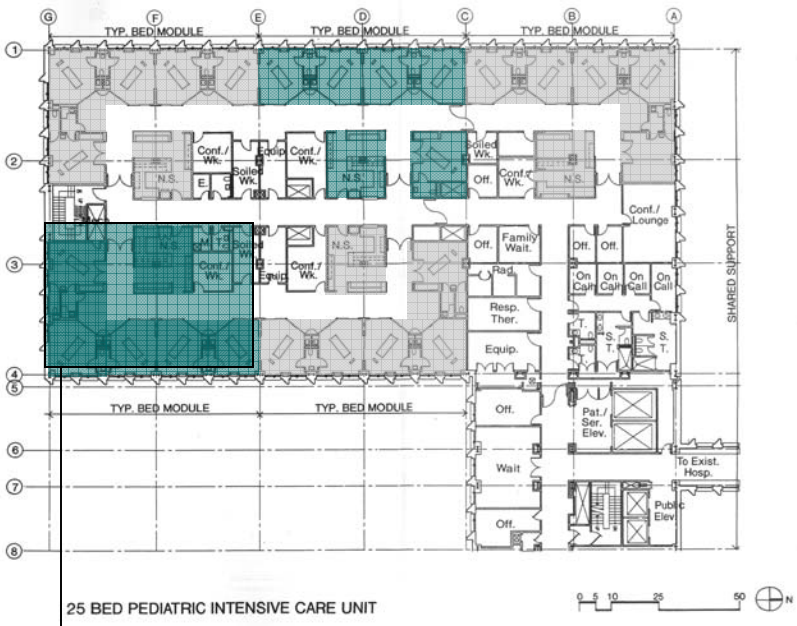


Best Practices Analysis

Features in Family Waiting Area

	St. Lukes	St. Eliz.	Mayo	Mayo-Litta	Clarian	Harris	Arkansas	
Adjacent to ICU	x	x		x		x	x	5
Inside ICU			x		x			2
Family Waiting Area	x	x	x	x	x	x	x	7
Children's Space		x						1
Consultation Rooms	x	x			x		x	4
Refreshments	x							1
Kitchenette			x	x	x	x	x	5
Quiet Rooms	x		x					2
Private Family Rooms	x					x		2
Lockers				x			x	2
Adjacent Restrooms		x	x	x		x	x	5
Showers			x				x	2
Garden Space					x			1
Laundry							x	1
	6	5	6	5	5	5	8	

