Evidence of Transformation: Complexity, Culture and Caring

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Learning Objectives

- Define the application of complexity science to healthcare and patient care work environments.

- Identify Relationship Based Care strategies to transform care delivery and professional practice through an understanding of complexity science and complex adaptive systems.

- Suggest advanced statistical methods to advance understanding and measure the multiple theoretical components and outcomes that emerge, evolve and adapt in a work environment.
Objective #1:

Define and Apply Complexity Science to Healthcare and Work Environments
Why Complexity Science?

“Complexity science helps us to appreciate that there is a space between the ordered stable region and its opposite, the zone of chaos, disintegration, and anarchy, where we are far from agreement and certainty. It is in this “zone of complexity on the edge of disintegration” that promising approaches to complicated issues maybe be forthcoming.”

Lindberg 1998
Complexity Science

Chaos-1960’s

- System behavior which appears random and unpredictable, is actually deterministic and contains a hidden order.
- The emergence of chaos suggests that simple rules can lead to complex results

Complexity-1990’s

- Use by Biological Sciences, Physicists and Mathematicians
- Nonlinear interactive components with Unpredictable outcomes
- Emergent phenomena and continuous and discontinuous change

Complex Adaptive Systems (CAS)

- Adapt to a changing environment
- Evolves by random mutation and self-organization
- Individual agents act in ways that are not always totally predictable, One agent’s actions changes the context for other agents.
Complexity Attributes

- Interaction of elements
  - Unpredictability
  - Dynamic
  - Constant Energy Flow
  - Non-Linear
  - Turbulence
  - Attractor Behavior
  - Adaptive
  - Patterns
  - Self Organizing
  - Emergence
  - Feedback loops + and −
  - Information exchange Hi

- Agents
  - Hospitals
  - Patient Care Units
  - Multiple disciplines
  - Individual Staff
  - Patients
  - Membership overlaps

- Rules
  - Fuzzy boundaries
  - Internalized Rules
  - Instinctive
  - Not one leader or leaders
  - Competition and cooperation
Conceptual Model
Work Environment

Proposed Conceptual Model of Complex Adaptive Variables Influencing Work Environment Performance
Complexity and Turbulence

- In fluid dynamics, turbulent flow is characterized by chaotic, random behavior.
  - Admission, discharge and transfers on patient unit
  - Timing and randomness of patient care orders
  - Dramatic change in a single patient’s condition
Conceptual Model

Work Environment

Proposed Conceptual Model of Complex Adaptive Variables Influencing Work Environment Performance
Complexity and Self-Organization

- New, unexpected structures, patterns, properties or processes in a self-organizing system arise.

- Higher order behaviors from mutually interrelated parts occur without the guidance or influence of a single leader or outside source.
  - Cardiac Arrest
  - Shared Governance
  - Care delivery
Emergent phenomena seem to have a life of their own with their own rules, laws and possibilities unlike the lower components.

Emergence normally seen in a crisis when groups rise to an occasion and adapt to demands of the hour. The challenge is to cultivate creative, emergent behavior outside of crises.

- Primary Nursing Care Delivery
- Professional Practice
- Caring and Healing in all interactions
- Collaboration among teams
- Staff lead negotiation of conflict and code of behavior
Conceptual Model
Work Environment

Proposed Conceptual Model of Complex Adaptive Variables Influencing Work Environment Performance
Complexity and Attractors

• The evolution of a non-linear dynamical, complex system can be marked by a series of phases, each of which constrains the behavior of the system to be in consonance with a reigning attractor.

