Managing by Prediction

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Workshop Session A7/B7
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SVP, Quality, Safety and Transformation

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AVP, Patient Safety

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SVP, Medical Operations
523 Bed Medical Center
Admissions/Year – 32,981
900,000 outpatient visits
$143 million externally funded research
$ 1.3 billion dollar endowment

12,000+ employees
Surgical Procedures – 31,000 cases (20% Inpt)
17% average annual growth over past decade
National /International partnerships and affiliates
Core Business strategy at Cincinnati Children’s

- **Research**-Conduct research to generate new knowledge that changes the paradigm-

- **Quality Improvement**-Reliably apply new and past knowledge (evidence) to transform outcomes
Strategic Commitment to Transform Outcomes, Experience and Value

1. Focus on large-scale, organizational changes

2. Goal setting for systems based on 100% performance and 0% defects

3. Emphasis on transparent processes for sharing successes and failures internally and externally with patients
Being the Best at Getting Better

- Focus on the outcomes
- Patients and families as Partners
- **Integration and alignment**
- Theory of knowledge, Building a learning system
- Respecting the science
- Capacity and capability
- Transparency and Trust
- Learning from other industries
- Prediction and management
- Executing with a sense of urgency
Alignment in complex set up

Role of Structures
Connecting the dots
Alignment

• Alignment:
  – Align measurement
  – Align strategy and accountability
  – Build improvement capability

• Integrate into daily work

• All strategic goals are part of each component of the organization with specific assignments and expectations down to the individual level
The Elements of Prediction

• **MEASURABILITY OF OUTCOME** – Will it be clear if the outcome happens or not?

• **VANTAGE** – Is the person making the prediction in a position to observe the predictions and context?

• **IMMINENCE** – Is the event to occur in the next week or years away? Is the prediction before the event?

• **CONTEXT** – Is the context clear to the person predicting?

• **PRE-INCIDENT INDICATORS (PINs)** – Are there detectable pre-incident indicators that will reliably occur before the outcome?

• **EXPERIENCE** – Does the predictor have experience with the specific topic involved?

• **COMPARABLE EVENTS** – Is it possible to study outcomes similar to the one being predicted?

• **OBJECTIVITY** – Is the person who is predicting objective enough to believe either outcome is possible?

• **INVESTMENT** – To what degree is the person predicting invested in the outcome?

• **REPLICABILITY** – Is it practical to test the exact issue being predicted in another situation?

• **KNOWLEDGE** – Does the person making the prediction have accurate knowledge of the topic? Is the knowledge relevant and accurate?

*The Gift of Fear and Other Survival Signals that Protect Us from Violence: Gavin De Becker, Dell Publishing, 1997*
Connecting the Dots

Putting it all together to achieve System Wide Transformation
One Example: Patient Safety
Managing by Prediction: Patient Safety
Journey to Reliability – The Next Zero

- **Optimized Outcomes**
  - $10^{-8}$ to $10^{-1}$

- **Human Factors Integration**
  - Intuitive design
  - Obvious to do the right thing
  - Impossible to do the wrong thing

- **Reliability Culture**
  - Core values & vertical integration
  - Behavior expectations for all
  - Hire for fit
  - Fair, just, and 200% accountability

- **Process Design**
  - Evidence-based best practice
  - Focus & Simplify
  - Tactical improvements (e.g. process bundles)
Sensitivity to Operations
Beyond reducing harm:
Moving toward Eliminating Harm
Characteristics of HRO’s

1. **Preoccupation with failure**
   Regarding small, inconsequential errors as a symptom that something is wrong; finding the half-event

2. **Sensitivity to operations**
   Paying attention to what’s happening on the front-line
   *Situation Awareness, Managing by Prediction*

3. **Reluctance to simplify**
   Encouraging diversity in experience, perspective, and opinion

4. **Commitment to resilience**
   Developing capabilities to detect, contain, and bounce-back from events that do occur

5. **Deference to expertise**
   Pushing decision making down and around to the person with the most related knowledge and expertise
What is Situation Awareness?