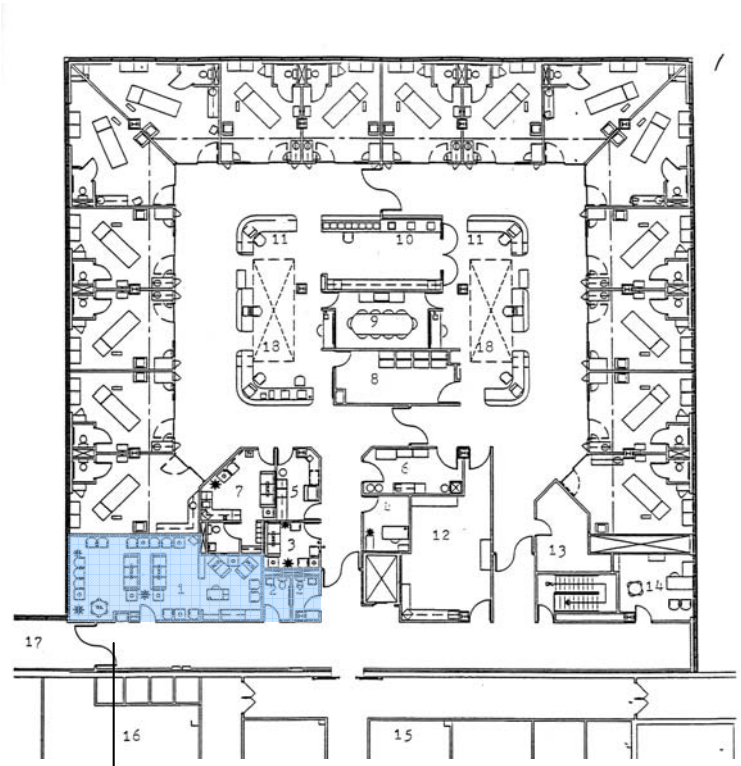
Typological Analysis: Clustering

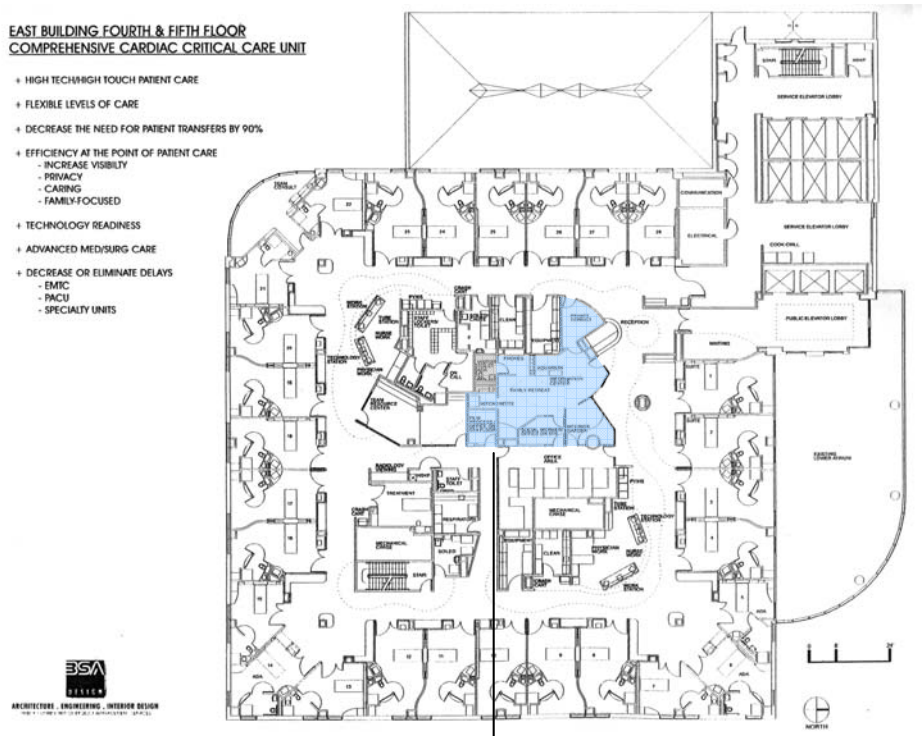


Clusters of 5 patient beds with self-contained nursing stations

Clusters of 10 patient beds

Typological Analysis: Family Area



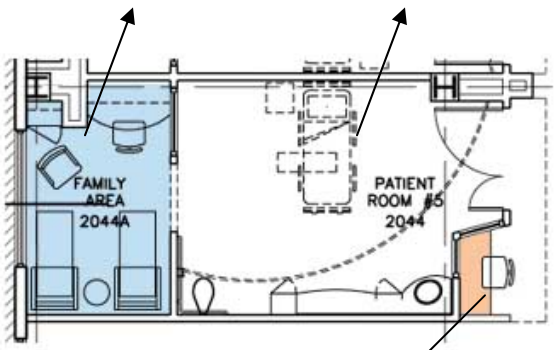


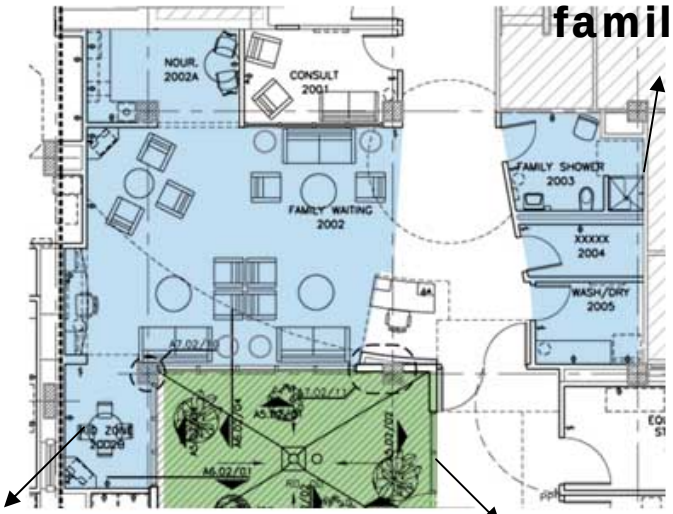
Family area outside the unit

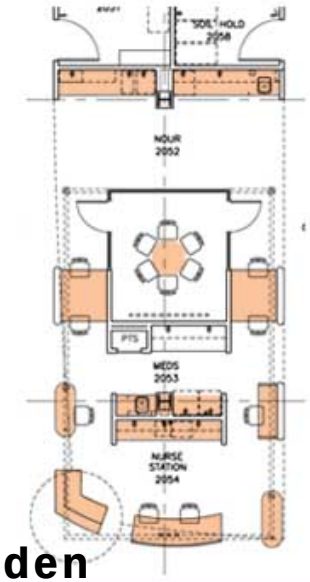
Family area inside the unit

Charrette:
EUH, GT, HKS
July 2005

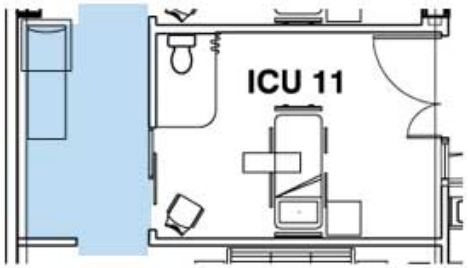
AFTER

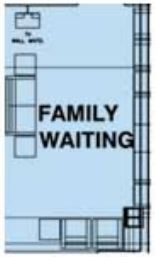


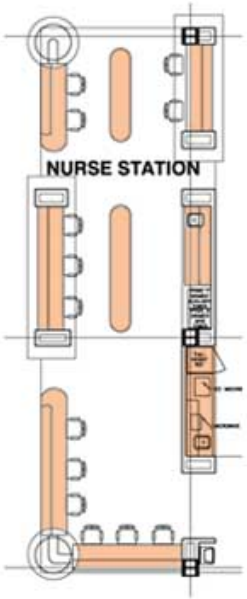




BEFORE





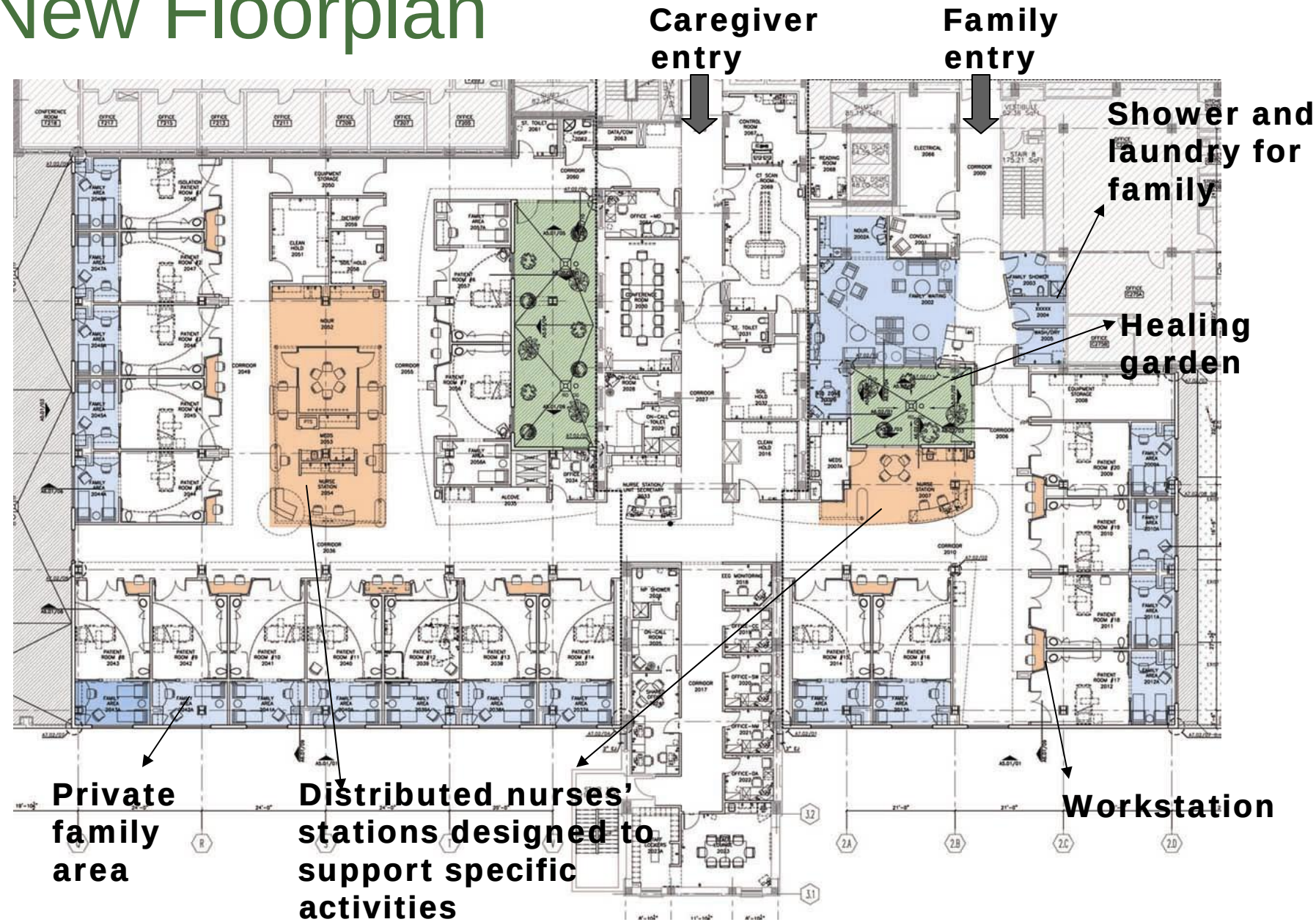


Patient room

Family waiting area

Nurses station

New Floorplan



Center for Health Design

- Non-profit research & advocacy organization
- Work began in 1988
- Research, education, advocacy, support

http://healthdesign.org

The Pebble Project

Purpose

- Create a ripple effect
- Provide examples
- Establish a research model
- Start a dialogue

Partners

- 40 active provider partners
- 2 corporate partners
- Various project types
- Different stages of design

Pebble Partners

Providers

- Children's Hospital & Health Center, San Diego, CA
- Bronson Methodist Hospital, Kalamazoo, MI
- Froedtert Hospital, Milwaukee, WI
- Weill Cornell, New York, N.Y.
- Parrish Medical Center, Titusville, FL
- St. Alphonsus Regional Medical Center, Boise, ID
- Yavapai Regional Medical Center, Prescott, AZ
- Scott & White Memorial Hospital, Temple, TX
- Sitrin Health Care Center, New Hartford, N.Y.
- M.D. Anderson Cancer Center, Houston, TX
- PeaceHealth Oregon Region, Eugene, OR
- Columbia St. Mary's, Milwaukee, WI
- Affinity Health System, Appleton, WI

Pebble Partners

Providers, cont'd

- Banner Estrella Medical Center, Phoenix, AZ
- Edward Hospital & Health Center, Naperville, IL
- St. Elizabeth's Hospital, Appleton, WI
- Shawnee Mission Medical Center, Shawnee Mission, KS
- St. Benedict's Family Medical Center, Jerome, ID
- Community Mercy Health Partners, Springfield, OH
- Village Care of New York, New York, NY
- St. Joseph's Community Hospital, West Bend, WI
- Dublin Methodist Hospital, Dublin, OH
- Palomar Pomerado Health, Escondido, CA
- Provena St. Joseph Medical Center, Joliet, IL
- SSM Healthcare, St. Louis, MO

Pebble Partners

Providers, con't

- Laguna Honda Hospital & Rehab Center, San Francisco, CA
- Lake Hospital System, Painesville, OH
- St. Joseph's-Baptist Health Care, Tampa, FL
- St. Luke's Episcopal Hospital, Houston, TX
- Spectrum Health, Grand Rapids, MI
- Lakeland Health, St. Joseph, MI
- Virtua Health, Voorhees, NJ
- Steelcase
- Hill-Rom

Pebble Project Benefits

- Peer support
- Evidence-based input
- Research facilitation
- Marketing opportunities
- Learning workshops
- Consulting & technical expertise
- National recognition

Bronson Methodist

Kalamazoo, MI

- $181 million
- December 2000
- $42 million less for new construction

Architecture & Interior Design:
Shepley Bulfinch Richardson & Abbott

Bronson Methodist

Design Features

- Access to nature
- Control
- Positive distractions

Bronson Methodist

Areas of Measurement

- Turnover
- Outcomes
- Length of stay
- Cost per unit of service
- Waiting times
- Satisfaction
- Organizational behavior
- Productivity