• Attractors keep complex social organizations stable in the face of change.
Objective #2:

Identify Relationship Based Care strategies to transform care delivery and professional practice through an understanding of complexity science and complex adaptive systems.
Complex System

- 2,395-bed major academic medical center

- Five major centers:
  - NYP/Cornell
  - NYP/Columbia
  - Morgan Stanley Children’s Hospital
  - NYP/Allen
  - Payne Whitney Westchester

- Two Ivy League medical institutions

- Rated #1 in New York City and #6 in Nation
Complex Setting

- **Columbia University Medical Center**
  - **Location:** Northern Manhattan
  - **Size:** 725 Beds
  - **Volume:** 60,000 Admissions
    - 120,000 Emergency visits
  - **Unions:** 1199 SEIU and NYSNA
  - **Scope:** Tertiary and Quaternary
    - Local, National and International
New York-Presbyterian Hospital:  
Columbia University Medical Center Clinical Specialties

- Medical
- Surgical
- Orthopedics
- Cardiovascular
- Neurology
- Neurosurgery
- Psychiatric
- Rehabilitation

- Oncology
- Transplant
- Geriatrics
- Infectious Disease
- Digestive Disease
- Vascular Care
- Women’s Health
Complexity Equilibrium
Columbia University Medical Center (2005)

- New Corporate Nursing and Hospital Leadership
- Nursing Governance: Centralized
- Nurse Manager/2 units; DON Vacancies
- Highly experienced nursing workforce
- Two employee unions (1199 and NYSNA)
- Medical Innovation
- CMS and JCAHO visits
- Care Delivery Model undefined
- Pre-Existing Corporate Satisfaction Initiatives
Complex Adaptive Strategy

- Implement Relationship Based Care and Shared Governance
- Complete rollout in 5 waves over 2.5 years
- “Breadth vs. Depth”
- Patient Care Director mentor/coach
- Director of Nursing lead and sustain each “wave”
- Primary focus was inpatient implementation
- Employee facilitators trained to imbed change agents
- Unit Practice Councils lead change and innovation
RBC and Complexity Attractors

- Caring and Healing Environment
- Leadership and Governance
- Behavioral norms and Teamwork
- Professional Nursing Practice
- Patient Care Delivery
- Resource Driven Care
- Outcomes Measurement
Simple Rules
Columbia University Medical Center (2008)

- Relationship Based Care Delivery
  - Way of being that focuses on relationships:
    - with patients
    - with colleagues
    - with self
- Caring and Healing Theoretical Model
- Shared Governance
Adaptive Programming

- Healthcare Environment Survey (Staff)
- RBC Introduction
- Unit Practice Council Selection and Orientation
- “Get Smart-er” Phase
- Work Complexity Assessment
- Caring Factor Survey (Patient)
- RBC Leader Practicum
- Reigniting the Spirit of Caring Facilitator Training
- Reigniting the Spirit of Caring
- Caring Factor Survey (Patient)
- Professional Practice Retreats (2009)
- Commitment to Care Retreats (for non-direct patient care staff)
Self-Organization

Patient Centered Care (PCC) Cabinet
COO; VP of Support Services and Patient Care Services; CUMC Directors; HR Support; PCC Specialists; C.O.L.E.

Coordination Council (CoorC)
Interdisciplinary Subcommittees: Caring And Healing; Communication; Education; Integration; Outcomes; Physician Relations; Service Support

Unit Practice Council (UPC)
Department Practice Council (DPC)
Staff govern practice, service, and quality

Wave I
June ‘06

Wave II
Jan. ‘07

Wave III
Sep. ‘07

Wave IV
Jan. ‘08

Wave V
Sept. ‘08
RBC Costs

- Consultant training, travel and status checks
- Staff education
  - Classroom rental space and meals
  - Training materials
- Staff backfill costs
- Patient and staff measurement
RBC Funding Strategies

- NYS BSN Training Reimbursement Grant
- Staffing and Management Vacancies
- Holding one budgeted RN position/unit/year
- Private and government grants
- Private Donors
- Employee Facilitators
Objective #3: Suggest advanced statistical methods to advance understanding and measure the multiple theoretical components and outcomes that emerge, evolve and adapt in a work environment.
Nursing Theoretical Concepts

Figure 1.

