HUMEDICA
Defining Knowledge.

Anceta

CARILION CLINIC

Henry Ford Health System

How Care Teams Are Using Predictive Analytics and Comparative Data to Optimize Interventions for High-Risk Patients

October 4, 2012

AMGA Institute for Quality Leadership Annual Meeting

Presenters

- Humedica
  - Mary Lantin, MPH, Vice President of Client Services, Provider Markets
- AMGA's Anceta Collaborative
  - John Cuddeback, MD, PhD, Chief Medical Informatics Officer
- Carilion Clinic
  - Mary Colette Carver, FNP-C, PCMH Team & Research Coordinator
  - Stephen A. Morgan, MD, Vice President of Medical Informatics
  - Marcus Speaker, MD, Medical Informaticist, Carilion Clinic
- Henry Ford Health System
  - Richard Dryer, MD, CMO Primary Care
  - Cara Seguin, RN, MSN, Director, Center of Clinical Care Design

Today's Session

- Humedica's CHF predictive model
- Predictive model validation
- CHF challenges and barriers
- Putting predictive analytics to work
  - Carilion Clinic
  - Henry Ford Health System
- Q & A

How Does Humedica Help Providers?

Humedica is a clinical intelligence company that:

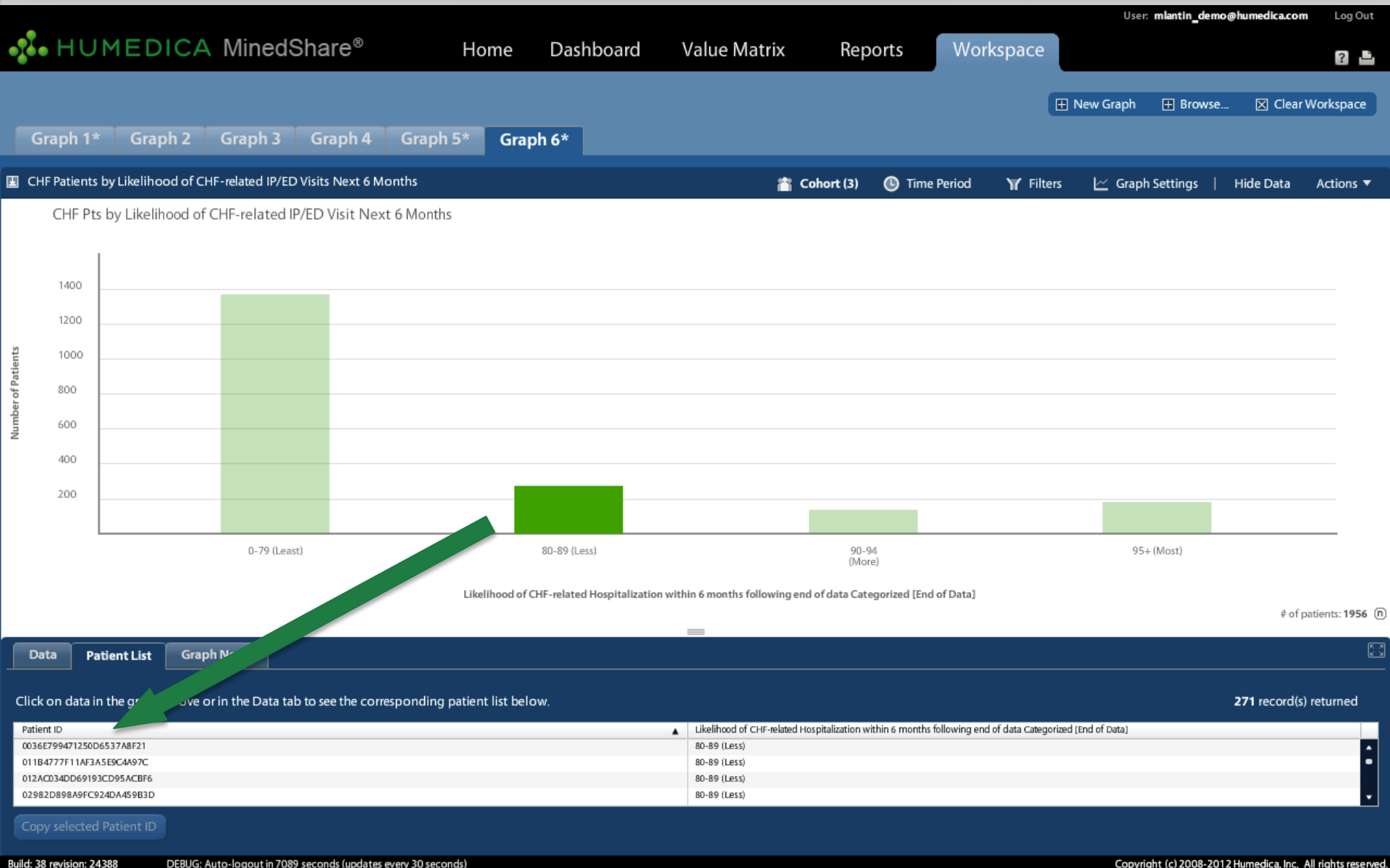
- ***Integrates and transforms*** clinical and claims data across the continuum
- Better ***predicts patients at-risk and reduces preventable cost*** through clinical risk factors
- Provides ***actionable*** insights