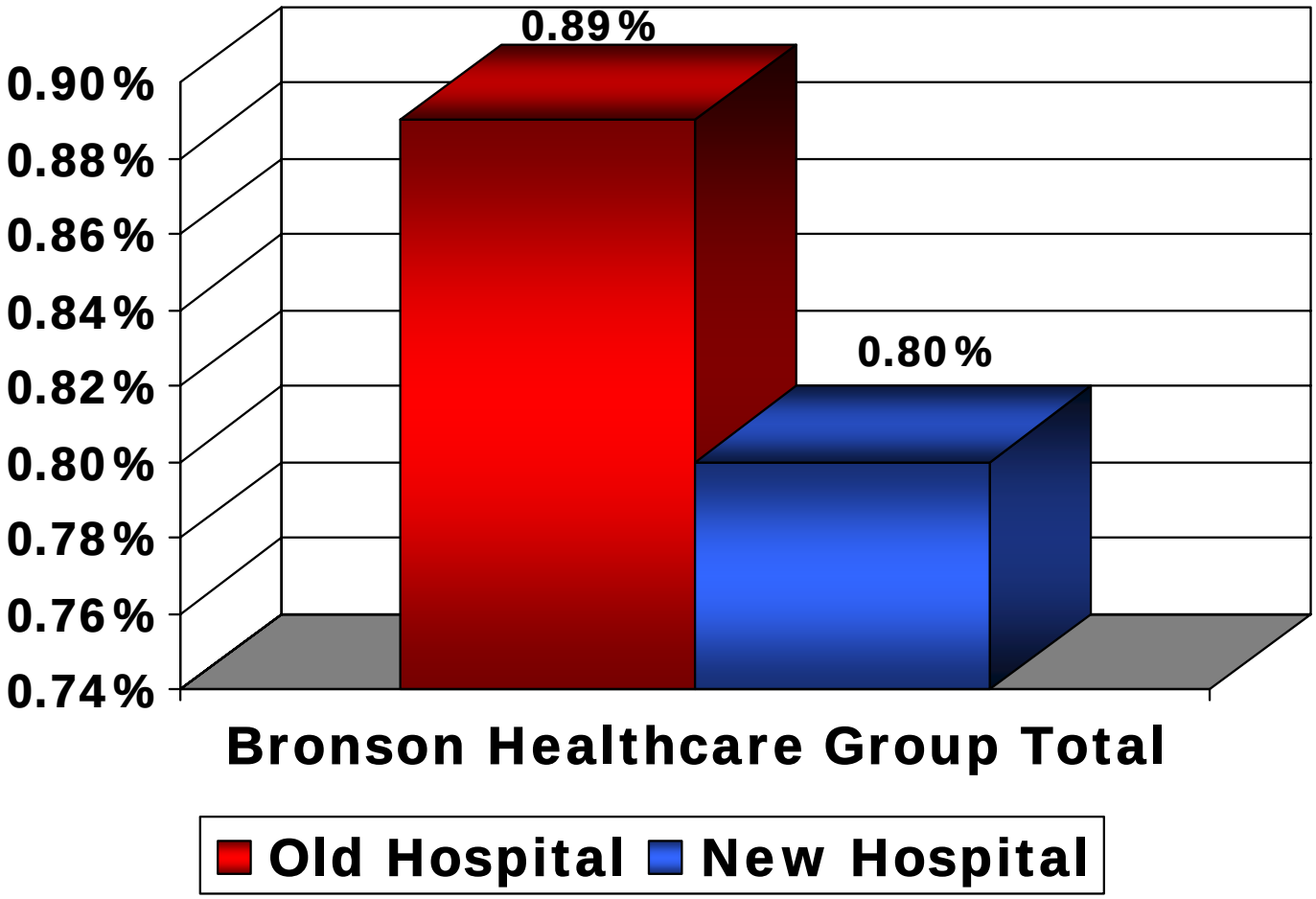
Bronson Methodist

Selected Data: Safety & Operations

- 11% decrease in infections
- $500,000 savings a year in transfers
- Increased market share
- 87% occupancy