- **Shared Governance**
  - Kanter
  - Lashinger
  - Porter

- **Quality Improvement**
  - Berwick
  - Deming

- **Professional Practice**
  - Bannister

- **Research**
  - Donabedian
  - Stetler

- **Caring International Research Collaborative**
  - Nelson
  - Swanson
  - Watson

- **Primary Nursing**
  - Manthey
  - Felgen
Complexity and Empirical Testing

- Translates metaphor into empirical data

- Complexity measurement is difficult because complex adaptive systems are interdependent and evolve over time and require different types of analysis

- Complexity’s aura is not unlike the moth becoming mesmerized with the flame...care must be taken to assure methods are appropriate and results match intent.
Complex Analytic Methods

- Descriptive and Inferential Statistics
  - Patient Satisfaction (Press Ganey Scores/Caring Factor Survey)
  - Staff Satisfaction (Healthcare Environment Survey)
  - Work Complexity Analysis

- Principal Components Factor Analysis
  - Validation of Healthcare Environment Survey
  - Caring Factor Research Study
Work Environment Data Sets 2006-2009

- Healthcare Environment Survey
- Work Complexity Analysis
- Nursing Minimum Data Set
- Caring Factor Survey
- Press Ganey Patient Satisfaction Survey
- Quality Data (HAPU, Falls, Restraint Use)
- HR Data (Vacancy, Turnover, Overtime, Agency)
## Healthcare Environment Survey

### Positive Score > 4.0

<table>
<thead>
<tr>
<th>HES Variables</th>
<th>Wave I</th>
<th></th>
<th>Wave II</th>
<th></th>
<th>Wave III</th>
<th></th>
<th>Wave IV</th>
<th>Wave V</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>T3</td>
<td>Pre</td>
<td>Post</td>
<td>T3</td>
<td>Pre</td>
<td>Pre</td>
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<tr>
<td>Workload</td>
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<td>3.64</td>
<td>3.55</td>
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<td>3.70</td>
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<td>Staffing and Scheduling</td>
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<td>4.79</td>
<td>5.00</td>
<td>5.06</td>
<td>5.09</td>
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<td>4.98</td>
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<td>Nurse Leadership (executive)</td>
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<td>4.97</td>
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<tr>
<td>Intent to Stay</td>
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<td>5.01</td>
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<td>4.81</td>
<td>4.95</td>
<td>4.88</td>
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</table>

Note: Pre = Pre-Survey; Post = Post-Survey; T3 = T3-Survey
# Healthcare Environment Survey

## Positive Score >4.0

<table>
<thead>
<tr>
<th>HES Variables</th>
<th>Wave I</th>
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<tbody>
<tr>
<td></td>
<td>Pre</td>
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<td>T3</td>
<td>Pre</td>
<td>Post</td>
<td>T3</td>
<td>Pre</td>
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<td>Pre</td>
<td>Pre</td>
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<td>5.53</td>
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<td>4.95</td>
<td>4.83</td>
<td>4.56</td>
<td>4.67</td>
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</table>

**NOTE:** Post results for Wave III and IV not yet available.
## Healthcare Environment Survey

### Positive Score > 4.0

<table>
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<th>HES Variables</th>
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<th>Wave IV</th>
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<th>Wave V</th>
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<td>Post</td>
<td>T3</td>
<td>Pre</td>
<td>Post</td>
<td>T3</td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Pre</td>
<td></td>
<td></td>
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<tr>
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<td>5.22</td>
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<td>5.03</td>
<td>5.31</td>
<td>4.96</td>
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<tr>
<td>Relationship with M D</td>
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<td>4.98</td>
<td>4.90</td>
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<td>4.98</td>
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<td>4.41</td>
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<tr>
<td>Autonomy</td>
<td>4.71</td>
<td>4.66</td>
<td>4.54</td>
<td>4.82</td>
<td>4.78</td>
<td>4.86</td>
<td>4.72</td>
<td>4.64</td>
<td>4.74</td>
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<td>Distributive Justice</td>
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<td>3.95</td>
<td>4.17</td>
<td>4.20</td>
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<td>3.85</td>
<td>3.93</td>
<td>4.03</td>
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<tr>
<td>HES Total (all scales combined)</td>
<td>5.00</td>
<td>4.89</td>
<td>4.81</td>
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<td>5.02</td>
<td>4.85</td>
<td>4.72</td>
<td>5.13</td>
<td>4.76</td>
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</table>
HES Unit Based Report

