Conflict of Interest

Charles G Macias MD, MPH

has no real or apparent conflicts of interest to report.
Learning Objectives

• Identify gaps in the care delivery process
• Define a strategy for managing populations with evidence-based practices and data management
• Discuss the development of evidence-based shared baselines of care
• Describe the use of near-time and real-time data to improve outcomes of care

• Value of Health IT
  – Satisfaction: patient experience
  – Treatment/clinical standards and care process delivery for populations
  – Electronic data/ data and predictive analytics
  – Patient education and self-empowerment
  – Savings: reducing the per capita cost of care
Respiratory Challenge: Case Illustration

• 14 month old girl with a viral prodrome but no history of asthma/prior episode of breathing difficulty, cough for one day; eczematous rash

• Coarse wheezing heard (R) but crying loudly; RR of 66

What do we really know to inform action that is highly meaningful for this family?
Families, providers, and payers want value. Thus, quality is key driver.
Illustrating the Problem

- RCT of treatment of hypertension on the jobsite (a steel mill) versus referral to the PCP
- No difference in compliance between the groups
- Exploration of factors relating to therapy revealed specific determinants of the clinical decision to treat some, but not other, hypertensive patients:
  1. The level of diastolic blood pressure.
  2. The patient’s age.
  3. ????
  4. The amount of target-organ damage.
Illustrating the Problem

- RCT of treatment of hypertension on the jobsite (a steel mill) versus referral to the PCP
- No difference in compliance between the groups
- Exploration of factors relating to therapy revealed specific determinants of the clinical decision to treat some, but not other, hypertensive patients:
  1. The level of diastolic blood pressure.
  2. The patient’s age.
  3. The year the physician graduated from medical school.
  4. The amount of target-organ damage.
Minimizing Variation

• Wide variations in practice are often not related to differences among patients

• Minimizing variations in practice can improve quality of health care delivery:
  – Variation in beliefs
  – Variation in interpretation of evidence
  – Variation in response when evidence is lacking
What About the Children? Are they seeing variable outcomes?
Is indicated care being delivered for children in outpatient settings?

- Acute medical problems: 67.6%
- Chronic medical conditions: 53.4%
- Preventative care: 40.7%
- Preventative services for adolescents: 34.5%

<50% are children receiving high quality care
Variability in pediatrics

- Among 16 hospitals treating children
- Indicators of quality (e.g. chest radiograph, laboratory blood work, antibiotics, breathing treatments, IV placement)
- Large variations in practices were NOT explained by severity of illness

Source: Variability in inpatient management of children hospitalized with bronchiolitis, Macias et al. Academic Pediatrics 2015
Measuring outcomes is critical to knowing a system has achieved the triple aim.

Improving care with a population health approach
Creating a Foundation for Improving Outcomes

SOURCE SYSTEMS (e.g. EMR, Financial, Costing, Patient Satisfaction)
Creating a Foundation for Improving Outcomes

Evidence Based Guidelines and Order sets, Clinical Decision Support, patient and provider materials

Improved Outcomes from high quality of care

CLINICAL SCIENCE
Evidence and best practice

SOURCE SYSTEMS (e.g. EMR, Financial, Costing, Patient Satisfaction)
Creating a Foundation for Improving Outcomes

**ANALYTICAL SYSTEM**
Data analytics and collaborative data

**SOURCE SYSTEMS** (e.g. EMR, Financial, Costing, Patient Satisfaction)

**Informatics, Electronic Data Warehousing**

**Improved Outcomes from high quality of care**
Creating a Foundation for Improving Outcomes

SOURCE SYSTEMS (e.g. EMR, Financial, Costing, Patient Satisfaction)

Advanced Quality Improvement course, QI curriculum, Care process teams

Improved Outcomes from high quality of care

OPERATIONAL IMPROVEMENT TEAMS
Creating a Foundation for Improving Outcomes

Improved Outcomes from high quality of care

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SOURCE SYSTEMS (e.g. EMR, Financial, Costing, Patient Satisfaction)
Creating a Foundation for Improving Outcomes

Patient centric outcomes and institutional outcomes achieved

Informatics, Electronic Data Warehousing

Advanced Quality Improvement course, QI curriculum, Care process teams

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Improved Outcomes from high quality of care