HUMEDICA

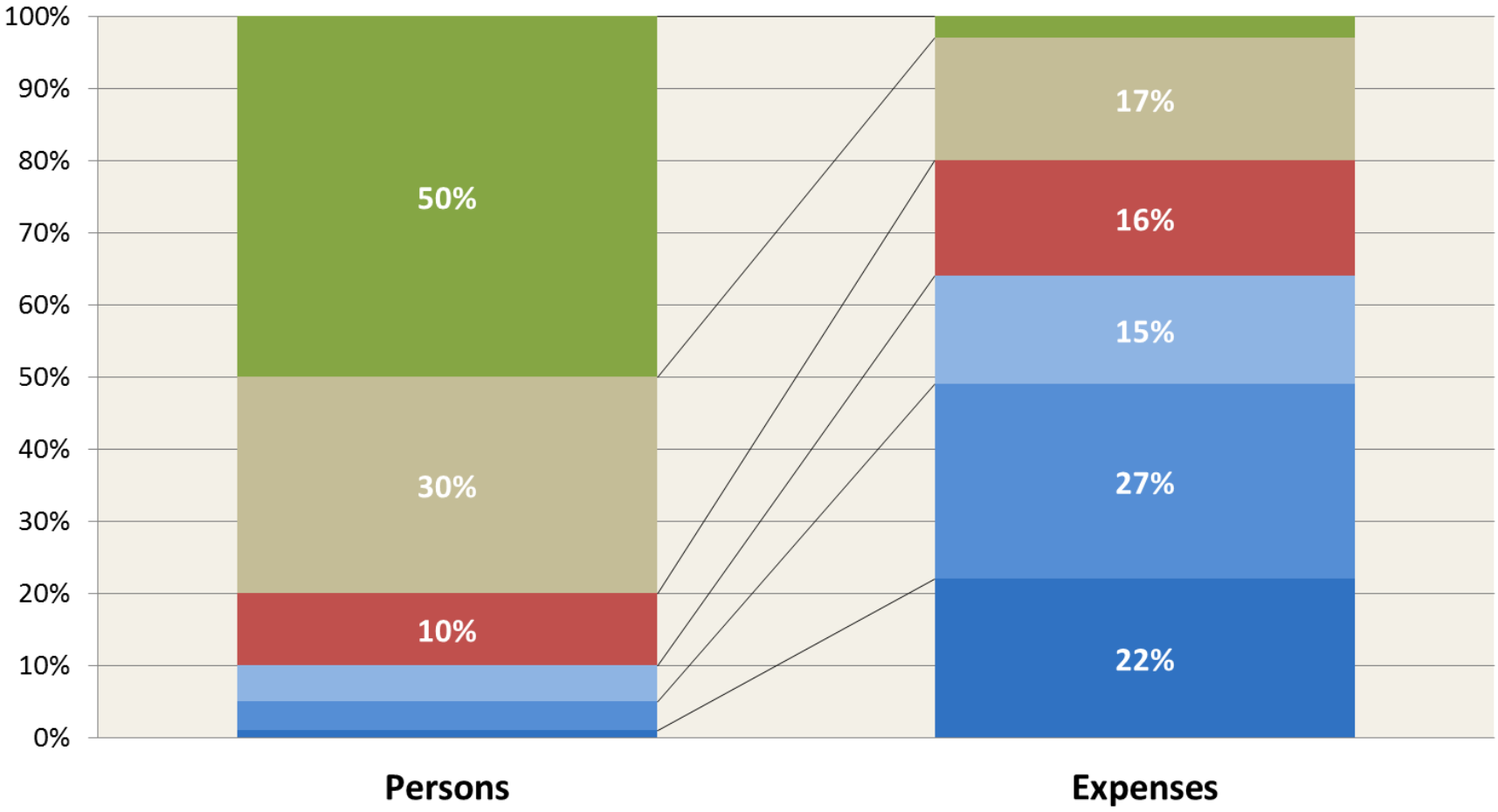
Humedica's CHF Predictive Model

- Goal:
  - Predict the likelihood that a patient with CHF will be admitted to the hospital or ED in the next 6 months
- Inclusion criteria:
  - CHF diagnosis code on a bill/claim or problem list source
  - Patient has had an E&M visit and/or procedure over the last 12 months
  - Patient is at least 18 years old
- Model development and results
  - Training and test samples
  - Area under the Receiver Operating Characteristic Curve: 0.73 for IDNs and 0.70 for non-IDNs
- Variables of interest
  - Demographics
  - Medications
  - Lab results
  - Vital signs
  - Utilization
  - Co-morbidities

Which Patients are at Greater Risk for Hospitalization?



U.S. Health Care Expenditures: The “80/20 Rule”



Source: Conwell LJ, Cohen JW. Characteristics of people with high medical expenses in the U.S. civilian non-institutionalized population, 2002. Statistical Brief 73. March 2005. Agency for Healthcare Research and Quality, Rockville, MD. Data from Medical Expenditure Panel Survey (MEPS).

“Lift” Definition

$$\text{Lift} = \frac{\%\ \text{of expenses}}{\%\ \text{of persons}}$$

% of…		Lift
Persons	Expenses	
1%	22%	22.0
4%	27%	6.8
5%	15%	3.0
10%	16%	1.6
30%	17%	0.6
50%	3%	0.1

Cumulative % of…		Cumulative Lift
Persons	Expenses	
1%	22%	22.0
5%	49%	9.8
10%	64%	6.4
20%	80%	4.0
50%	97%	1.9
100%	100%	1.0

$$\text{Lift} = \frac{\%\ \text{of patients with admissions}}{\%\ \text{of patients}}$$

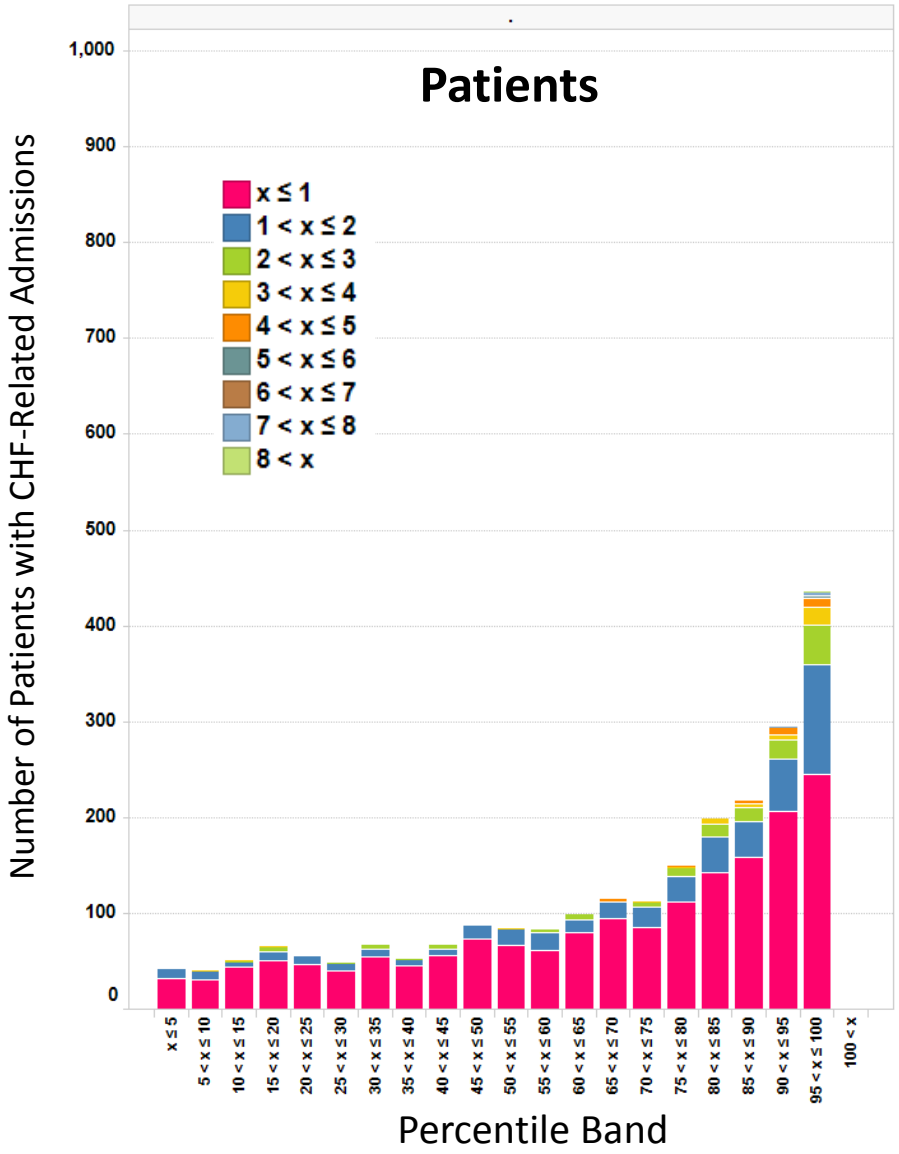
$$\text{Lift} = \frac{\%\ \text{of admissions}}{\%\ \text{of patients}}$$