• Simple Definition:
  – Knowing what is going on around you.
  – Having a notion of what is important.
  – Anticipation of possible future consequences of the current situation.

*Dr. Mica Endsley (1995)*
Prediction: Patients at Immediate Risk

- PEWS $> 5$
- Family raises a concern
- Therapy unusual for this team
- "Watcher patient"
- Communication amongst team not adequate
Bedside Team
- Intern
- Bedside nurse

Microsystem Team
- Watchstander
- Senior Resident
- Watchstander
- PCF/Manager
- Attending

Organization Team
- MRT
- Safety Team (MPS and SOD) at 800, 1600 & 100

Family concerns
- High risk therapies
- PEWS>5
- Watcher
- Communication concern

Situation Awareness Model
- Reliable escalation of risk
- Rapid assessment and communication with primary team
Focused Prediction for Safety: Inpatient Unit

- Patients at Immediate Risk
- Staffing:
  - Form the team
  - Adequate numbers
  - Unfamiliarity
- Contingency Plans
- What if...?
Focused Prediction for Safety: Pharmacy

- Drug Shortages
- Unusual Therapies
- Chemotherapy Issues (Late starts)
- Staffing
Organization Huddle
Adopted from the US Navy

The Admirals’ Huddle on a Carrier Task Force
• Look Back
• Look Forward
• Identify and Solve Issues
Every morning at 9AM
Cincinnati Children’s version

- Organization Daily Safety Brief
  - 8:35 AM
- Department Huddles
  - 8:00 AM
- Unit-Clinic-Team Huddles
  - 6:30-7:45 AM
• **What Happened in the Previous 24 Hours?**

• **What’s Predicted for the Next 24 Hours?**

• **Issues Which Need Resolution.**
Departments Reporting Out on Daily Safety Brief

Employee Safety
Inpatient (Liberty too) and ICU’s
Surgery (Liberty too)
Emergency Department (Liberty too)
Outpatient
Psychiatry (A4C2 too)
Home Health Care
Pharmacy

Radiology
Family Relations
Laboratory
Infection Control
Supply Chain
Information Systems
Protective Services
Facilities
Others
Safety Focus: Operating Rooms

- Clear Plan for the Case
- Multiple Surgical Teams
- Staffing appropriate
- Equipment available and staff competent
- Contingency Plans (add-ons)
Situational Awareness in the Operating Room
Situational Awareness in Peri-Op Arena

- **Predict** – Event / Patient Specific Risks
  - “Huddles” each shift – Identify Situations at Risk
  - Nurses/Techs, Anesthesia, Leadership, Surgeons

- **Mitigate** - Team based solutions
  - Rounding with a purpose – update, mitigate
  - Provide resources

- **Escalate / Communicate** – System based solutions
  - Automatic increase in resources and help
  - Expected behavior, not sign of failure
Prediction

Situational Awareness Model
Peri-Operative Services

Prior Day S.A. Huddle Predict Risk

- Team concerns
  - Correct RN/Tech Team
  - Correct Anesthesiologist Team
  - Experienced Surgical Team
  - Other Situations
- Equipment Concerns
  - New or Unfamiliar Equipment
  - Competencies in Use/Setup
  - Loaner/Trial Equipment
  - Unique supplies/trays

Day of Surgery and Intra-Operative Risk

- Risk Changing Actions
  - Massive Blood Replacement
  - Respiratory Distress
  - Cardiac Arrhythmia
  - Operative Procedure Change With upgraded risk

- Team Changes
  - Anesthesia, RN, Surgeon
- Late Room Status
  - Anesthesia Change
  - Surgeon Change
- Equipment
  - Non Function of Equipment
  - New Equipment Introduced in mid-operation

Escalation To Leadership Of Peri-Op Services

- CONTACT PCF or FRONT DESK RN
- If Unresolved or Progressive
  - ESCALATE CONCERN TO SURGICAL SAFETY OFFICER OF THE DAY