ANALYTICAL SYSTEM
Data analytics and collaborative data

OPERATIONAL IMPROVEMENT TEAMS

CLINICAL SCIENCE
Evidence and best practice

SOURCE SYSTEMS (e.g. EMR, Financial, Costing, Patient Satisfaction)
Improving care with a population health approach
Improving care with a population health approach
Improving care with a population health approach
Creating a Foundation for Improving Outcomes

DATA ANALYTICS AND COLLABORATIVE DATA<br>
Improved Outcomes from high quality of care

CLINICAL SCIENCE<br>
Evidence and best practice

SOURCE SYSTEMS (e.g. EMR, Financial, Costing, Patient Satisfaction)

Evidence Based Guidelines and Order sets, Clinical Decision Support, patient and provider materials
Goal: To increase evidence based care delivery by (a relative) 40% for the most common diseases treated at TCH within 2 years.

Aim: To improve the outcomes of children treated by Texas Children’s through evidence based practice.

Clinical Effectiveness Key Driver Diagram

Key Drivers:
- ↑ Evidence based guideline/summary development and culture
- Create a system for Clinical Decision Support
- Deploy a metrics/scorecard system
- Create a data analytics and translation platform (EDW)
- Integrate financial systems to EBGs

Change Strategies:

* Providers:
  - Integrate educational initiatives (e.g., rounds, noon lectures)
  - Create and teach evidence based courses and engage participation (e.g., EBG course offerings, fellow boot camp)
* Operations leaders:
  - Utilize EBG career development through implementation strategies (e.g., pathways)
  - Become exemplar in the state and nationally for EBP
* Quality leaders:
  - Engage in national initiatives to drive TCH as an EBP derivation and implementation exemplar (e.g., CHAT, CHC, AAP)

Evidence Based Outcomes Center:
- Model decision support tools for high mortality, high mortality, high variation processes of care
- Create infrastructure

Evidence Based Outcome Competency Center:
- Providers:
  - Create disease-specific balanced scorecards through CCO
  - Link scorecards to cascaded competencies
- Operations leaders:
  - Utilize metrics development methodologies to create sector/division scorecards/products
  - Create governance for standardization of metrics throughout the enterprise

Evidence Based Outcome Competency Center:
- Providers:
  - Create governance for data analytics and predictive analytics use
  - Engage disease-specific care improvement teams to utilize a combination of EHR and population health IS
  - Select EDW bridges to enhance and integrate EHR registries, care process teams, and organizational dashboards (e.g., CQI)
  - Build predictive analytics models through CDS
- Operations leaders:
  - Participate in integrated tools development (e.g., APR, 386 calculator)
  - Link regulatory/financial incentives to CPEs

Evidence Based Outcome Competency Center:
- Providers:
  - Integrate clinical tools on a collection
  - Create clinically relevant dashboards for identification systems
- Operations leaders:
  - Participate in integrated tools development (e.g., APR, 386 calculator)
  - Link regulatory/financial incentives to CPEs
We utilize a systematic development for “Clinical Standards”

1. Identify the quality problem/gaps: mortality, resource consumption, variability, prevalence
2. Search for existing guidelines and assess their applicability
3. Assemble a group of stakeholders (bottom up, never top down)
4. Identify the Patient Intervention Comparison Outcomes (PICO) questions
5. Search the evidence
6. Evaluate the evidence using an evidence rating AND recommendation rating tool
7. Vet with stakeholders
8. Once approved, build into Epic with consider for clinical decision support
Shared baselines: Evidence Based Outcomes Center

We are nimble with multiple clinical standards products

- Full guidelines, 34
- Evidence summaries, 18
- Approved summaries, 47
Creating a Foundation for Improving Outcomes

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Improved Outcomes from high quality of care
TCH’s EDW Architecture

- **Administrative Sources** (e.g. API Time Tracking)
- **Financial Sources** (e.g. EPSi)
- **Departmental Sources** (e.g. Sunquest Labs)
- **Patient Satisfaction Sources** (e.g. NRC Picker, PeopleSoft)
- **EMR Source** (e.g. Epic)