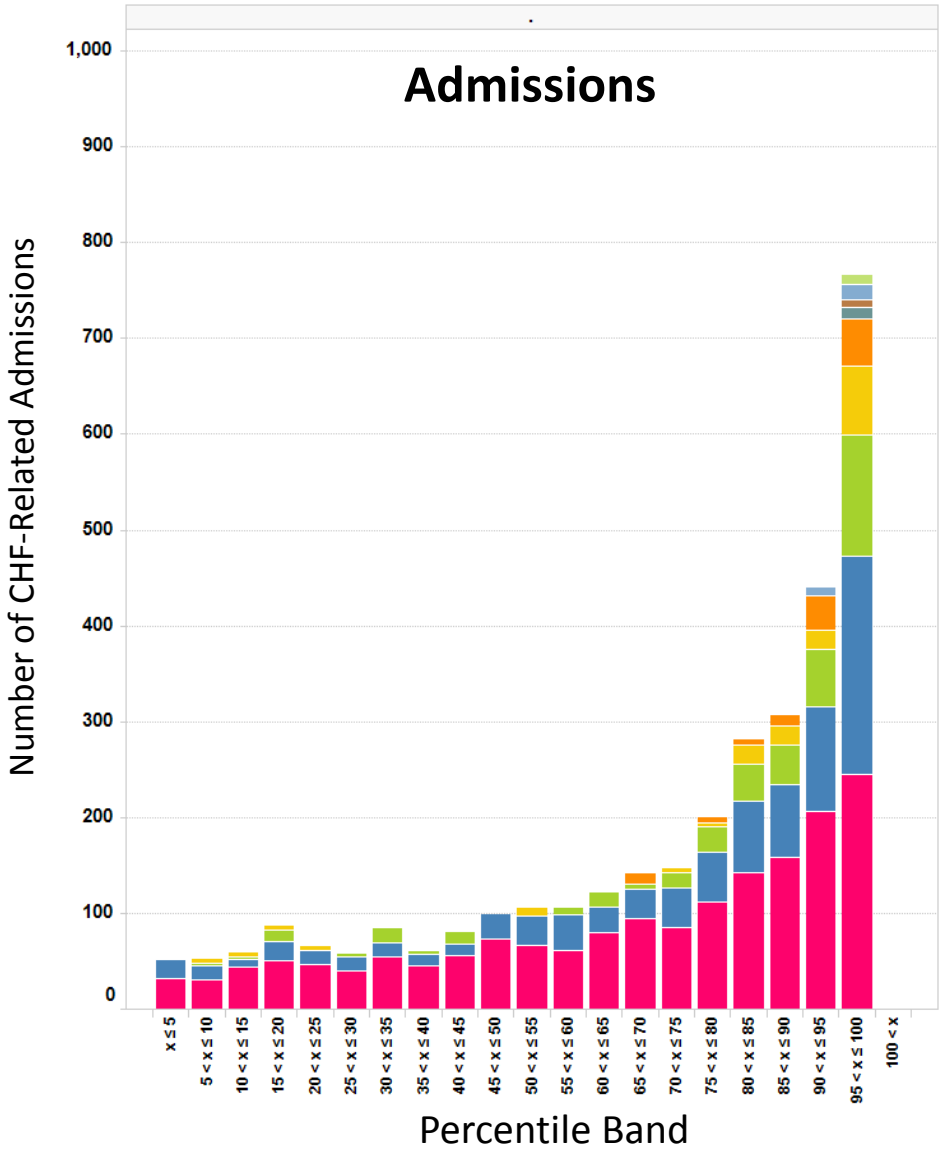
Predictions based on data through:
1/31/2012

Patient experience through:
7/31/2012

6 integrated delivery systems
30,496 patients with CHF
exclude 1,083 patients who died
29,413 patients