- Reliable Escalation of Risk
- Rapid Reassessment and Communication
- Reassess Prior to Beginning cases
Risk Model : EMR Prediction

• Past History / Known Diagnosis
  – Congenital Anomalies
  – NICU experience
  – Co-Morbidities – Cardiopulmonary, DM, Neuro, Obesity,

• Past Experience in Institution
  – Prior Surgery
  – Airway management difficulties

• Prior Risk Incidents
  – SSI, ICU Admission, Anesthesia Experience
Risk Prediction Model

- Previous SSI
- Previous Critical Care Stay
- Anesthesia Pre-Screen/Consult conducted
- Prior return to ED

- At least one Complex Chronic Condition (Neuromuscular, Cardiovascular, Respiratory, etc)
- Morbid Obesity

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>MRN</th>
<th>Procedure Date</th>
<th>Previous SSI</th>
<th>Previous Critical Care</th>
<th>Previous Anesthesia Consult</th>
<th>Previous Anesthesia Screen</th>
<th>CCC Score</th>
<th>ED Days Prior</th>
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<tr>
<td></td>
<td>11/29/2011</td>
<td></td>
<td>1</td>
<td>No</td>
<td>Yes, Last Stay: 11/23/2011</td>
<td>No</td>
<td>No</td>
<td>1</td>
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</table>

Surgeon(s): 1)  
Procedure(s): 1) MLB W/ BALLOON DILATION  
Med Hx: ANTERIOR GLOTTIC WEB OF LARYNX >>> Previous Discharge Dx: 11/23/2011 - 1) CONGENITAL WEB OF LARYNX; 2) STENOSIS OF LARYNX; 3) ATTENTION TO TRACHEOSTOMY; 4) ESOPHAGEAL REFLUX  
Allergies: OTHER - Dairy products cause constipation., Reaction: Constipation  
Anes Comments: need optical instruments for poss granulation tissue removal  
Epic Problem List: TRACHEOSTOMY STATUS; GERD (GASTROESOPHAGEAL REFLUX DISEASE); CONGENITAL LARYNGEAL WEB; SUBGLOTTIC STENOSIS; VASCULAR RING, AORTA; ADENOTONSILLAR HYPERTROPHY  
Previous Patient Experience Issues: international patient ; Hebrew
• **Green** - is all **CLEAR**, patient prepared and verified

• **Yellow** - is “WATCH ROOM”, notes elevated risk factors for patient safety identified. Proceed with caution. Communicate possible additional needs to PCF.

• **Orange** - is “HIGH ALERT” risk for patient vulnerability during the perioperative process. Requires additional resources and/or support from identified perioperative expert.

• **Red** - is the highest indicator which requires “HARD STOP” until the perioperative safety communication system has resolved the identified threat.

### Classification of Cases – 30,700 Patients

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<thead>
<tr>
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<th>Green</th>
<th>Yellow</th>
<th>Orange</th>
<th>Red</th>
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<tbody>
<tr>
<td>Cases</td>
<td>30,314</td>
<td>329</td>
<td>36</td>
<td>21</td>
</tr>
</tbody>
</table>
Distribution of Cases in Mix

- Otolaryngology – 12,000
- Pediatric Surgery – 4,100
- Neurosurgery - 525
- Orthopedic Surgery – 2,500
- Cardiac Surgery - 360
- Urology – 3,000
- Plastic Surgery - 825
- Others (dental, Gyn, GI, Pulm) – 8,000
Case Details

• **Green**
  – Routine Cases

• **Yellow (1 %)**
  – Re-Do Cardiac Surgery, Transplantation

• **Orange (0.12 %)**
  – Intraoperative Change in Status

• **Red (0.07%)**
  – Equipment Dysfunction
  – Multi-Service Pre-Operative planning
  – Intraoperative Deterioration
Situational Awareness Model

- **Prediction of Risk**
  - Intrinsic Patient Factors
  - Risk of Procedure
  - Experience of Team
  - Equipment
  - Work Environment
  - Risk Report