Participative Management
Job Satisfaction
Dispositional Optimism
Intent to Stay
Promotional Opportunities
Pride in the Organization
Relationship with Nurses
Relationship with Coworkers
Staffing and Scheduling
Professional Patient Care
Executive Leadership
Healthcare Environment Total
Autonomy
Relationship with Physicians
Distributive Justice
Workload

Mean (average) Score (higher scores indicate greater satisfaction)

Wave, Pre or Post
- Pre, Wave I
- Post, Wave I

8HN, Role: Nurses
HES Unit Based Report - Support

Participative Management
Job Satisfaction
Dispositional Optimism
Intent to Stay
Promotional Opportunities
Pride in the Organization
Relationship with Nurses
Relationship with Coworkers
Staffing and Scheduling
Professional Patient Care
Executive Leadership
Healthcare Environment Total
Autonomy
Relationship with Physicians
Distributive Justice
Workload

Mean (average) Score (higher scores indicate greater satisfaction)

Wave, Pre or Post

8HN, Role: Support Staff

Pre, Wave I
Post, Wave I
Interdependence Influences on Professional Patient Care (Nurses)

Nelson Decision Making Grid (NDMG)©
2007

Primary Nursing Care (PNC)
- 8.6% of PNC is explained by SS
- 18.8% of PNC is explained by PNC
- 6.3% of PNC was explained by RCW

Staffing and Scheduling (SS)
- Dispositional Optimism (DO)
  - 3.3% of Auto is explained by DO
- Autonomy (Auto)
  - 26.7% of Auto is explained by PM
  - 15.0% of Auto is explained by WL
- Workload (WL)
  - Workload is explained by PM

Pride in Organization (PIO)
- 23.4% of PIO is explained by WL
- Relationship with Coworkers (RCW)
  - 11.4% of PIO is explained by PNC

Professional Patient Care (PPC)
- 25.1% of PPC is explained by EL
- Executive Leadership (EL)
  - 45.7% of PIO was explained by EL
- Distributive Justice (DJ)
  - 9.8% of PIO was explained by DJ

Participative Management (PM)
- 41.4% of Autonomy is explained by PM

Nelson Decision Making Grid (NDMG)©
2008

Executive Leadership (EL)
- 5.1% of PPC explained by EL
- Relationship with Coworkers
  - 2.3% of PIO was explained by RCW

Pride in Org (PIO)
- 2.2% of Auto was explained by PO

Distributive Justice (DJ)
- 9.9% of Auto is explained by WL
## Evolution of Attractors

### Explained Variance of Autonomy, Nurses only

<table>
<thead>
<tr>
<th>Wave</th>
<th>Participat Mgmnt</th>
<th>Workload</th>
<th>Rel MDs</th>
<th>Rel Cowkr</th>
<th>Prof. Growth</th>
<th>Exec Ldrs</th>
<th>Staff Sched</th>
<th>Explained variance</th>
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<td>5.4%</td>
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<td>37.9%</td>
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<td>0</td>
<td>0</td>
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<td>60.9%</td>
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<td>II – T3</td>
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<td>6.3%</td>
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<td>IV – Pre</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>49.4%</td>
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HES Adaptation and Feedback

- Profile of staff most likely to have improved HES scores over last three years:
  - Work on units 7GS or 6GN
  - Work the 8-hour evening shift
  - Are married, single, or domestically partnered
  - Age 40-49
  - Female
  - Has less than 20 years of unit, hospital, or nursing profession experience
  - Work between 36-40 hours per week
Healthcare Environment Survey

- **Autonomy**
  - **Unit manager** – most consistent predictor of autonomy
  
  - **Professional growth** emerged years two and three of RBC as a predictor of autonomy. Theory is that clarity of role and system helped nurses use what they were learning professionally to act fully within their role.