CHF-Related Admissions, by Percentile Band

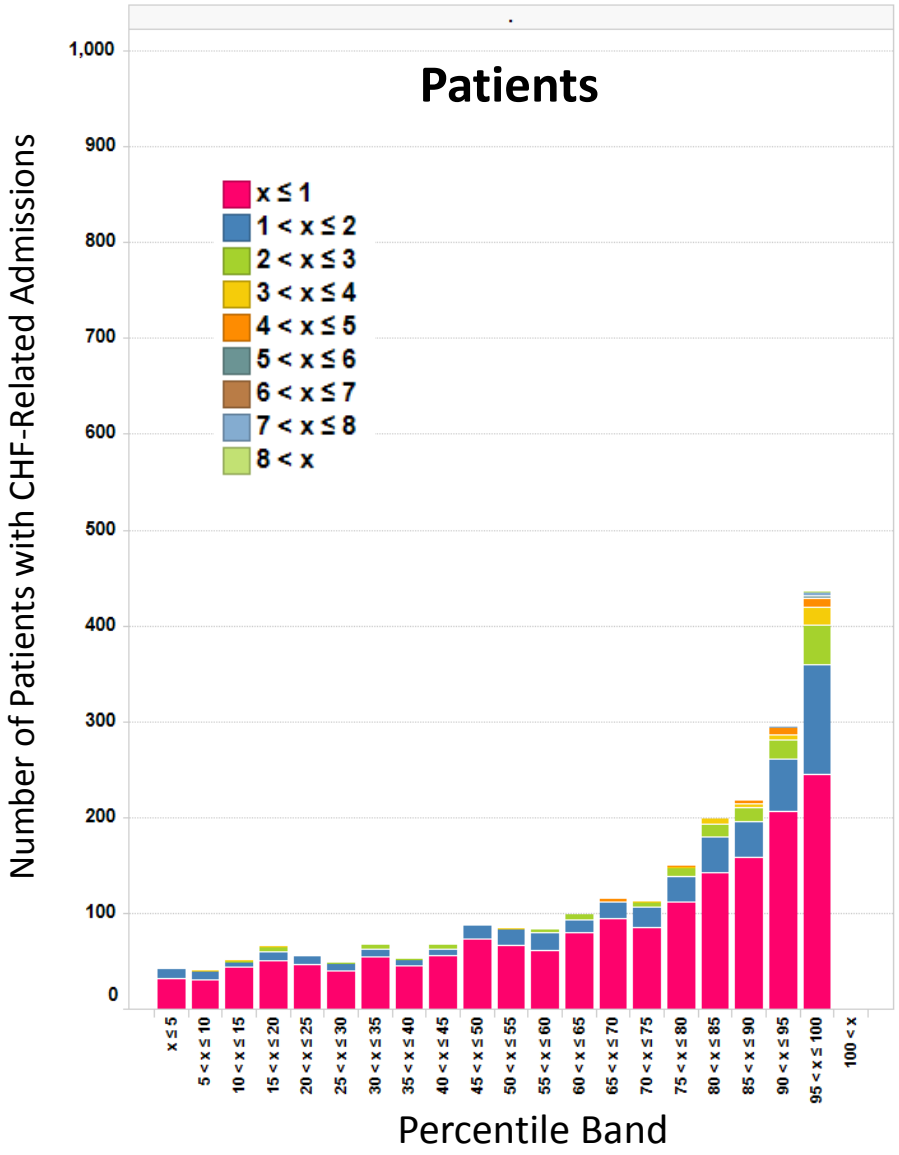


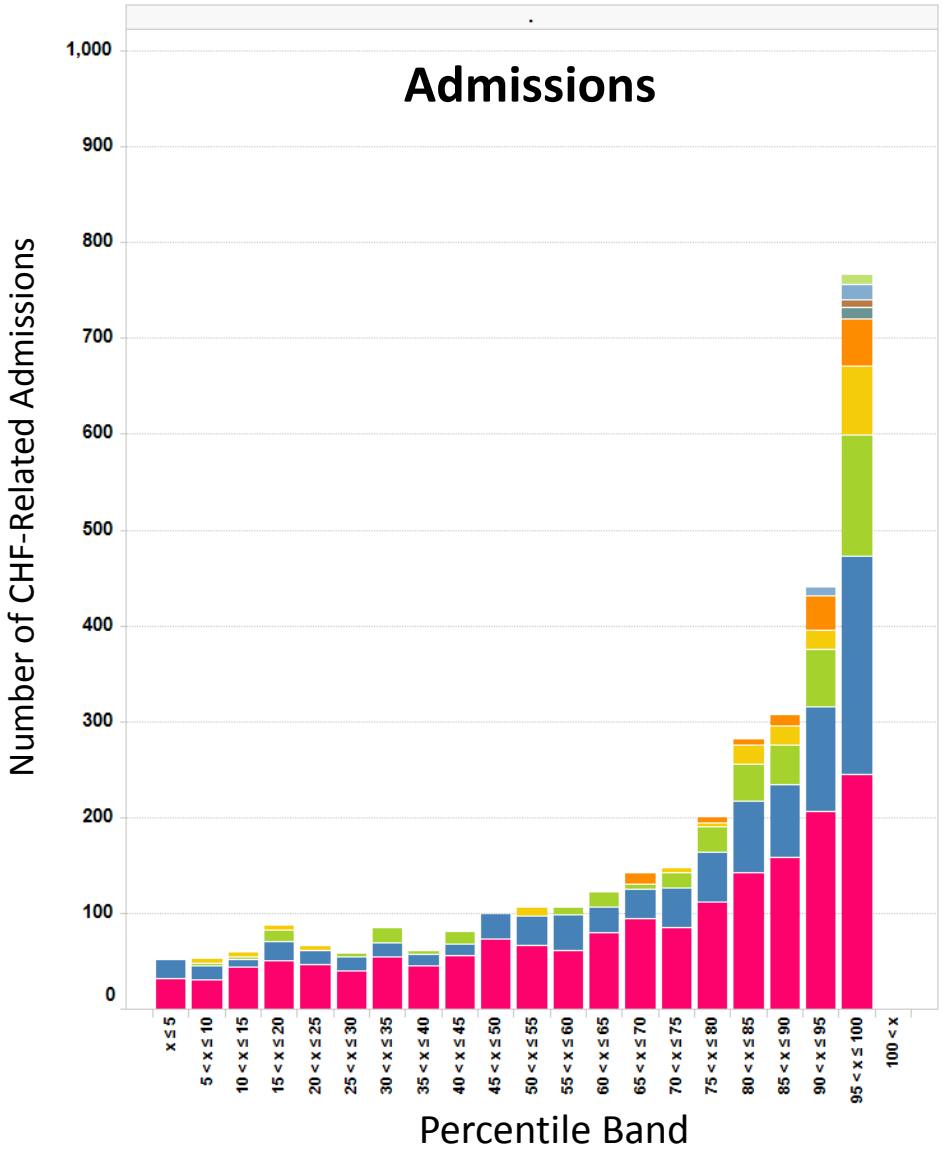


Lift Calculation: CHF-Related Admissions

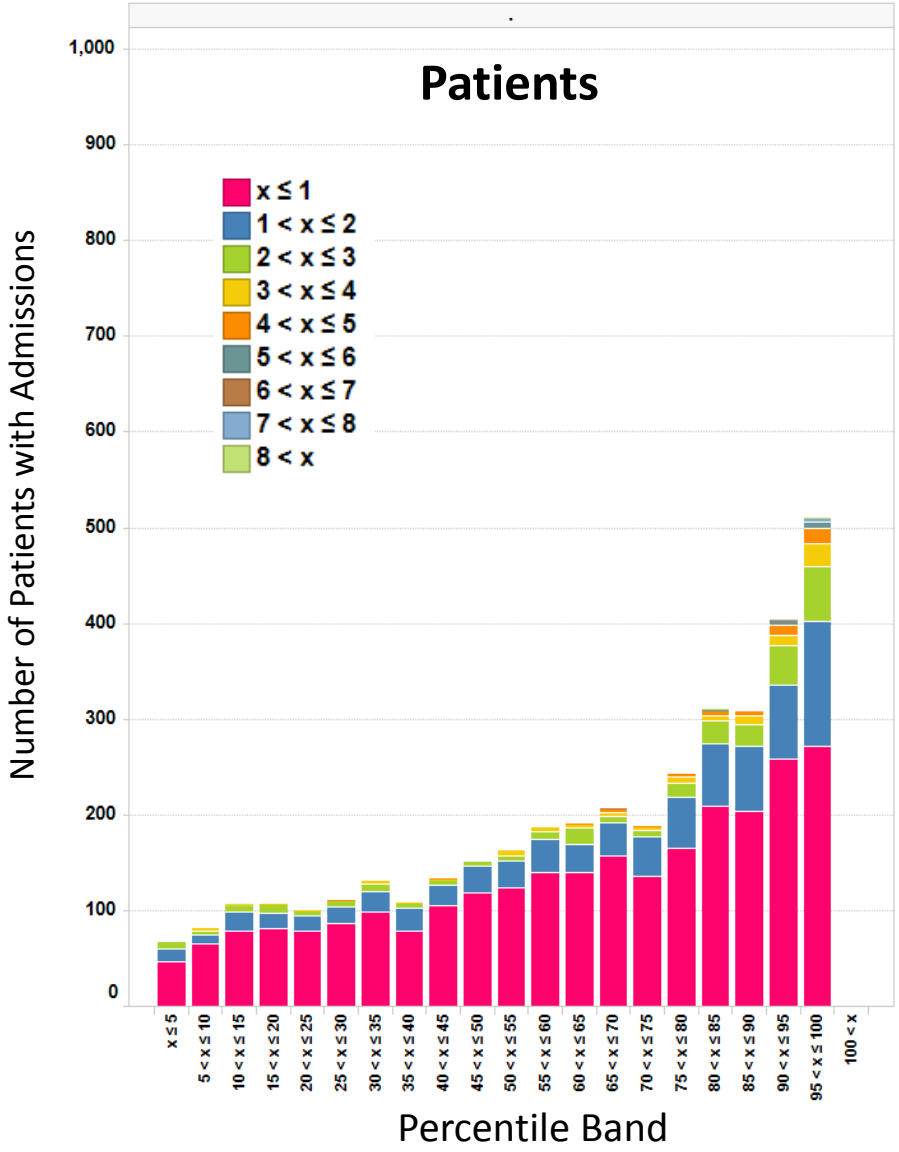
Percentile Band	% Pts.	Cumulative % Pts.	% Pts. with Admissions	Cumulative % Pts. with Admissions	Lift (Percentile Band)	Cumulative Lift
96 – 100	4.2%	4.2%	18.5%	18.5%	4.4	4.4
91 – 95	4.5%	8.7%	12.5%	31.0%	2.8	3.5
86 – 90	4.6%	13.3%	9.2%	40.2%	2.0	3.0
81 – 85	4.9%	18.2%	8.5%	48.6%	1.7	2.7
76 – 80	4.9%	23.1%	6.3%	55.0%	1.3	2.4
71 – 75	5.0%	28.1%	4.8%	59.7%	1.0	2.1
66 – 70	5.0%	33.1%	4.8%	64.6%	1.0	1.9
61 – 65	5.2%	38.3%	4.2%	68.7%	0.8	1.8
56 – 60	5.1%	43.4%	3.5%	72.2%	0.7	1.7
51 – 55	5.3%	48.7%	3.6%	75.8%	0.7	1.6
46 – 50	5.3%	53.9%	3.7%	79.4%	0.7	1.5
41 – 45	5.3%	59.3%	2.8%	82.2%	0.5	1.4
36 – 40	5.2%	64.5%	2.2%	84.5%	0.4	1.3
31 – 35	5.2%	69.7%	2.8%	87.3%	0.5	1.3
26 – 30	5.2%	74.9%	2.0%	89.3%	0.4	1.2
21 – 25	5.2%	80.1%	2.3%	91.7%	0.5	1.1
16 – 20	5.1%	85.2%	2.8%	94.4%	0.5	1.1
11 – 15	5.1%	90.3%	2.1%	96.6%	0.4	1.1
6 – 10	5.1%	95.4%	1.7%	98.3%	0.3	1.0
1 – 5	4.6%	100.0%	1.7%	100.0%	0.4	1.0