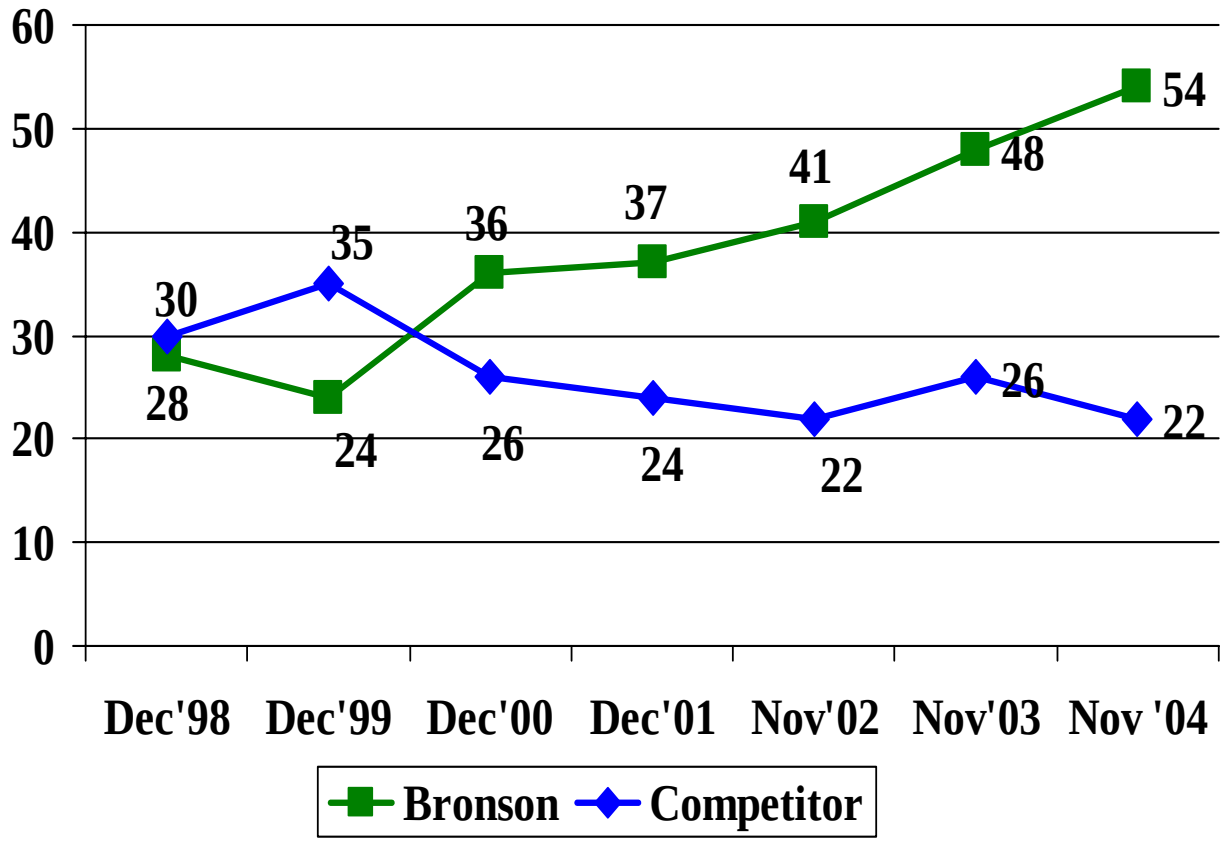
Bronson Methodist

Selected Data: Nosocomial Infections



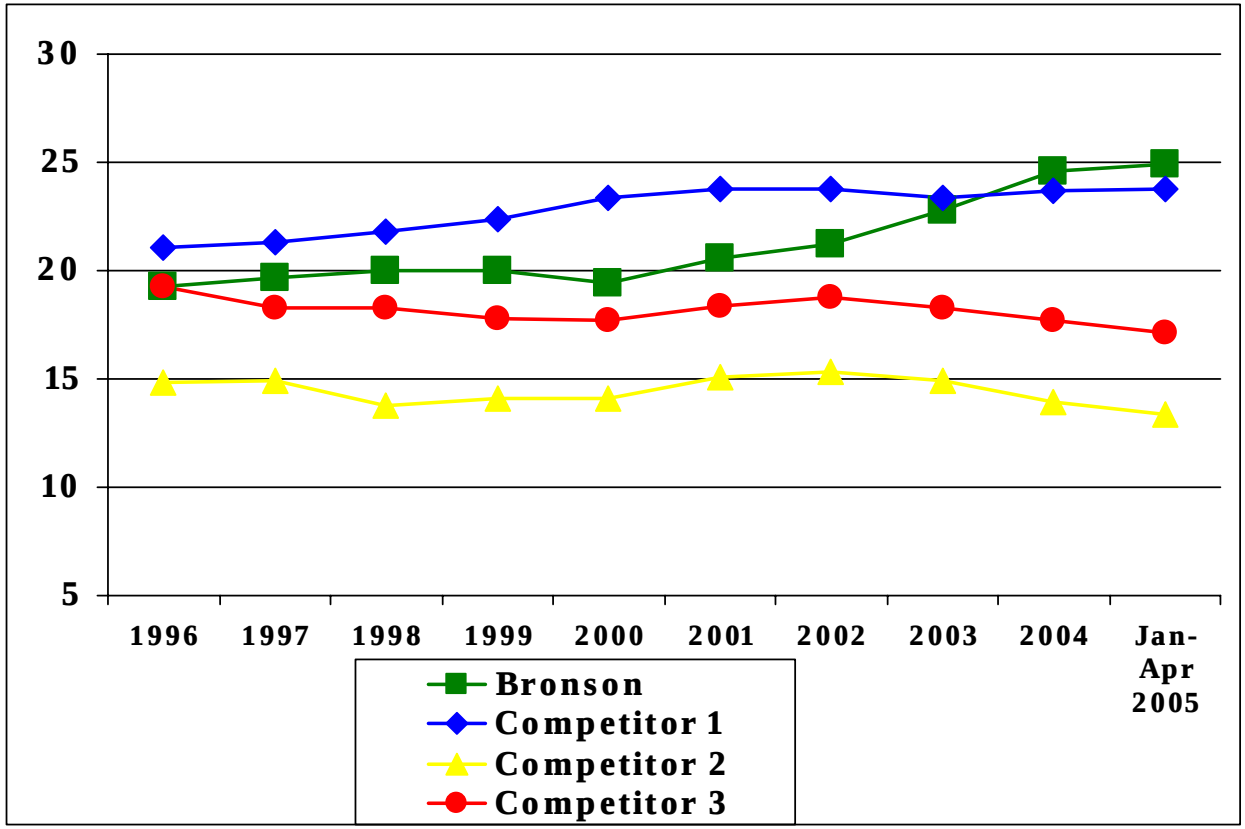
Bronson Methodist

Selected Data: Consumer Preferences



Bronson Methodist

Selected Data: Market Share



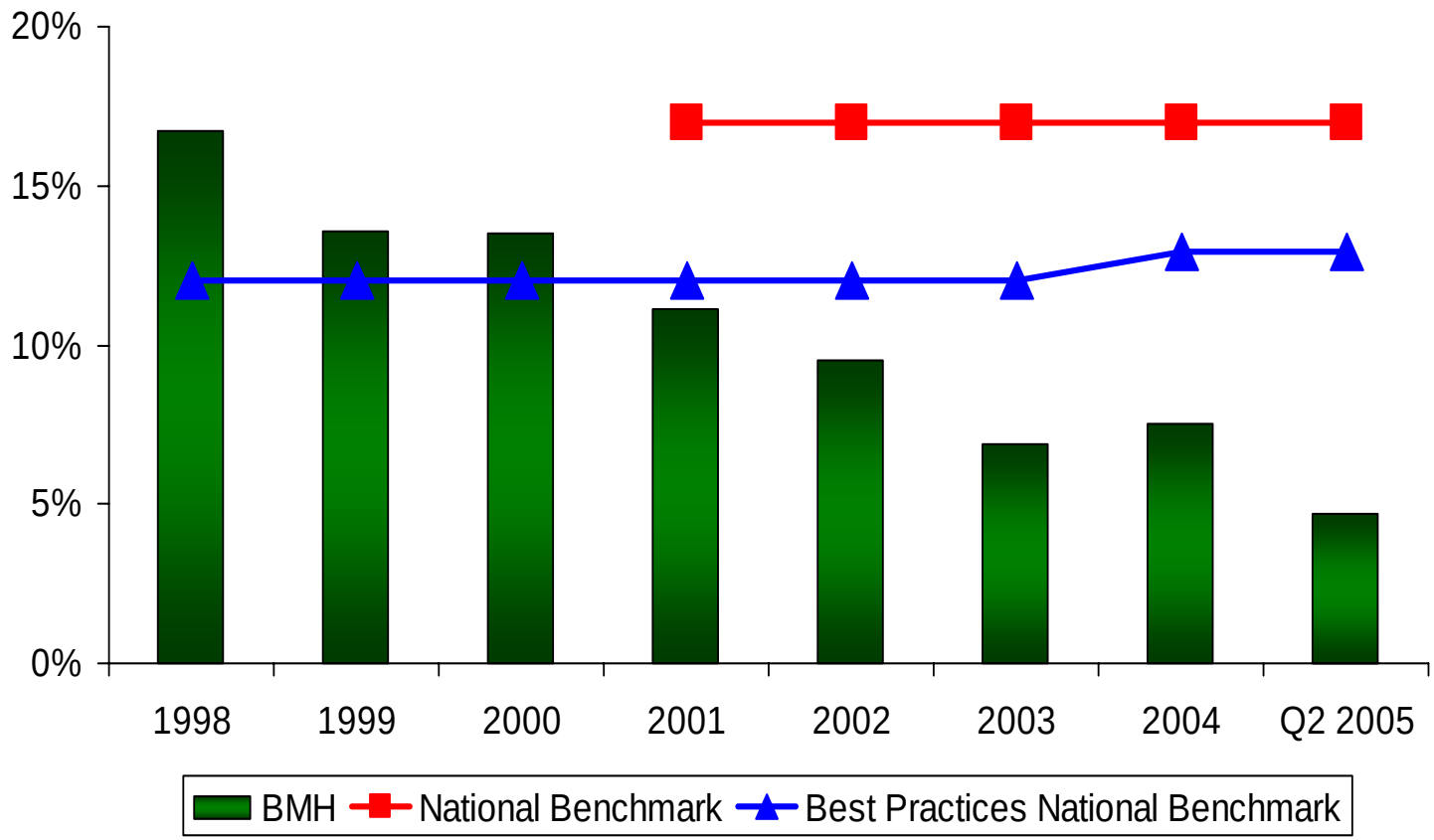
Bronson Methodist

Selected Data: Satisfaction

- 4.7% nurse turnover
- Increased employee satisfaction
- 96.7% patient satisfaction

Bronson Methodist

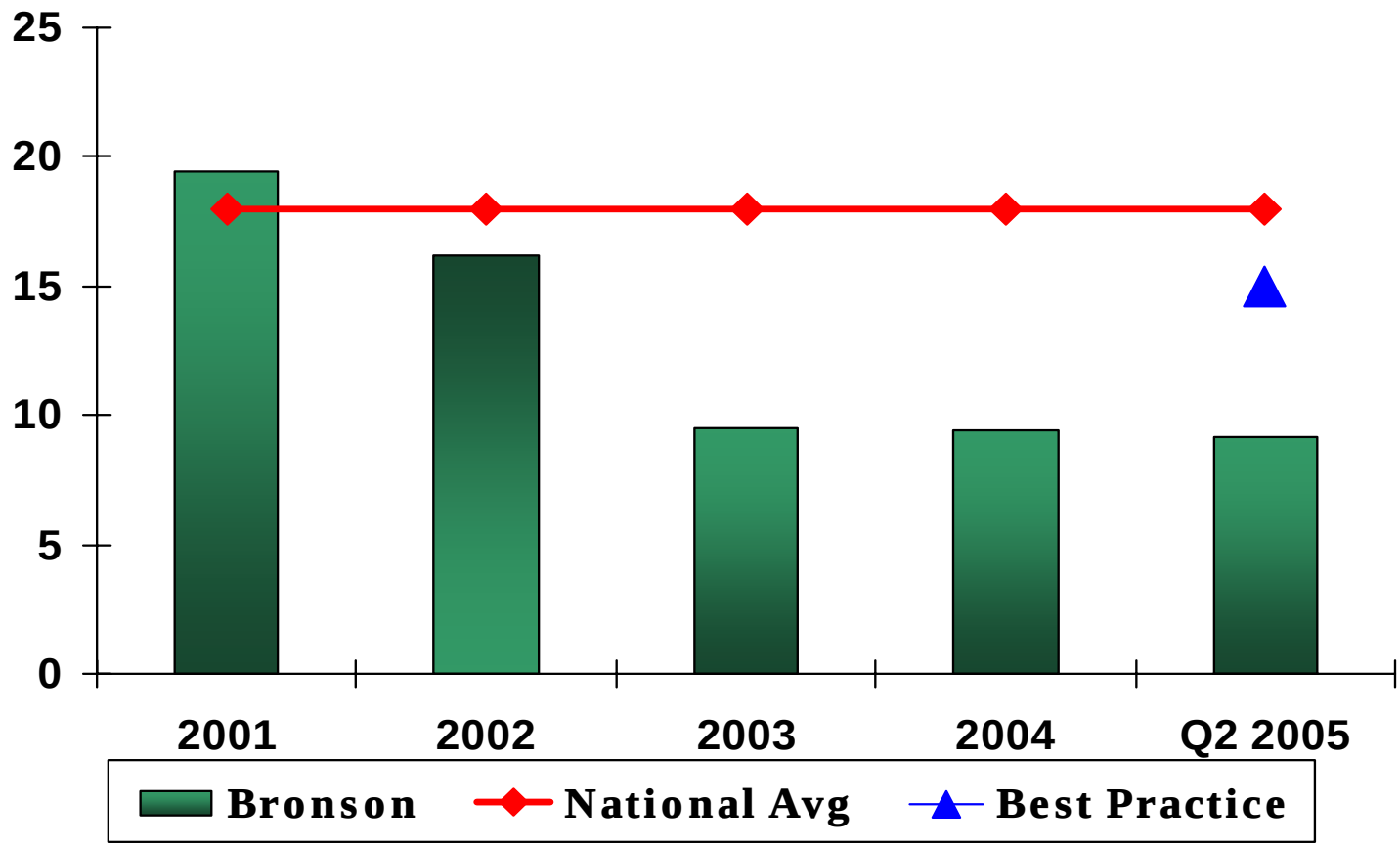
Selected Data: RN Turnover



Source for National Benchmark: The Advisory Board
Source for Best Practices: ANCC