  - Dependence on **physician for autonomy** is either decreasing or disappearing altogether during the implementation of RBC as nurses evolve from “external” autonomy to “internal”.
Emerging Patterns

- 84% Primary Nurse known to each patient
- Meeting patients #1 goal (4.6/5.0)
- Advancing patient satisfaction
- Consecutive RN Shifts
- Staff huddles every shift
- Hourly patient rounding
- Weekly Unit Practice Council Meetings
- Staff led communication networks
- Unit and Visitor Welcome Guides
- Post-discharge phone calls
  - 90% of patients eligible for discharge call were contacted
- Unit-Based Quiet time and Yacker Trackers
  - 4.9 improvement in patient satisfaction
- RBC Website
Complexity and Feedback Loops

- **Human Resources**
  - Voluntary turnover rate ↓
  - Vacancy rate ↓
  - Caregiver satisfaction
  - Consecutive shifts
  - Core staff %
  - Overtime % ↓

- **Financial**
  - Total NHPPD ↑
  - ALOS ↓
  - CMI ↑

- **Quality Perception**
  - Patient satisfaction ↑
  - Discharge Call Manager
  - Hourly Rounding Stats

- **Clinical Quality**
  - Falls prevalence ↓
  - HAPU rate ↓
  - Infection rate ↓

- **Relationship Based Care**
  - Identification of Primary Nurse ↑
  - How well were patients’ needs met (1-5 Likert scale) ↑
  - Daily patient goal
## Emergence and Patient Satisfaction

<table>
<thead>
<tr>
<th>Question</th>
<th>BASELINE</th>
<th>May 2007 to April 2008 (n* = 4884)</th>
<th>May 2008 to June 2009 (n* = 6075)</th>
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<tbody>
<tr>
<td>Std Overall</td>
<td>80.8</td>
<td>81.4</td>
<td>82.8</td>
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<td>Std Nurses</td>
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<td>85.1</td>
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<td>Friendliness/courtesy of the nurses (^H)</td>
<td>88.8</td>
<td>89.5</td>
<td>90.2</td>
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<td>Promptness response to call (^H)</td>
<td>81.5</td>
<td>82.0</td>
<td>82.7</td>
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<tr>
<td>Nurses’ attitude toward requests</td>
<td>85.3</td>
<td>85.9</td>
<td>87.1</td>
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<tr>
<td>Attention to special/personal needs (^H)</td>
<td>82.7</td>
<td>83.8</td>
<td>85.0</td>
</tr>
<tr>
<td>Nurses kept you informed (^H)</td>
<td>82.0</td>
<td>82.6</td>
<td>83.9</td>
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<tr>
<td>Skill of the nurses</td>
<td>87.5</td>
<td>87.9</td>
<td>88.9</td>
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<tr>
<td>Staff concern for your privacy</td>
<td>82.5</td>
<td>83.1</td>
<td>84.7</td>
</tr>
<tr>
<td>How well your pain was controlled (^H)</td>
<td>83.6</td>
<td>84.0</td>
<td>85.3</td>
</tr>
<tr>
<td>Staff addressed emotional needs</td>
<td>78.9</td>
<td>79.7</td>
<td>81.2</td>
</tr>
<tr>
<td>Response concerns/complaints</td>
<td>77.5</td>
<td>78.4</td>
<td>79.9</td>
</tr>
<tr>
<td>Staff include decisions re:trtmt</td>
<td>80.6</td>
<td>81.0</td>
<td>82.3</td>
</tr>
<tr>
<td>Staff worked together care for you</td>
<td>85.5</td>
<td>86.0</td>
<td>87.6</td>
</tr>
<tr>
<td>Noise level in and around room (^H)</td>
<td>70.8</td>
<td>73.0</td>
<td>75.2</td>
</tr>
</tbody>
</table>