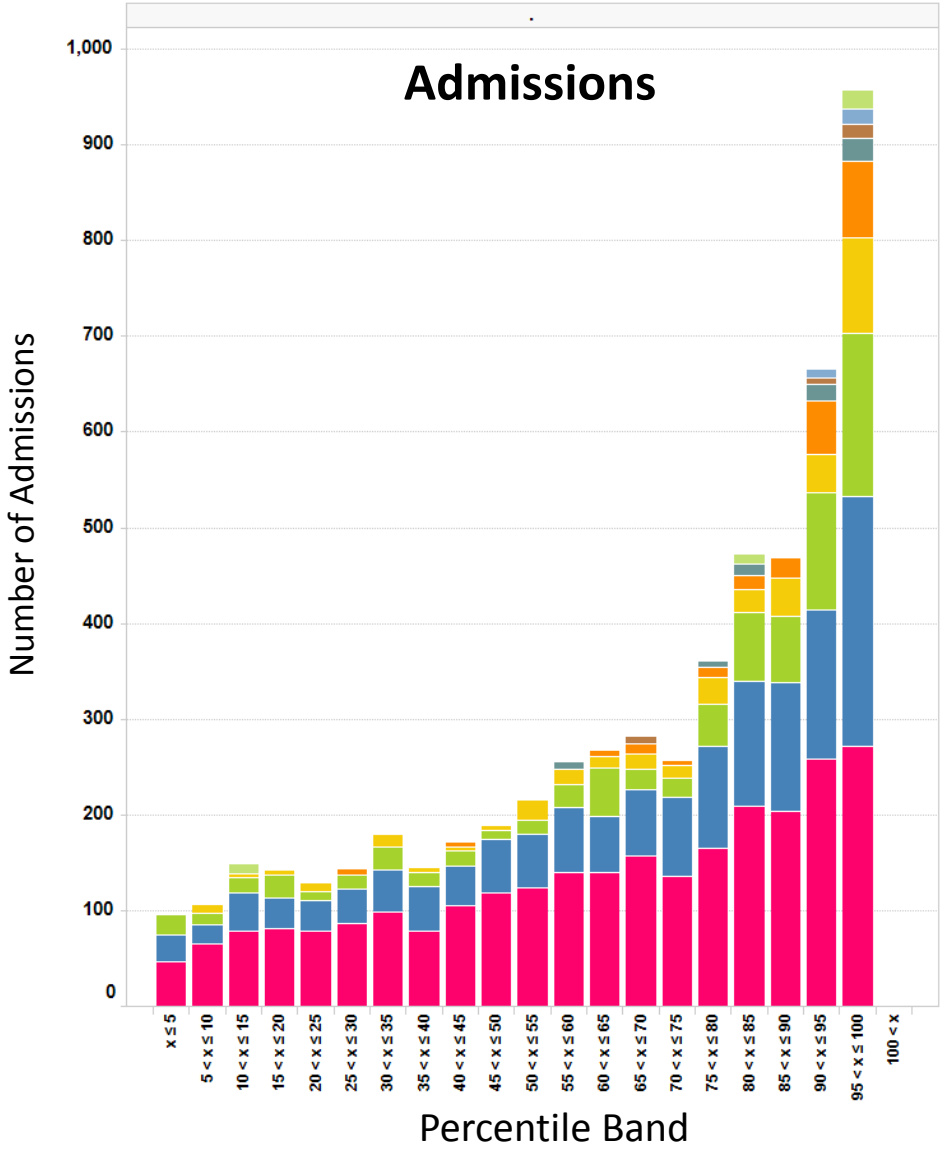
CHF-Related Admissions, by Percentile Band