- **Plan for Mitigation**
  - OR Staffing Models
  - Anesthesia Staffing
  - OR Team Composition
  - Just in Time Training
  - Environmental Assessment-Case Mix

- **Color Coded Risk**

- **Structured Response Level (1-3)**
Mitigation Planning

- **Reactive** – Depend on individuals to think their way through problems on the scene
- **Predictive** – Plan in advance for potential risks

- *A carefully thought out plan developed in advance is nearly always better then a sudden decision made in the midst of an urgent situation.*
Risk Mitigation

• Round with Purpose
  – Structured time based – risk based attention

• Ask Questions . but . Ask the Right Questions
  – Update predictions – concerns, unexpected outcomes or changes
  – What are you worried about, resources met

• Focus on Safety Behaviors we believe will translate into better safer care – (the little stuff)

• Structured Escalation – Doesn’t require someone to ask for Help
Risk Escalation / Communication

• Definition of a “Great Nurse / Doc” is no longer based on “work-arounds” and “solo-saviors” - emphasis now on getting the right assistance / team for safest care

• $\uparrow$ Risk $\leftrightarrow$ Automatic $\uparrow$ staff / support in room

• Skill level $\uparrow$ with escalation
  – Not just more people, more of the right people

• Build Plans for anticipated risks in advance (advanced prediction = considered plan)
Safety Lessons we have Learned

• We were not clear about “Mission”
  – It is more then “Be a Safe Surgical Team”
• We were not clear about Expected Behaviors
  – Line Item Detail – ALL Providers (Not just RN’s)
• We were not clear on Execution
  – Unclear roles, role modeling
• We are still defining Personal Accountability
  – Violation of clear rule vs system problem
  – Blame-free culture vs required responsibility
  – No Exceptions
Leadership in Improvement

• **Them** – M.D’s, R.N.’s, OR Techs, Residents

• **Summary Knowledge** – Experience, pitfalls
  – Know where improvement work most improvement!

• **Positional Power** – As health care team leaders, we affect other’s mood and attitude toward improvement efforts. Possess a “Red Card”

• **Future Leaders** – Need to constructively re-define the obligations of leadership “**Them**” is Us!
  – Role modeling – define and support change
  – Embed safety culture in our daily work
  – Innovative Thinking – Every Day Safer

• **It’s about the Patients** – pretty simple
Prediction – Capacity Management


A4N: % Correct Discharge Predictions

Same Day Predictions (Early Discharges Included*)

% Correct

Desired direction of change:

Week of, Number of Predictions

*Patient discharged earlier than predicted

% Correct Including Early
Baseline: Through September 30 2007
3 Sigma Control Limits
Prediction – Capacity Management

Discharge Prediction 10/2010-11/2011

Initiatives

• Prediction tied to RN shift
• Morning Bed Huddle Report
• Updated Prediction as day progresses
• Focus on Execution
• Failure Analysis
Prediction – Capacity Management


Managing Discharge to Prediction

% Correct Discharge Predictions
Same Day Predictions (Early Discharges Included)

% Correct, as of 7 am
% Correct, updated within 2 hrs
Control Limits
ICU to Floor Transfer
Demand:Capacity Matching

Patients Waiting More than 2 hours* for a Transfer from the ICU to a Unit
Population: All Inpatients transferred from BCC or BHI** to another unit

% of Patients

Month

- Actual %
- Center Line
- Control Limits
- Goal

James M. Anderson Center for Health Systems Excellence

*100% of data being calculated. CICU & PICU are included together.
System Wide Delays

Percent of Patients Delayed
(Includes ED, PACU, and PICU*)

Desired Direction of Change

65%

28%
**Weekly Critical Flow Failures**

**Flow System Failure**
- "Holds" in the ED
- Patients staying overnight in the PACU
- Times PICU bed not immediately available for Urgent Use
- Delayed or canceled surgery because of bed capacity
- Patients who remain in an ICU bed longer than medically necessary because an appropriate bed is not available