### KEY (for shading)
- Baseline (no color)
- Gain since Baseline (+0.5 - 1.0)
- Gain since Baseline (+1.0 - 2.0)
- Gain since Baseline (+2.0 - 3.0)
- Gain Since Baseline (> 3.0)

Note: * n = Response to Overall Question; \(^H\) = HCAHPS measures
Nonlinearity
Patient Satisfaction
(May 2006 – May 2009)

Patient Satisfaction in Nursing (May 2006 - May 2009)

Mean

Month

Std Overall
Std Nurses
Friendliness/courtesy of the nurses
Promptness response to call
Nurses' attitude toward requests
Attention to special/personal needs
Nurses kept you informed
Skill of the nurses
Staff concern for your privacy
How well your pain was controlled
Staff addressed emotional needs
Response concerns/complaints
Staff include decisions re:trtmnt
Staff worked together care for you
Noise level in and around room
Patterns: Patient Satisfaction in Nursing
(May 2006 – May 2009)
Patterns: Patient Satisfaction with Nursing
(May 2006 – May 2009)
Advanced Analytic Methods

- Structural Equation Modeling - Turbulence Modeling
- Hierarchical Linear Modeling - Turbulence and Patient Satisfaction
- Discrete Event Simulation - Patient Flow
- Social Network Analysis - CPOE
- Data Farming - Technology workflow
- Computational Modeling - “if...then” questions
  - Simulation to forecast staffing needs
  - Bar coding improvements
Hierarchical Linear Modeling

- Used in education analysis and school systems
- Class of nested data at multiple levels such as patient, unit, hospital
- More advanced form of simple linear and multiple linear regressions.
- Models seen as generalizations of linear models but can extend to non-linear
- Can be used to separate change within one individual, within one unit or differences between individuals between units.
- Meshes an analytic theoretical model with natural structure of data
Structural Equation Modeling

- Building a structural equation model of change using:
  - Regression equations from each year reveal an “evolution of attractors”. As clarity of self, role, and system evolves through education, so does what employees pay attention to.
  
  - Identified demographics that influence change (interaction effects)
  
  - Create measurement models and test relationships between unobserved variables
  
  - Identify key factors (loadings) to understand relationship of unobserved variables to observed/measurable variables
Lessons Learned ~ RBC

- “Trust the process”
- RBC is an experience not education
- Transformational - Cultural - Emotional Shift
- Intractable Vision/Persistent Attention
- Patient Care Director articulated Expectations
- Caring cannot be required; it must be genuine
- Inclusiveness and Collaboration
- Every decision and expenditure with RBC vision
- Wave V will be more effective than Wave I
- Ask the right questions-round-communicate-support
- Lead with your heart
Key Findings

- HES-Breadth and specificity of indicators provide the most meaningful information
  - Primary Nurses are the most proud of their organization and satisfied with workload
  - Primary Nursing was the top ranked variable every year of the study.
  - Primary nurses are evolving from an external to internal control of their work
  - Workload and perception of rewards improved over the three years, but remain the lowest scoring.
  - RNs on units with the most tasks to be delegated are least satisfied with workload
  - RNs who perceived themselves as most autonomous were those with the best manager relationship and least frustrated with workload
Key Findings

- **WCA and NMMDS** - Complexity of care, delegation and work allocation are important to assess in maximizing use of roles.

- **CFS** - Most satisfied patients are cared for by the least satisfied nurses.
Next Steps

- Continue RSC Training
- Implement Leadership Training for RN’s
- Continue implementation of Department Councils (Admitting, Social Work, Respiratory Transport)
- Continue Coordination Council with UPC/Committee Quarterly Reports
- Lead implementation on other 4 campuses at NYP
Research Plans

- Continue Caring Research (Nelson, Persky)
- HES Staff Satisfaction Research (Nelson, Persky)
- Emlogis Predictive Staffing Model (Clancy, Persky)
- Turbulence and Patient Satisfaction (Persky, Bakken)
- Heart Math Stress Conditioning (Rizzo, Persky, Browning)
Questions?