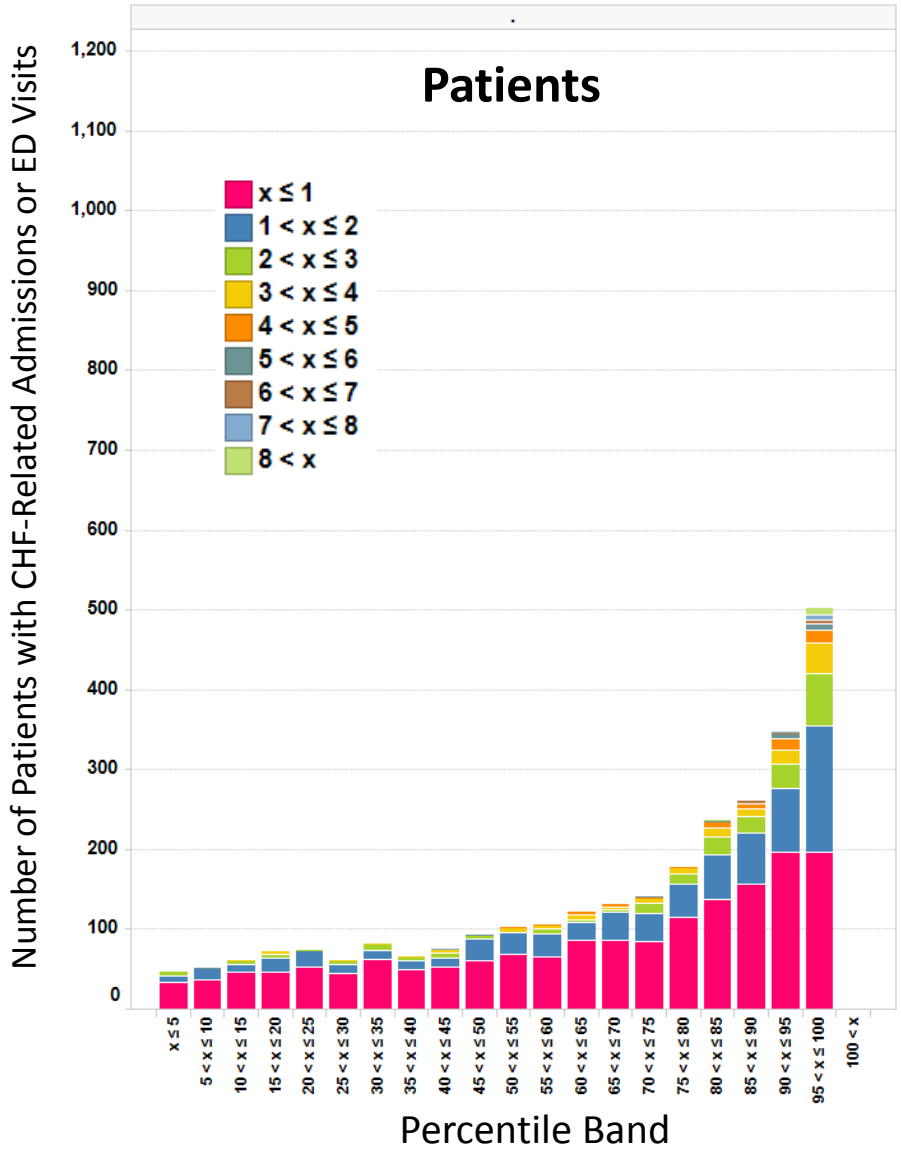


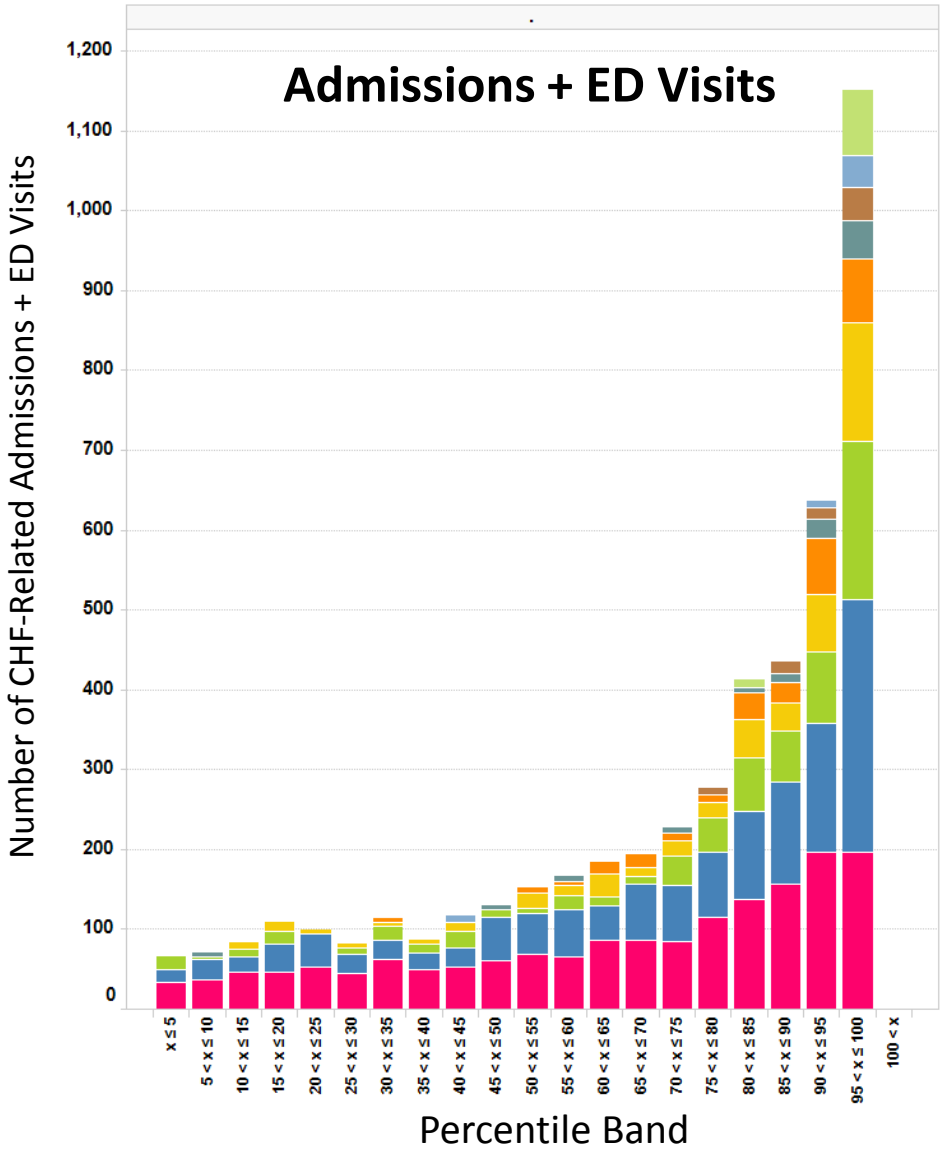
All Admissions, by Percentile Band





CHF-Related Admissions + ED Visits, by Percentile Band





Lift Values

Predicted Parameter	Percentiles 96–100	Percentiles 86–100
Patients – CHF-related Admissions	4.4	3.0
Patients – All Admissions	3.2	2.4
Admissions – CHF-related	5.4	3.4
Admissions – All	4.0	2.8

Congestive Heart Failure Pitfalls and Barriers

- Diagnostic Challenges
- Physician Prescribing
- Patient Compliance
- Provider Coordination
- System Reporting

Path to CHF Management
Where is your group heading?

Path to CHF Management
What is your organization doing?

- Divide into groups of two or three
- Identify one issue with CHF management where your group struggles
- Describe the issue to your partner(s)
- List and discuss barriers your group has encountered
- How have you addressed them?

Sharing Best Practices

Integrated Delivery System

Carilion Stonewall Jackson Hospital
Lexington

Carilion Giles Community Hospital
Pearisburg

Carilion New River Valley Medical Center

Carilion Roanoke Community Hospital

Carilion Clinic Saint Albans Hospital
Radford Exit 109, I-81

Carilion Tazewell Community Hospital

Bedford Memorial Hospital

Carilion Clinic Riverside Center

Virginia Tech Carilion School of Medicine

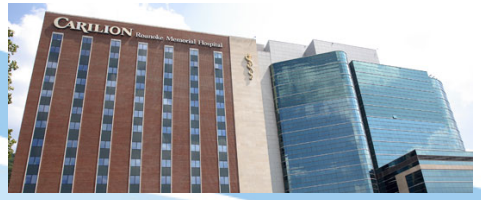
Virginia Tech Carilion Research Institute

Carilion Roanoke Memorial Hospital

Carilion Clinic Children's Hospital

Carilion Franklin Memorial Hospital
Rocky Mount

- Hospitals
- Urgent Care
- Primary Care
- Home Care
- Hospice
- Solstas Labs



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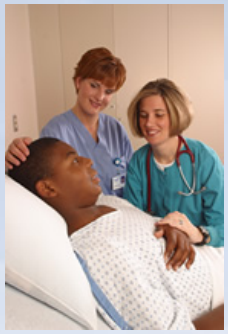
Carilion Clinic by the numbers (FY 2011)



- Physician Group 725
- Hospitals 8
- AMB sites 160
- Licensed beds 1,200
- Employees 11,000
- Revenue $1.3 B

CARILION CLINIC

Carilion Clinic by the Numbers (FY 2011)

- 800,000 annual primary care visits
- 49,000 annual admissions
- 180,000 annual ED visits – 492 daily average
- Primary/secondary market – 675K/900K
- 28 NCQA Level 3 PCMH sites
  - 1st Level 3 site in the Commonwealth of Virginia

CARILION CLINIC

Carilion Clinic - Education

VTC SOM/GME

- Virginia Tech Carilion School of Medicine and Research Institute

- Graduate Medical Education
  - 220 residents and 16 fellows
  - Ten residency programs
  - Twelve fellowship programs

CARILION CLINIC

Jefferson College of Health Sciences

- 1,064 students
- 72 full-time faculty
- Associate, baccalaureate, and master's degrees
  - Nursing
  - Therapies
  - PA program
- Accredited by the Southern Association of Colleges and Schools Commission on Colleges

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Volume to Value

- Clinic Journey
  - 2006-2011
    - Physician leadership development
      - PLA
      - Committee Structure
      - Departments, BOG,
    - Increased physician employment
    - Consolidation of practices to one site
    - Research and Education
    - System-wide EMR
    - PCMH development

CARILION CLINIC

Volume to Value

- Clinic Journey
  - 2012-2017
    - Payment Partnerships
      - Aetna Partnership
      - MAP, Medicaid HMO
      - MSSP
      - Anthem
    - System wide protocols
    - Improved analytics
      - Risk Stratification
      - Predictive Modeling
    - PCMH expansion and optimization
      - CHF

CARILION CLINIC

Population Management Model

Primarily Reactive focus - Care Coordinator

- Transitions in care
  - All patients with a facility transition Hospital and/or SNF

- Population Management
  - Preventive Care Focus
    - Pre visit planning
  - Chronic Disease Focus
    - Pre visit planning- Clinically Important Condition (CIC) identified
    - Individual disease coaching (CIC) patients – visit/telephone
    - Disease and High risk registries review and contact

25

Population Management Model (continued)

Needed Proactive focus

CHF

- Carilion Clinic and CMS priority
- Existing CHF Clinic learn from our internal success
- Pilot our intensive effort in one disease state to develop and replicate

26

Patient Selection

Pilot IM site

- Internal Medicine site with CHF as CIC
- Existing CHF Registry and Procedures
- Guidelines established

27

Resource Allocation

Initial team

- Advisors Physicians
- Application Analyst
- Project Lead NP
- Participants

Technique

- QI project log used to organized work

28

Resource Allocation (continued)

Project Objective: Determine if the Mindshare, Humedica database is able to adequately support intensive population management work with Congestive Heart Failure patients.

① Validate the database, ensure it contains accurate data and adequate features.

② Provide baseline data to IM CCR3 Department about their CHF population (see 2.5 Baseline data 1-8).

③ Report results of predictive modeling tool applied to this population, further identifying a cohort as "CHF priority" patients.

④ Establish a workflows to utilize database.