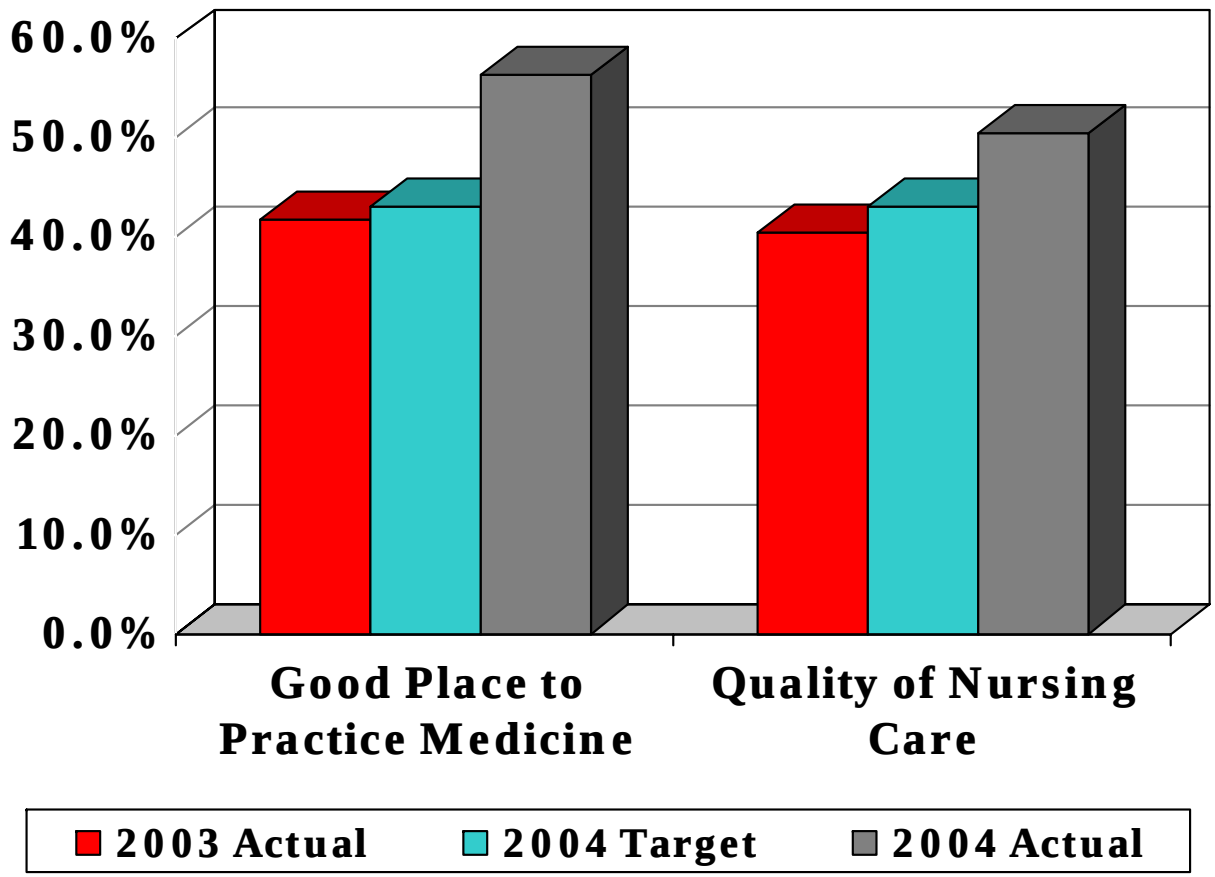
Bronson Methodist

Selected Data: Overall Turnover



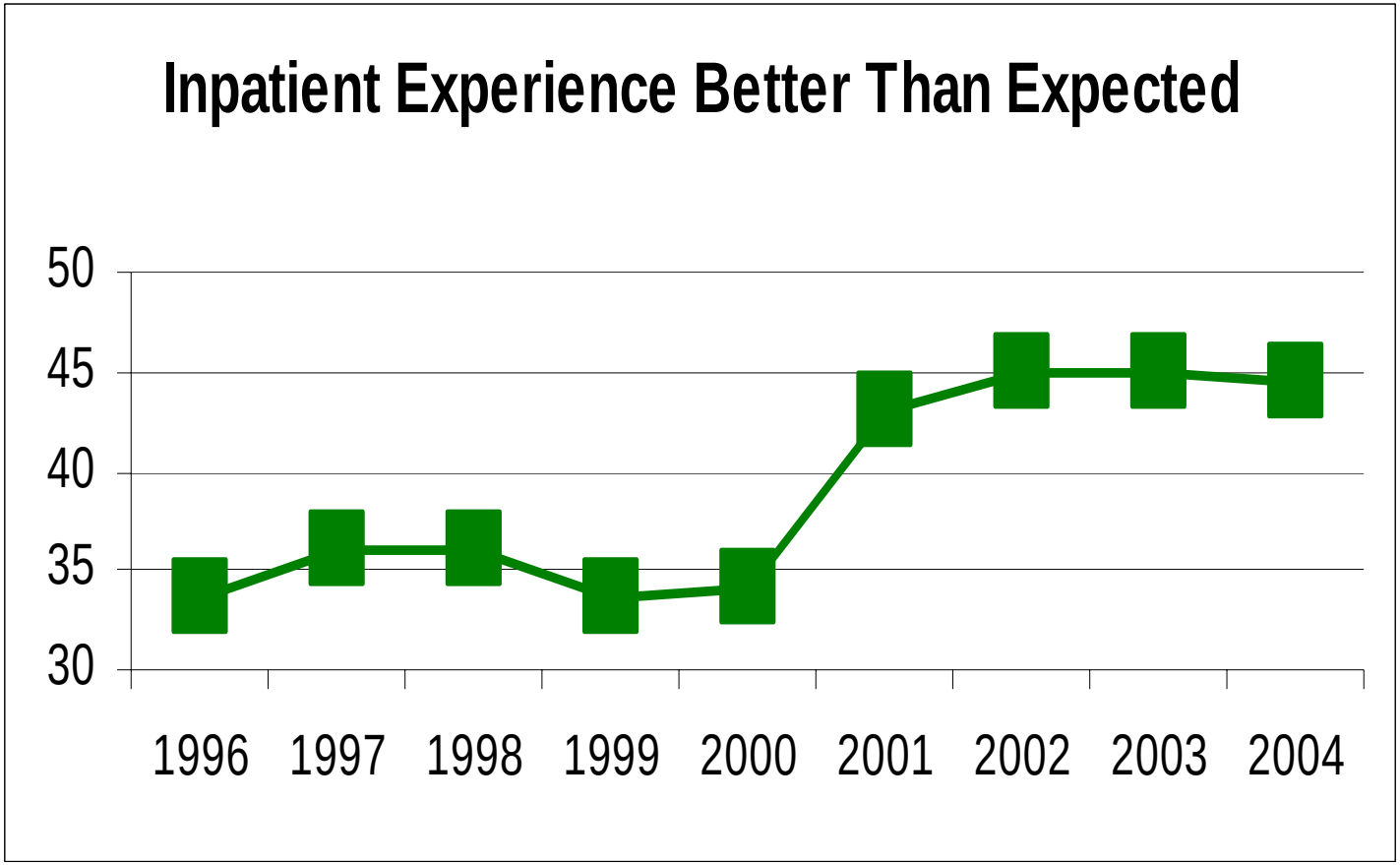
Bronson Methodist

Selected Data: Physician Satisfaction



Bronson Methodist

Selected Data: Patient Satisfaction



Bronson Methodist

Selected Data: Built Environment

- Patient room features rated high
- Positive correlation/key measures
- Enables high quality of care