**Placement Failures**
- Psychiatry patients placed anywhere outside of their primary unit
- Hem/Onc/BMT patients placed anywhere outside of their primary unit
- Transplant patients not on A4N
- Ventilated patients who are admitted to the ICU because a bed is not available on TCC

**Weekly Chart**
- **# of New Patient Failures**
- **Total # of Bed Days**
- **Week Beginning**
- **# of New Failures**
- **Total Failures (Bed Days)**
• **Getting to 85% Reliability**
  – Standardization, Decrease Variation
  – Evidence Based Care Pathways
  – “Bundles” of Care
  – Checklists
  – Scripted Behaviors (Handoffs)

• **Getting from 85% to 100%**
  – *High Reliability Organization*
    – Prediction of Future Risks
    – Mitigation / Communication Strategies
    – Resilience in face of adversity
    – Escalation to Experts
Situation Awareness: Identifying and Mitigating Experience Failures

Front Line Team
- Intern
- Bedside Nurse

Microsystem Team
- Watchstander Senior Resident/ Fellow
- Watchstander Charge Nurse/ Manager
- Attending/ Clinical Director

Organization Team
- Safety/ Experience Officer of the Day
- Family Relations

Disruptive/ complex family dynamics
- Poor/ declining prognosis
- Add-on/on-call for OR
- Lack of Communication/ availability with care team
- Complex Diagnosis
- Family concerns with Plan of Care

Rapid assessment and communication with primary team
Reliable escalation of risk

Family concerns with Plan of Care
Situation Awareness Process for Experience (Inpatient)

- 7:30 AM Unit Huddle
  - Unit staff predict patients/families at risk for a negative experience
- 8:00 AM Bed Huddle
  - Charge Nurses report predictions
- 8:30 AM Daily Safety Briefing
  - Family Relations report number of current concerns and current predictions
- Throughout Day
  - Patient/Family Advocates visit units to discuss/coach unit staff on mitigation plan
- 4:30 PM Bed Huddle
  - Charge Nurses report back and/or bring new predictions
Mitigation Strategies

• Proactive Rounding
• Clear communication of care plan
• Mitigating delays
• Proactive care interventions
Prediction Stories (Inpatient)

• 9 year old patient with complicated medical history and previous escalated concerns.
  
  • **Prediction:** With pending complicated procedure, family likely to be dissatisfied.
  • **Mitigation:** Plan involved a communication strategy for the Attending to explicitly address previous concern issues, staffing arranged for an experienced RN to minimize noise and extra trips to the room, and to communicate to parents a clear escalation plan should it be needed.

• Critical care patient, mother with documented mental health issues.
  
  • **Prediction:** Mother complains that staff not answering her questions, though staff repeatedly provide this information.
  • **Mitigation:** Initially, unit staff felt as though they could do nothing to change “mom’s reality.” Later developed a plan to journal mom’s questions and staff responses.
Alignment

• Alignment:
  – Align measurement
  – Align strategy and accountability
  – Build improvement capability

• Integrate into daily work

• All strategic goals are part of each component of the organization with specific assignments and expectations down to the individual level
Organizing For Transformation

- Board Oversight
  - Senior Leadership Focus
    - System-Wide Priorities
      - CSI Priorities
        - Division/microsystem-Based Priorities
          - Individual Priorities
Clinical Systems Improvement

- Provides strategic priority setting, resource allocation, organizational alignment
- Serves as champions/coaches to the Clinical Systems Improvement Teams and Sub-teams
- The Clinical System Improvement reports to the Patient Care Committee of the Board

Board/Michael Fisher’s Leadership Team

- Comprised of Patient Services, Faculty, Administrative and Community Physician Leadership
- Develops, reviews & acts on System Level Measures

Clinical System Improvement Integrating Team

- Develop, monitor & act on a dashboard of measures

Microsystems: Monitor & act on a dashboard of measures

Clinical & Non-Clinical Support Processes

Components:
- Inpatient Team
- Outpatient Team
- ED Team
- Peri-Op Team
- Home Care Team
- Mental Health Team
- Patient/Family

Mental Health Team

Outpatient Team

Inpatient Team

ED Team

Peri-Op Team

Home Care Team
Capability vs Capacity

• **Improvement Capability**
  – An *individual’s* knowledge & skill to design improvement initiatives to achieve measurable results & the ability to execute (i.e. develop, test, measure & implement changes) improvement efforts & sustain results.