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29

Resource Allocation (continued)

Baseline Data

CHF Cohort: All patients with a diagnosis of CHF or relevant features triggering inclusion,

who receive care at the IM Practice sorted by PCP.

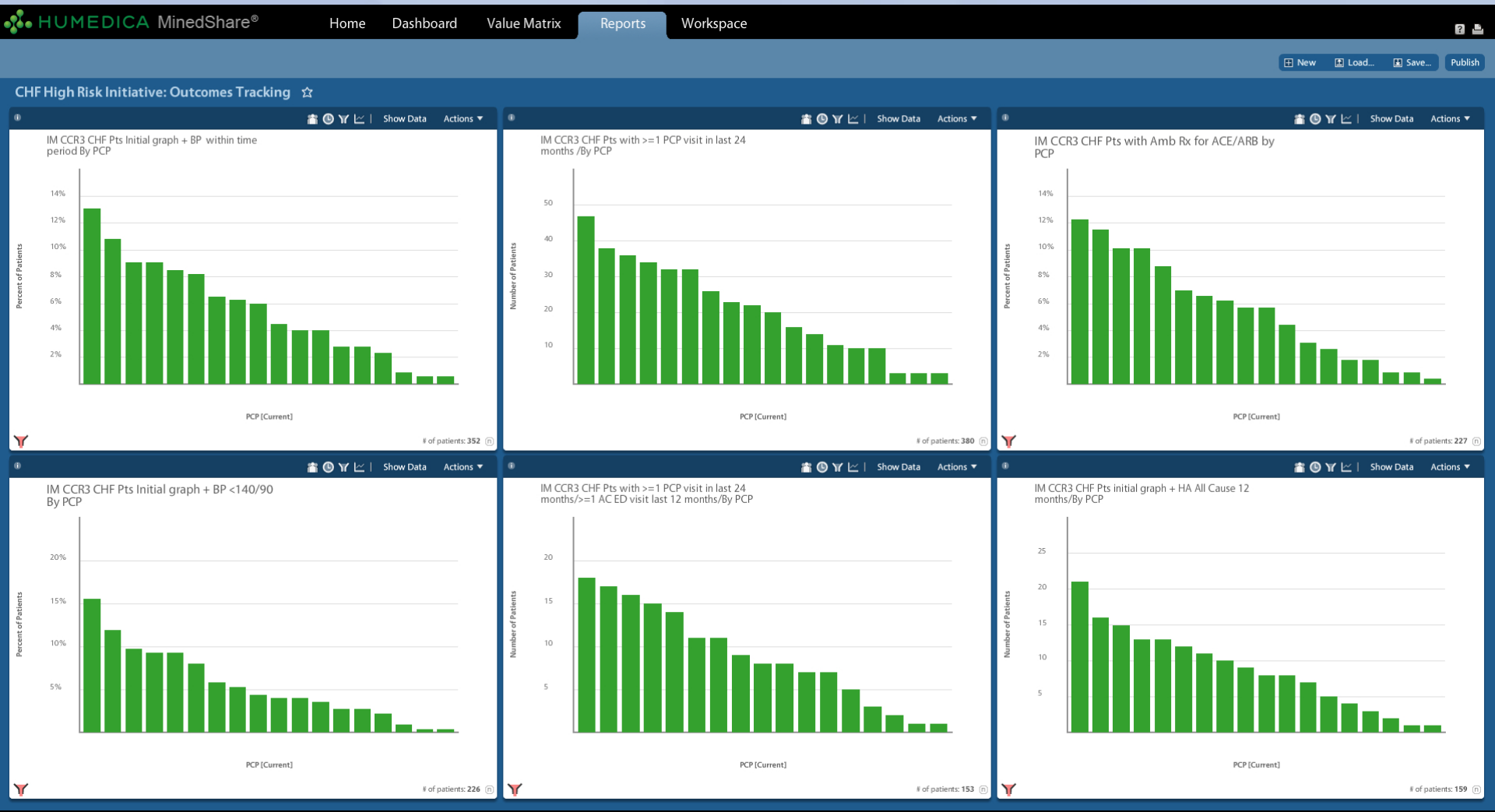
- Patients with one visit with the PCP in the last 24 months.
- A total number of all-cause ED visit within the rolling 12 months for the defined population.
- A total number of hospital visits within the rolling 12 months for the defined population.

- Patients with clinical features present and at goal for the following:
  ① % of pts with BP measurement present
  ② % of pts with BP at goal (140/90)
  ③ % of pts prescribed Ace Inhibitor or ARB.
  ④ % of pts prescribed beta-blocker.
  ⑤ % of pts with BP at goal, *and* on Ace Inhibitor or ARB, *and* on beta-blocker

- Humedica's Predictive Model applied to the CHF cohort.

30

CHF High Risk Population Analysis in Humedica MinedShare®



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Resource Allocation (continued)

Measurement Validation: Using the Humedica generated list of patients an audit will be done of 10% of the total population to validate presence of the following features:

① CHF diagnosis or relevant features triggering inclusion, who receive care at IM CCR3

② One visit with PCP within the last 12 months

③ Presence of either an Ace or ARB

④ Presence of a Beta-blocker

32

Protocols

Protocols existing and new

Existing

- Registry protocols
- Transition Contact protocols
- Chronic Disease Guidelines

New

- Registry protocols for High Risk patients – CHF included
- Care Coordinators complete visits with referral to CHF clinic, home health, Telemonitoring, and future pharmacy consultant service on extensivist team.
- Readmission assessment performed for all Care Transitions
- Departmental project initiated to support CHF diagnosis accuracy, results in a number of gains

33

AMGA 2012 INSTITUTE FOR QUALITY LEADERSHIP

"How Care Teams are Using Predictive Analytics and Comparative Data to Optimize Interventions for High-Risk Patients"

Malcolm Baldrige National Quality Award
2011 Award Recipient
PMS 289

Gaylord National Resort &
Conference Center, Washington, DC

Henry Ford Health System

Richard Dryer, MD, CMO Primary Care
&
Cara Seguin, RN, MSN, Director,
Center of Clinical Care Design

Collaborative Objective

- To use Humedica's Predictive Model to identify congestive heart failure patients at highest risk for hospitalization, intervene using a collaborative Tele-health model to decrease avoidable health care utilization, and improve health outcomes.

Henry Ford Health System (HFHS)

Core Services:

- Four acute med/surg and two behavioral health hospitals
- Henry Ford Medical Group
  - 32 Medical Centers
  - 1200 physicians & scientists
- 2200 private physicians
- 1500 MD & DO physician trainees
- Health Alliance Plan

Post-acute services:

- 2 Skilled nursing facilities
- Home Health Care
- Outpatient Dialysis
- Home Products
- Retail Pharmacies
- Vision Centers

Other Statistics (annual):

- Over 23,000 employees
- Over 200 care delivery sites
- 102,000 admissions, 2200 beds
- 418,000 ED visits
- 3.2 million office visits
- 88,000 surgeries

Henry Ford Health System

Primary Care Chronic Disease Management

30 Ambulatory Care Sites Across
3 Regions/ 4 Counties

Henry Ford Medical Group- 41 specialties, 30 ambulatory centers

Supported by Center for Clinical Care Design

Patient Centered Medical Home

Physician Group Incentive Program

Organized Systems of Care

Michigan Primary Care Transformation Project

6 Diabetes Care Centers

Medical Nutrition Therapy

Diabetes in Active Control Program

Diabetes Self Management Program

Integrated Depression Care

Regional Psych Nurse Practitioners

PCP Practices Screening and Managing Depression

Ambulatory Case Management

23 Nurse Case Managers across 17 sites

Panel Managers -10

Focus on closing gaps in care

Participation in Michigan Primary Care Transformation (MiPCT) Project

The Michigan Primary Care Transformation Project (MiPCT) is a three-year multi-payer project aimed at **improving health** in the state, making **care more affordable**, and strengthening the **patient-care team relationship** by targeting funding for care coordination, practice transformation & incentives.