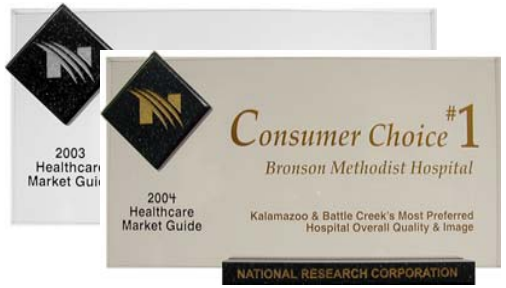
Bronson Methodist

Selected Data: Staff Productivity

- RNs in GMU walk more
- Design differences are plausible explanation

Bronson Methodist

Performance Results



FORTUNE® 100 BEST COMPANIES TO WORK FOR 2004

WORKING MOTHER 100 BEST COMPANIES 2003

WORKING MOTHER 2004 100 BEST COMPANIES

FORTUNE® 100 BEST COMPANIES TO WORK FOR 2005

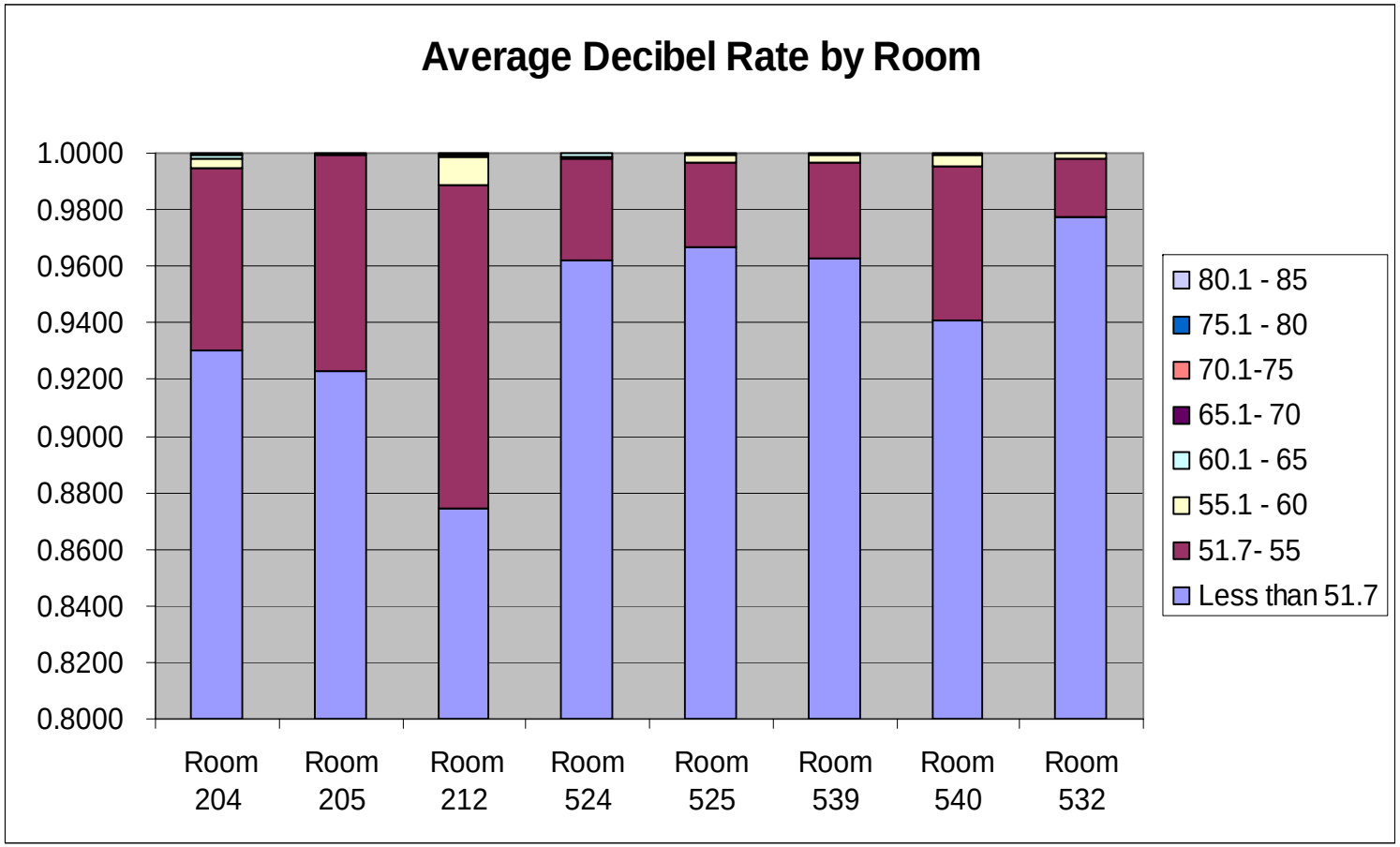
HOSPITALS for a HEALTHY ENVIRONMENT™

WEST MICHIGAN'S 101 BEST AND BRIGHTEST COMPANIES TO WORK FOR WINNER 2003

MICHIGAN QUALITY COUNCIL 2001 LEADERSHIP AWARD RECIPIENT

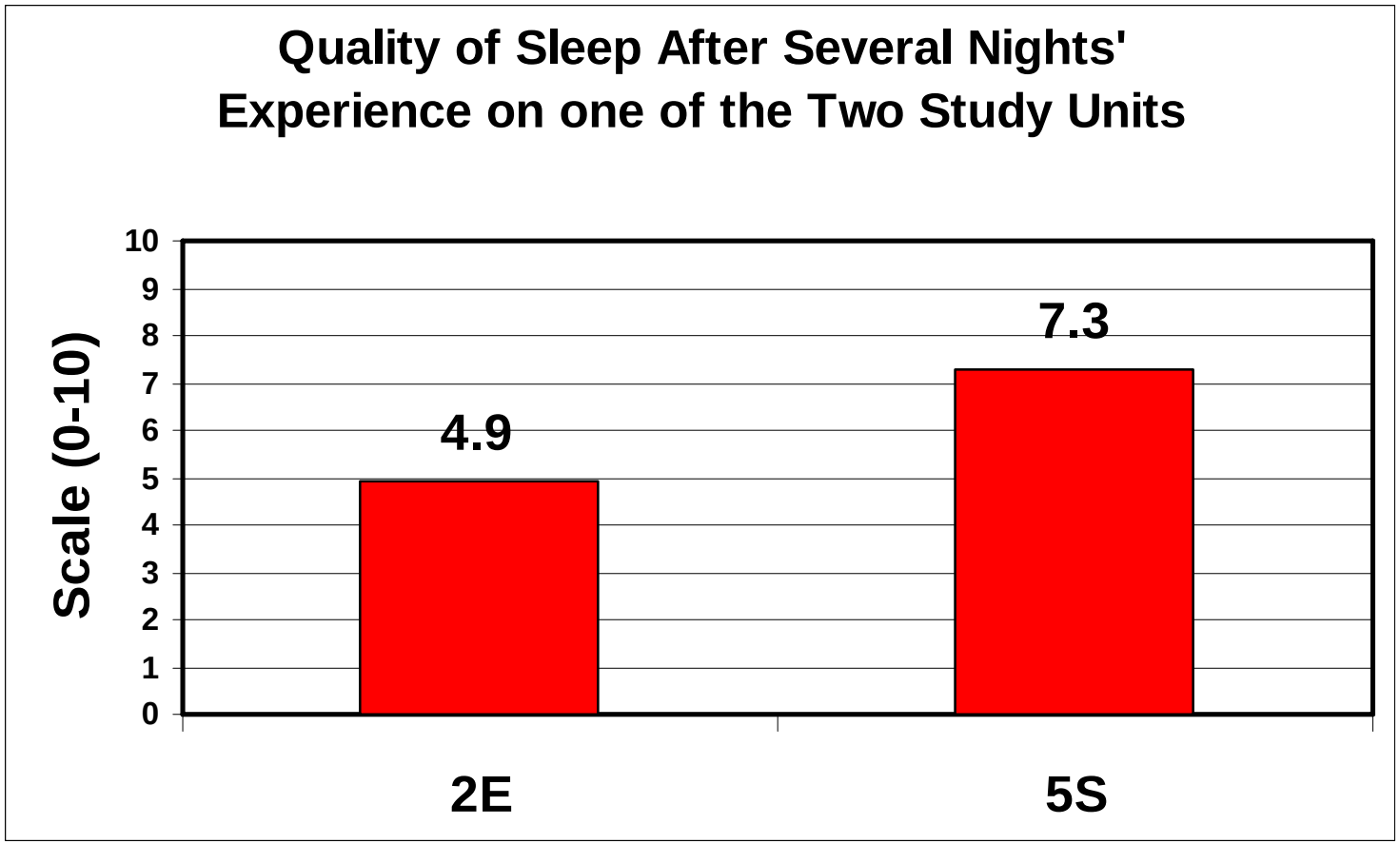
HEALTHGRADES™ THE HEALTHCARE QUALITY EXPERTS™

St. Alphonsus
Selected Data: Noise



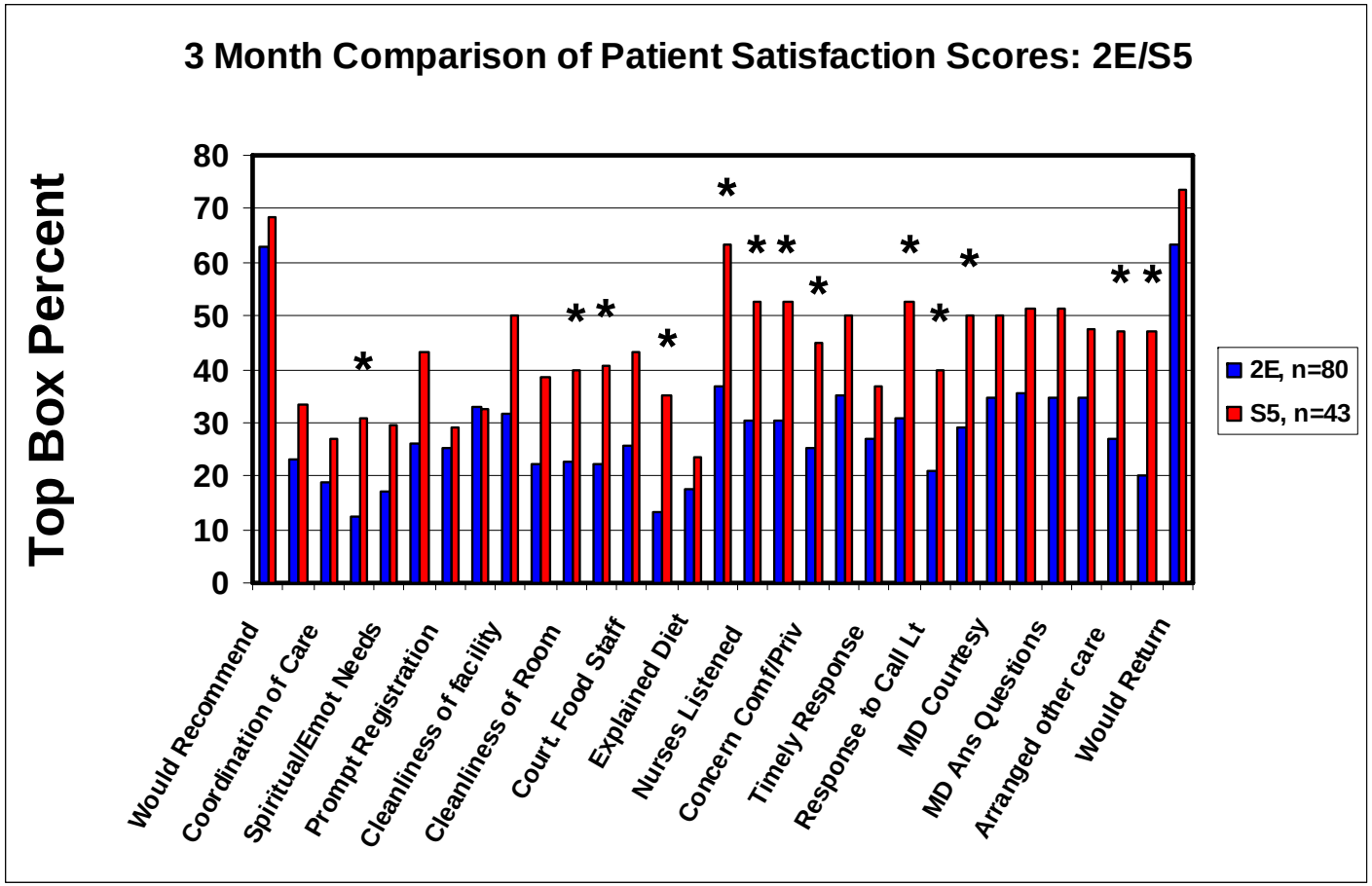
St. Alphonsus

Selected Data: Sleep Quality



St. Alphonsus

Selected Data: Satisfaction



Palomar Pomerado Health & The Center for Health Design

A Collaboration

The ‘Fable Hospital’

The ‘Fable’ Hospital

How much does a better building cost?

To answer that, we invented
The Fable Hospital.

Based on Pebbles’ measured experience using
Evidence Based Design (EBD).

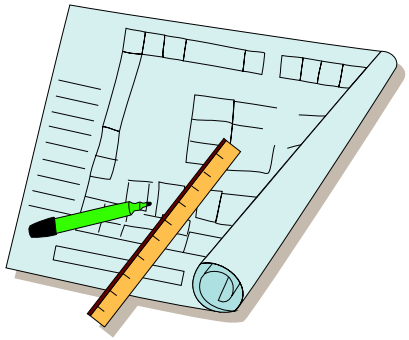
Unusual Culture

- Obsessed with quality and safety
- Driven by values
- Patient focused
- Family friendly
- A good corporate citizen
- Determined to be eco-sensitive
- Willing to benchmark
- Want to be held accountable

CONCEPTS
NEEDS

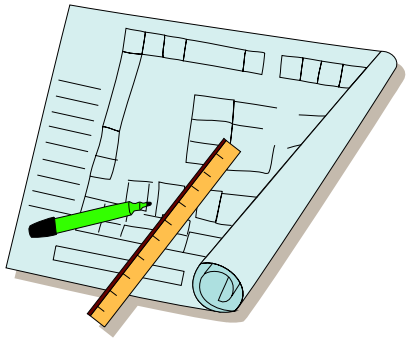
Design Features

- Oversized, windowed, single rooms
- Variable acuity rooms
- Decentralized, barrier-free nursing stations
- Computerized order entry, bar code, PDAs
- Additional hand-washing facilities
- HEPA filters



Design Features, cont'd

- Double-door bathroom access
- Healing art, music, and gardens
- Consultation spaces
- Patient education center
- Staff support facilities



The ‘Fable’ Hospital

- 300-bed regional medical center
- Urban site
- $240 M replacement facility
- Values: quality, safety, patients, families, staff, cost, value, community responsibility