• **Improvement Capacity**
  – An *organization’s resources* which enable it to initiate & sustain a transformation effort. This includes capable individuals but also structures, processes, infrastructure including quality experts & measurement experts.
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<tr>
<th>Leverage Point</th>
<th>Target Audience</th>
<th>Competencies</th>
<th>CCHMC Target Categories</th>
<th>CCHMC Interventions</th>
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<tbody>
<tr>
<td><strong>Macrosystem</strong></td>
<td>Sr. Leaders (e.g. CEO, Sr. VPs, VPs)</td>
<td>Lead the whole system based on Deming’s System of Profound Knowledge</td>
<td>Approximately 28 Sr VPs &amp; VPs</td>
<td>Intermediate Improvement Science Series (I2S2)</td>
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<tr>
<td>CCHMC (Whole System)</td>
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<tr>
<td><strong>Mesosystem</strong></td>
<td>CSI Leaders • MD Division Heads • Asst VPs • Directors/Sr. Directors • Strategic Improvement Project Team Leaders</td>
<td>• Lead strategic improvement teams/complex/cross-functional projects to get results • Articulate the role of dept/unit/division as a sub-system that is interdependent part of larger system of CCHMC • Coach others to do improvement publications • Disseminate results via external presentations &amp; prof journals</td>
<td>Dept. Heads/Division Heads, VP’s, AVP’s, selected MD’s, Sr. Directors, Directors (includes typically M3-M5 – approx. 380 people +) (Includes selected APN’s &amp; some Clinical Directors)</td>
<td>• Intermediate Improvement Science Series (I2S2) • JIT coaching and continued use of I2S2 learning while developing a portfolio of projects • Advanced Improvement Methods (AIM) for faculty focused on publication • Quality Scholars Program for young faculty with leadership aspirations</td>
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<tr>
<td>Clinical Systems</td>
<td>Improvement {CSI} site of care teams and medical &amp; surgical divisions</td>
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<tr>
<td><strong>Microsystem</strong></td>
<td>• Clinical managers • Lead MDs</td>
<td>• Lead small teams/narrow scoped projects in a small microsystem &amp; get results • Lead microsystem efforts to remove defects &amp; waste from processes of daily work • Effectively participate in cross-functional &amp; strategic improvement teams • Successfully complete a narrow-scoped project &amp; get results</td>
<td>Includes all clinical &amp; nonclinical front-line supervisors &amp; managers typically in the M1 &amp; M2 bands-approx. 250 people) (Includes Clinical Managers, Supervisors, Leads, Coordinators, Lead APN’s, CNS’s, Care Managers when appropriate, Clinical Directors or at the next level &amp; “Faculty-Routine QI activities”: (~200)</td>
<td>• Rapid Cycle Improvement Collaborative (RCIC) &amp; compressed team leader course • JIT coaching while participating in a QI project by I2S2 graduate, QIC, etc.</td>
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<tr>
<td>Department units, clinics, ORs, etc.</td>
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<td><strong>Individual Contributors</strong></td>
<td>All front-line, non-management staff</td>
<td>• Engage in the improvement of daily work • Effectively participate in improvement teams</td>
<td>Includes APN’s, RN’s all attending physicians (~400), residents and fellows;medical, nursing &amp; allied health students</td>
<td>On-line courses: • Intro to Quality • Intro to Measurement</td>
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<tr>
<td>Front Line Improvers</td>
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Thank You

• Questions?

• Comments?

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To learn more about our work visit:

www.cincinnatichildrens.org/andersoncenter