**Common, Linkable Vocabulary; Late binding**

- **Clinical**
  - Asthma
  - Appendectomy
  - Deliveries
  - Pneumonia
  - Diabetes
  - Surgery
  - Neonatal dz
  - Transplant

- **Operations**
  - Labor productivity
  - Radiology
  - Practice Mgmt
  - Financials
  - Patient Satisfaction
  - + others

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Source: Adapted with permission from Health Catalyst © 2015
Creating a Foundation for Improving Outcomes

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Improved Outcomes from high quality of care
Avenues for Dissemination

**QUALITY LEADERS**

- National Programs and Partnerships

**ADVANCED**

- *Classroom* (e.g. AQI Program, Six Sigma Green Belt)
  *Project Required*

**INTERMEDIATE**

- *Online and Classroom* (e.g. IHI Educational Resources, PEDI 101, EQIPP, Fellows College)
  *Project Required*

**BEGINNER**

- *Online and Classroom* (e.g. Nursing IMPACT (QI Basics), IHI Educational Resources, Lean Awareness Training)

**NEW**

- *Classroom and Department* (e.g. New Employee Orientation, e-Learning, Unit/Department-based training)
Linking Science, Data Management, Operations

Permanent, integrated teams composed of clinicians, technologists, analysts and quality improvement personnel drive adoption of evidence-based medicine and achieve and sustain superior outcomes.

Source: Health Catalyst © 2015
Population Health approaches: permanent teams drive PDSA cycles
Quality? Only Through Measurement Will We Know...

• Population health
  – Health outcomes
  – Disease burden
  – Behavioral and psychological factors

• Experience of care
  – Patient/family satisfaction
  – IOM domains of quality

• Per capita cost of care
  – Total cost per person per disease
  – Hospital and ED utilization rate (cost)

Appendicitis across the continuum: a population health model

• Process mapping a patient through the health care infrastructure
• Recognizing clinically risk adjusted targets: simple versus complex appendicitis
• Increased postoperative simple order set adoption rates by 36% and postoperative complex order set adoption rates by 9%
Clinical standards: driving antibiotic monotherapy
Decreasing length of stay

![Graph showing decreasing length of stay](image)

- Weekly Mean LOS
- Before Intervention
- Transition
- After Intervention
Reduced cost of care

![Graph showing the average total variable direct cost over time with minimum and maximum values.](image-url)
Diabetes across the continuum: EC and Inpatient: Order Set Utilization

Revised Order Sets available May 1, 2014

% Pts with IP OS

Oct-13 Nov-13 Dec-13 Jan-14 Feb-14 Mar-14 Apr-14 May-14 Jun-14 Jul-14 Aug-14 Sep-14

83% 86% 89% 96% 90% 96% 96% 96% 97% 91% 86%
Insulin timeliness improved

% of patients receiving IV insulin within 1 hour following insulin order

Interventions:
- Verbal Stat order option in EC
- Beta-hydroxybutyrate point of care testing in EC
Decreasing Length of Stay

LOS from Triage to Discharge for the Hospital Account

- Days
- Count of Hospital Accounts

2013-12: 3.9
2014-01: 3.2
2014-02: 3.1
2014-03: 3.0
2014-04: 3.0
2014-05: 2.9
2014-06: 3.2
2014-07: 3.2
2014-08: 2.4
2014-09: 3.1
2014-10: 3.1
2014-11: 2.8
2014-12: 2.6

Hospital Accounts
LOS

CY - Month
Diabetes Education: Certified Diabetes Nurses and a New Diabetes Care Unit

80% of patient care experiences will be provided by the CDNs

DCU opened on 14WT March 17th
Identified serial Diabetic Ketoacidosis risk factors and patient geography

• Red pins = TC Health Plan patients with 2+ DKA visits within 12 months of each other

• Red targets = Zip codes with 5+ TC Health Plan encounters since 2010

• Black targets = Zip codes with 1+ TC Health Plan encounters since 2010
Predictive analytics and prescriptive analytics have contextual properties

Organizational Direction for Data

Improved outcomes for our patients and our enterprise

Organizational evolution over time

Data analytics
- Shortening event to reporting time
- Transforming data and translating to action