The ‘Fable’ Hospital

Detailed Construction Cost Estimates

Example

Changes	Additional Cost	Calculations
Larger private patient rooms	$4,717,500	Based on an assumption of an increase of 100 square feet for each of 255 single patient rooms. Fifteen percent of the beds (45) are in an ICU configuration:

+ $12 Million

(5% of project cost)

The ‘Fable’ Hospital

Savings & Revenue

Example

Evidence	Savings	Calculations
Patient Falls: Reduced	$2,452,800	Patient falls are common and can cause significant harm. Falls result from patient instability, confusion, unfamiliar surroundings, lack of assistance, poor lighting, and slippery surfaces. The national unlitigated average cost of a fall is $10,000 (Hendrich 1995); litigated falls can cost in the millions. Like many other hospitals, Fable is self-insured due to the high cost of malpractice insurance. The cost of patient falls goes directly to the bottom line. The national median rate of acute-care falls is 3.5 falls/1,000 patient days and this is the rate experienced by Fable’s predecessor hospital. Fable reduced patient falls by 80% by locating toilets closer to the patient, putting double doors on bathrooms, utilizing bed exit features that notify a nurse when a patient is out of bed, decentralizing nursing stations, and locating supplies close by to reduce the amount of time the nurse is away from the patient. Fable’s reduced patient fall rate is the same as that experienced by Pebble partner Clarian Health Partners Methodist Hospital, Indianapolis (Hendrich, Bender, Nyhuis 2003; Flynn 2003). Savings: 300 beds at 80% occupancy = 240 beds = 87,600 patient days / 1000 x 3.5 = 306 falls/yr x $10,000 = $3,066,000. Reduced by 80% = savings of $2,452,800.[1]

The ‘Fable’ Hospital

Savings & Revenue

(One-Year Savings)

Fewer Patient Falls	**$2,452,800** *(- 80%)*
Fewer Patient Transfers	**$3,893,200** *(- 80%)*
Fewer Nosocomial Infections	**$80,640** *(- 4/m)*
Reduced Nurse Turnover	**$164,000** *(- 14%-10%)*
Reduced Drug Cost	**$1,216,666** *(- 5%)*
	Total Cost Savings: $7,807,306

The ‘Fable’ Hospital

Savings & Revenue

(One-Year Revenue Gains)

Market Share Increase	**$2,168,100**
Increased Philanthropy	**$1,500,000**
	Total Revenue Gain: $3,668,100

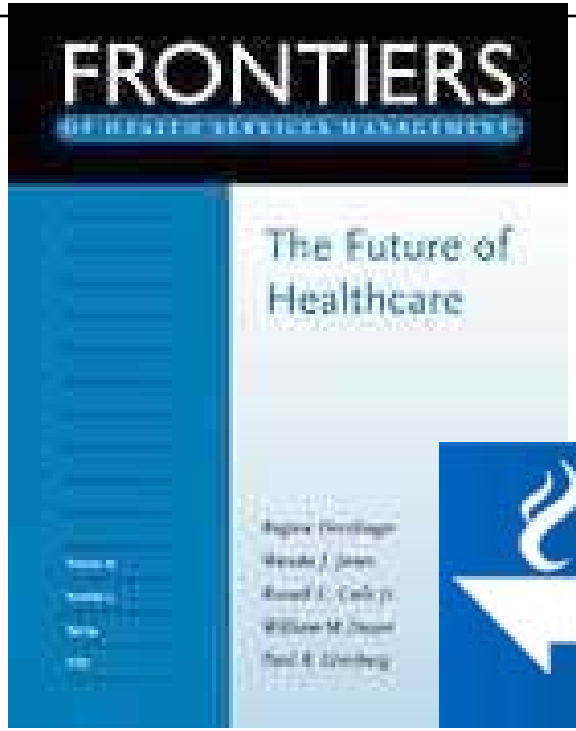
+ Total One-Year Savings: $7,807,306
Total : $11,475,406

The ‘Fable’ Hospital

Cost avoidance savings alone, if invested at 3% for 30 years, would pay the capital costs of the hospital many times over.

How many of our 43 million uninsured citizens would this cover?