Predictive analytics
- Linking likelihood of outcomes to care decisions for populations
- Predicting financial outcomes
- Linking strategies across former silos in infrastructures

Prescriptive analytics
-- Integrating best evidence into delivery system infrastructures
- EMR based recommendations and alerts
- Integrated plans of care across continuums
- Utilizing big data bi-directionally
Asthma: EC: Early Administration of steroids
Inpatient: Prolonged LOS

- Evidence based approach to early medication weaning through a pathway
- 35% reduction in LOS
  - No change in 7 or 30 day readmission rate
  - No change in days of school/days of work missed
- Direct variable cost ($60/hr)
Across the Enterprise

Discharge per Quarter

Order Set Utilization
The Continuum: Improved Patient Experience and Outcomes

- Improved time to first beta agonist (ED or inpatient arrival)
- Increase chronic severity assessment
  - Improve accuracy
  - Increase appropriate controller prescriptions
  - Clinical decision support
- Increase influenza vaccination rate
- Increase number of culturally sensitive education encounters
- Increase number of social work/legal support encounters

- AAP use from 20% to 52%
- ACT use from 0% to 41%
- Severity classification from 10% to 54%
Transparency: Creating Dashboards

Asthma EBP/CSI Dashboard
Financial Conversations
**Predictive analytics for diabetes, appendicitis, epilepsy… aligned with clinical care goals and payment reform**

**Targets:** reduce ED visits, hospitalization, albuterol overuse, ICS non adherence  
Critical data source: TCHP, TDSHS data

### SHORT ACTING BETA AGONISTS
- 6 to 9 SABA = 1 point  
- ≥ 10 SABA = 2 points

### EC UTILIZATION
- 1-2 ER = 1 point  
- > 2 ER = 2 points

### HOSPITALIZATION
- 1 hospitalization = 1 point  
- ≥ 2 hospitalizations = 4 points

### NUMBER PRESCRIBING PROVIDERS
- ≥ 3 different prescribing providers in 12 months  
  one of above criteria met, add 1 point

### PRIMARY CARE VISITS
- Last PCP visit > 6 months + one of above criteria met =  
  add 1 point

### INHALED CORTICOSTERIOD
- ≥ 6 ICS low dose canister equivalent refills, subtract 1 point

**Targets:** reduce ED visits/ unscheduled PCP visits  
Critical data source: TCH ED, PCP

**Age 1-5**, 4 of 5 below
- Government insurance (Medicaid or CHIP): Q2 under health insurance information  
- Financial barrier to meds: Answered Yes to Q4 under health insurance information  
- Previous asthma hospitalization: Yes to Q2 under past history of asthma care  
- Chronic Severity: Mild persistent  
- Acute Severity: Mild

**Age 6+**
- All 3 of the following  
- Government insurance (Medicaid or CHIP): Q2 under health insurance information  
- Chronic Severity: Mild persistent  
- Acute Severity: Mild

- Or All 3 of the following  
- Government insurance (Medicaid or CHIP): Q2 under health insurance information  
- Exercise induced asthma: Answered yes to exercise page 3 of TEDAS.  
- Acute Severity: Mild
Population Health Approaches: The Permanent Care Process Teams

A gap strategy for 38 “registries” with Evidence Based Practice alignment
Respiratory Challenge, a Case illustration

• 14 month old girl with a viral prodrome but no history of asthma/prior episode of breathing difficulty with a one day history of cough; eczematous rash

• Coarse wheezing heard (R) but crying loudly; RR of 66

• Uncertainty of evidence
  – Best treatment, best advice?
Respiratory Challenge, a Case Illustration

• Uncertainty of evidence
  – Best treatment, best advice?
  – Continuums of care? Asthma?
Accountability and a Shared Vision
Using knowledge management within and across populations

Improved Outcomes from high quality of care

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Evidence and best practice

SOURCE SYSTEMS (e.g. EMR, Financial, Costing, Patient Satisfaction)
Improving outcomes for population health
Questions & Thank You

• Speaker contact information
  Charles G Macias MD, MPH
  Chief Clinical Systems Integration Officer
  Texas Children’s - Houston, Texas
  cgmacias@texaschildrens.org
Responsive.

Realizing Value. Transforming Health.