Fall 2004 Issue



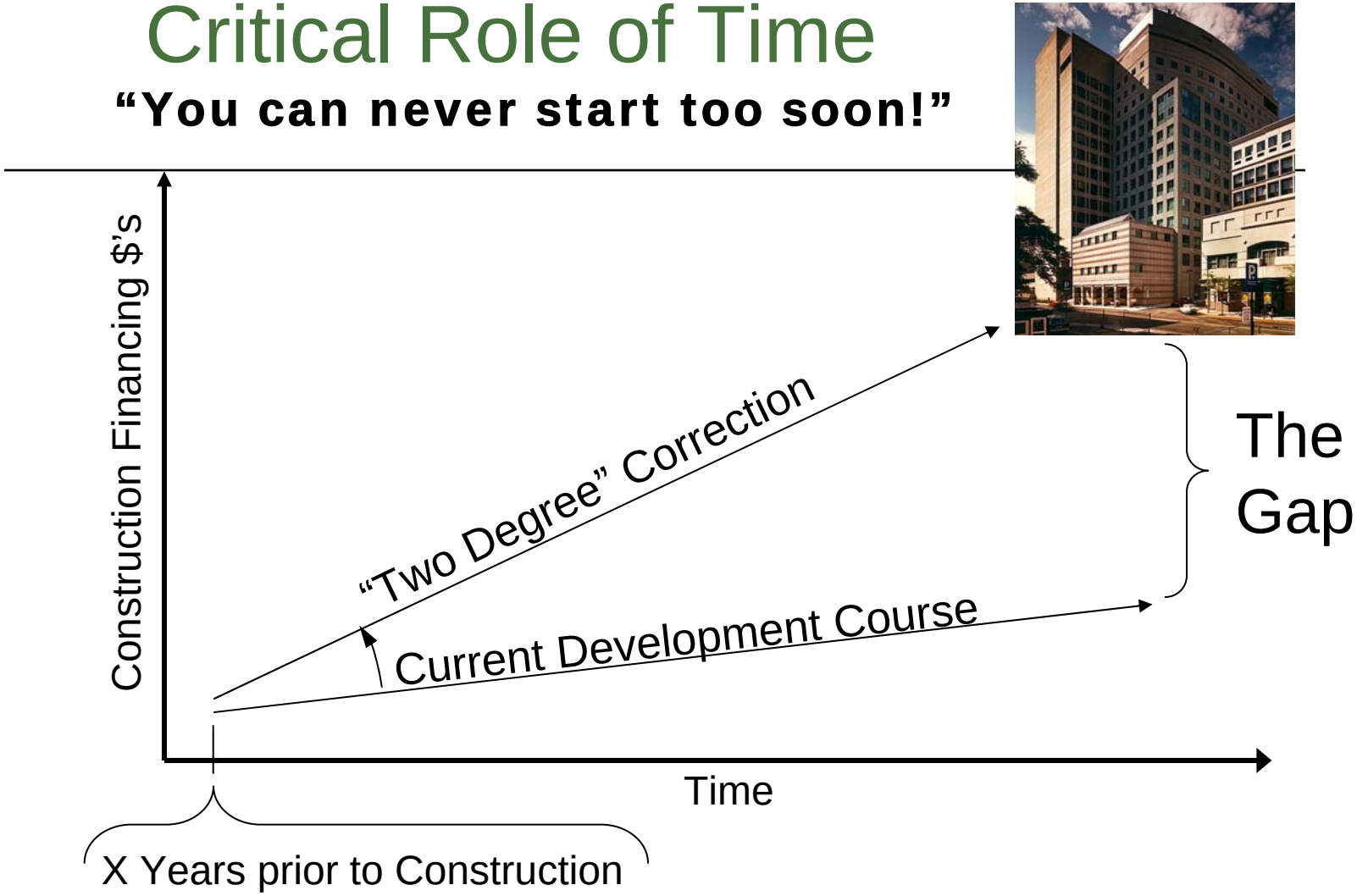
www.ache.org

AmericanCollege of HealthcareExecutives
for leaders who care®

www.healthdesign.org

Critical Role of Time

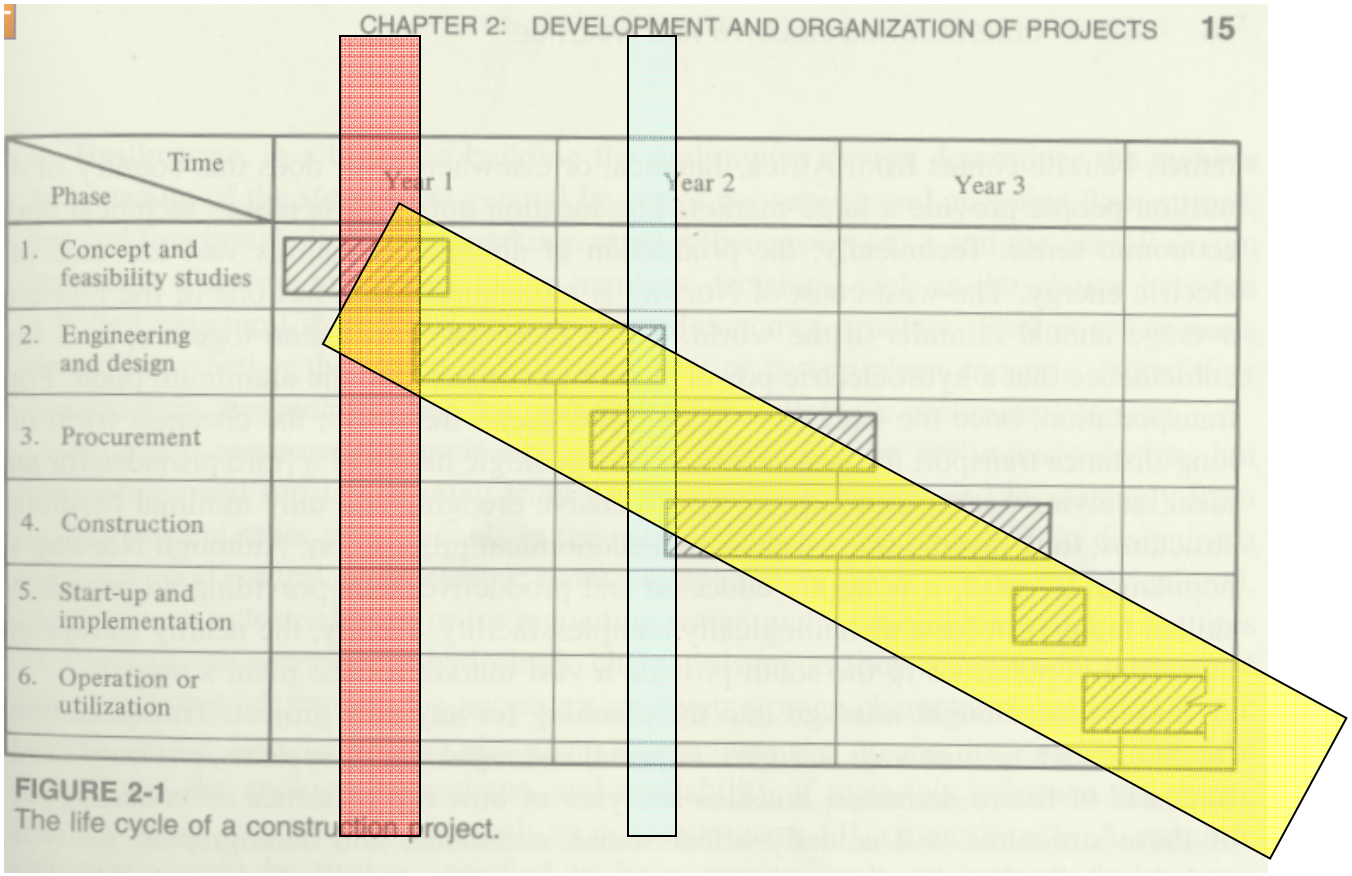
"You can never start too soon!"



The Process Perspective

- Process is the key to success
  - Better processes make better buildings
- Many “process maps” in the industry
  - Good but not perfect
- Role of client is crucial
  - “Be the best client you can be”
- Crucial phase: Project Planning (PP)
  - Our target: A PP guide for clients and their project partners

Process timeline



Crucial phases: PP VE Commissioning

High level process maps

	Initiating	Planning	Executing	Controlling	Close
Project Integration Management	Develop Project Charter Develop Preliminary Project Scope	Develop Project Management Plan	Direct and Manage Project Execution	Monitor and Control Work Integrated Change Control	Close Project
Project Scope Management		Scope Planning Scope Definition Create WBS		Scope Verification Scope Control	
Project Time Management		Activity Definition Activity Sequencing Activity Resource Estimating Activity Duration Estimating Schedule Development		Schedule Control	
Project Cost Management		Cost Estimating Cost Budgeting		Cost Control	
Project Quality Management		Quality Planning	Perform Quality Assurance	Perform Quality Control	
Project HR Management		Human Resource Planning	Acquire Project Team Develop Project Team	Manage Project Team	
Project Communications Management		Communications Planning	Information Distribution	Performance Reporting Manage Stakeholders	
Project Risk Management		Risk Management Planning Risk Identification Qualitative Risk Analysis Quantitative Risk Analysis Risk Response Planning		Risk Monitoring and Control	
12. Project Procurement Management		Plan Purchases and Acquisitions Plan Contracting	Request Seller Responses Select Seller	Contract Administration	Contract Closure

Figure 1: Chart of Process Groups and Knowledge Areas (2004 PMBOK®)

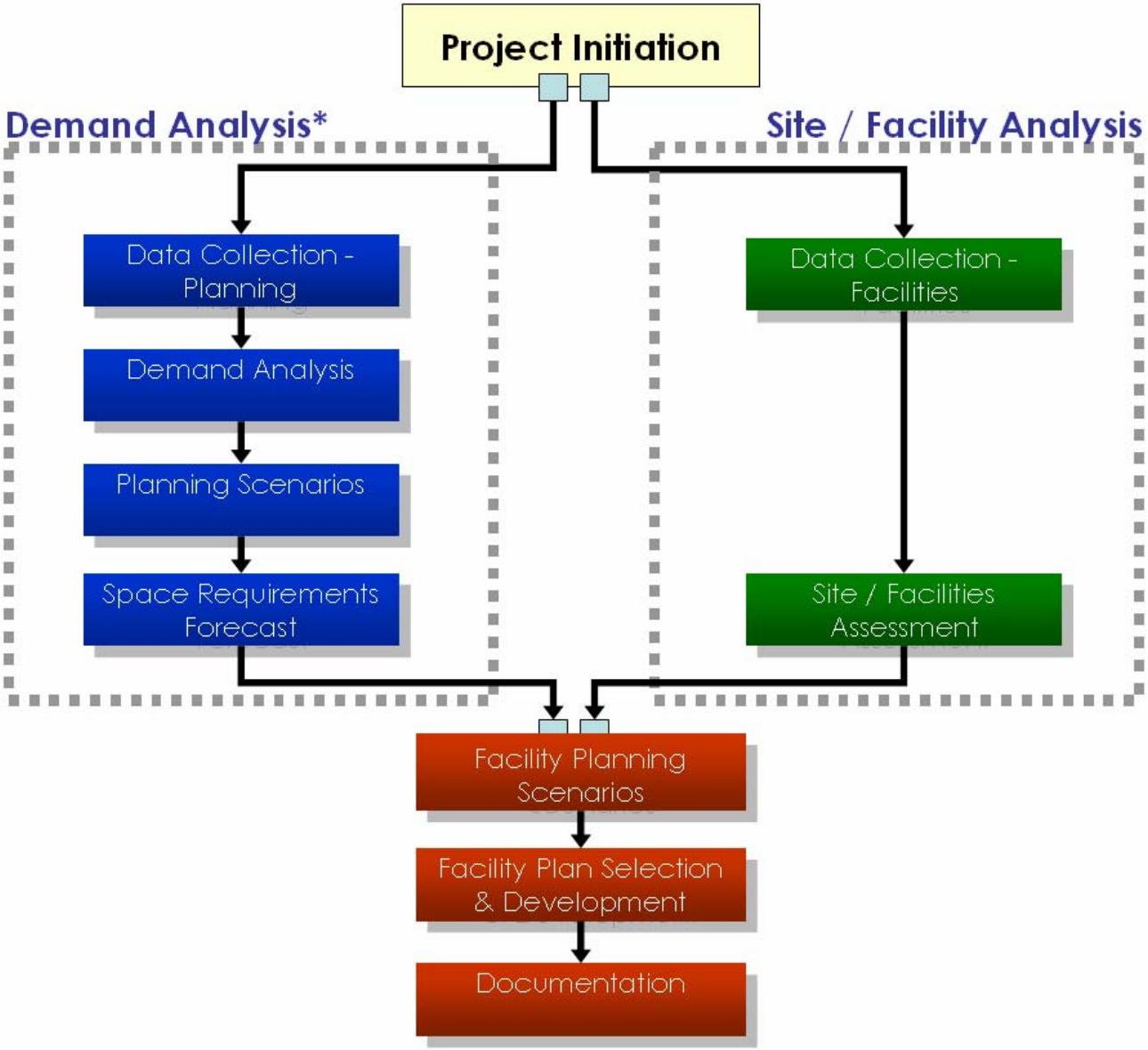
An process example (DoD)

Health Facilities Planning Agency (HFPA)
Pre-Planning Process

Health Facilities Planning Agency (HFPA) Pre-Planning Process

- “Master Planning”
  - Building a road map to provide guidance towards a final solution
  - Not static, fluid document
  - Revised every 3-5 yrs (or when major change occurs)
  - Creates better requirements, thus better projects
- “Project Books”
  - Project Specific
  - MIL-Handbook 1191 criteria

Master Planning



MILCON Process Overview

Programming Process – Project Books

Project Book (PB) summarizes existing site conditions and utilities, including the following **minimum** information as defined in the MIL-Handbook 1191

- completed site survey
- area maps
- location maps,
- site location
- site description
- style of architecture
- construction season limitations
- seismic, wind and snow considerations
- status of forces agreement (SOFA) issues
- host country agreements
- soil and foundation conditions
- utility conditions (water, sewer, power, steam, electrical
- site restrictions
- site security
- restrictions, the National Capital Planning Commission (NCPC).
- security and anti-terrorism considerations
- communications considerations
- **Etc. → see 1191 for complete list of minimum requirements**

What can we do better?

More client control upstream
Push choice of solutions downstream

How?

Better capture of client needs
Better control over the process (PP)

The Process Planning Guide

- An overview of trends in project management, with emphasis on empowering the client in the PP phase
  - Strengths and weaknesses
  - Best practices, milestones, document formats
- Highlights of performance based building in general
  - How can the EBD knowledge base be infused
- What do current team technologies offer?
  - Communities, portals, etc
- What do current KM technologies offer?
  - Maximize the ROI of the EBD knowledge base
- Populate the PP phase with structured tools
  - Outcomes of recent academic research

Target audience of the PP guide

- Offered to clients and the community at large
- Proliferation of best practices
- Stresses owner responsibilities and interventions
  - Seamless integration in current processes
  - Upfront establishment of needs and values
  - Strong integration with commissioning

Measures of success will be the ability to:

Pull client control upstream

Push choice of solutions downstream

What You Might Do Now

- Create a Project Plan
- Clinic Models
- Create design drivers
- Start a Transformational Collaboration process
- Create RFQs

How can we best support your project?