MiPCT is state-wide in scope and is the **largest** Patient-Centered Medical Home (PCMH) **project in the nation**. Michigan is leading the efforts as one of eight states.

477 primary care practices and 1800 primary care physicians that are affiliated with one of 41 physician/physician hospital organizations (POs/PHOs) are eligible to receive payments.

2 Phases of MiPCT for 2012

First 6 Months

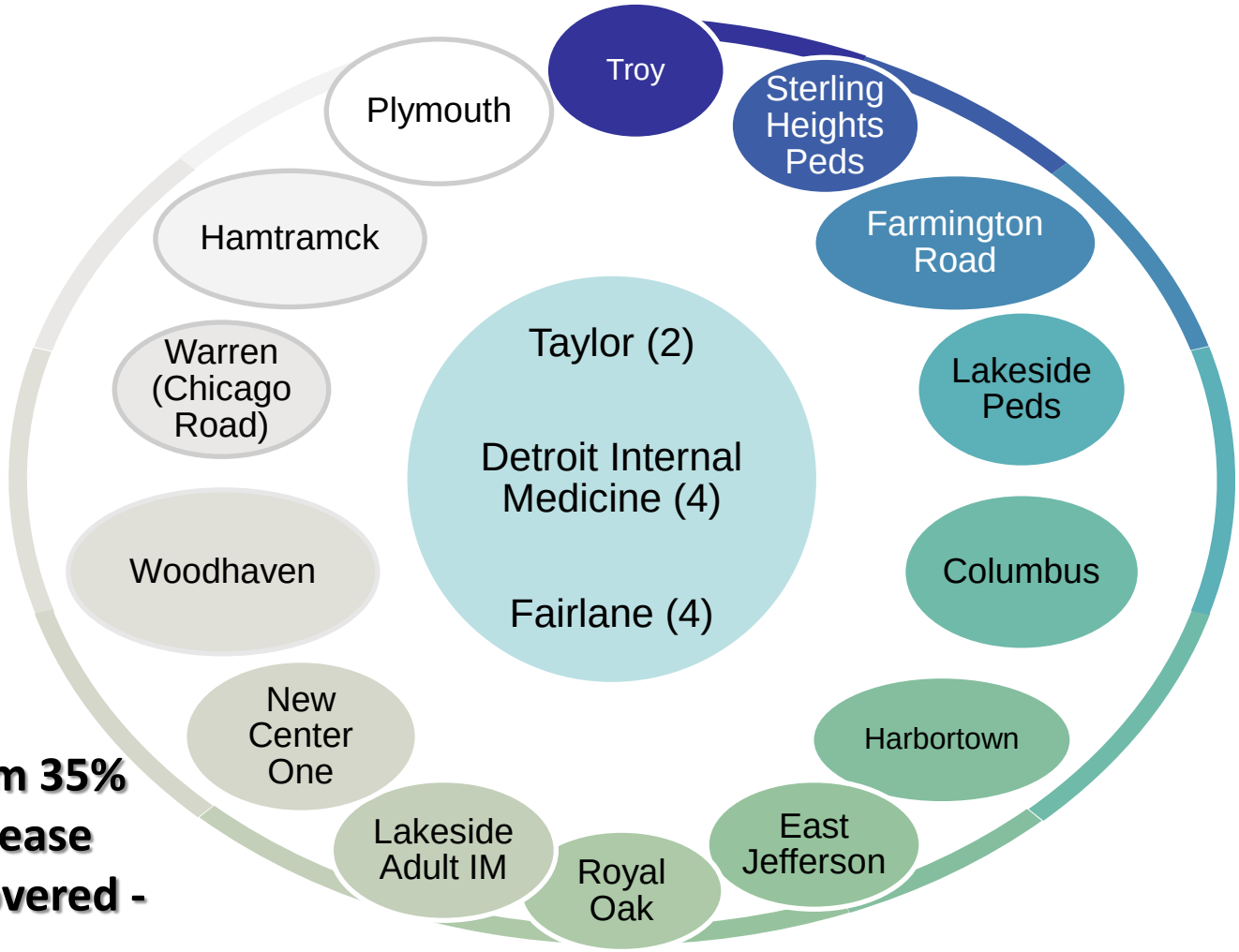
- Access & Extended Hours
- Patient Registry
- **Case Managers Hired and Trained**
- **Developing Transitions of Care Model**

Last 6 Months

- Additional Patient Registry Infrastructure and Reporting
- Reducing Primary Care Sensitive ED Avoidable Visits
- **Reducing avoidable readmissions for chronic disease**
- Building collaborative network in medical neighborhood

Henry Ford Health System

2012 System Spread of Case Management
(From 4 sites to 17 sites- 23 CMs)



Expanded from 35% of Chronic Disease Population Covered - to now >75%

Anticipating Hurdles

- Spread big in short amount of time
- Potential to lose existing buy-in with new focus
- New role for sites- new processes; potential for fragmentation
- System communication and buy-in important
- Merging the new team with the existing team

Henry Ford Health System

Overcoming Challenges With Communication

- Established project time line- Gantt chart
- Initiative part of system strategic plan
- Monthly Steering Committee meetings- include Human Resources, Nursing Leadership and Finance
- Primary Care Learning Collaborative Forums & Presentations
- Primary Care Newsletters, ICON on webpage
- Conference calls with sites; orientation weekly e-updates, site visits; regular presentations at staff meetings
- Communication with system hospitals to build transitions of care- formed system case management council

Standardization

- Roles and responsibilities of Case Manager
- PCMH standardization- 27 standards
- Primary Care Development Team- input from sites by region
- Learning Collaborative Meetings- include Pillar Awards to acknowledge quality improvement initiatives related to standardization
- Use of standing orders to limit interruptions

Promoting Candidate Retention

- Human Resources advanced screening questions
- Transparency of model, project details, salary range **PRIOR** to interview
- Their preference for top 3 sites to work with on-line application
- Strong problem solving, organizational, planning as well as good computer skills
- Initial screen by central office for abilities and overall recommendation, 2nd interview by site leadership to ensure **"right fit"** for both the site and the candidate

Team Engagement

- Collaborate on goal setting- team assists in drafting measurements; data shared at monthly meetings
- Sharing patient success stories- e.g. Web-ex
- Clear reporting structure- Participate at local site staff meetings
- Recognition:
  - Celebrations at CM monthly all day meetings- birthdays, achieving goal milestones
  - Nominated for Focus on People Award this year
  - "WOW" awards- system employee recognition
  - Share positive patient feedback surveys with leadership
  - Team building e.g. luncheon, Tigers baseball game
  - Provide CEO feedback on patient satisfaction and share at all levels e.g. System, Board of Trustees levels

How we use Humedica MinedShare

- Estimating populations for studies/research
- Reports provide actionable data at panel, physician, case manager level
- Stratification of High Risk CHF patients using predictive model
  - Identify ED and inpatient high utilizers
  - Identify patients who require more intense ambulatory attention
- Evaluating outcome metrics for patients receiving coaching/education over time
- Coding opportunities where clinical evidence exists but no related diagnostic code

Risk Adjustment & Population Management

Risk Stratification

Enterprise Data Warehouse

- With move to Epic
- Includes Risk Stratification
- Profiling-Data management
- Outcomes

Humedica MinedShare®-*Anceta*

- New feature Q2 2012-Predictive modeling for CHF patients likely to have an admission in next 6 months
- Reports for CM, Diabetes Care Team, Management of chronic diseases

IPD CM High Risk for Readmission

- Collaborative hand-off/referral processes to prioritize referral of PC high risk patients
- Challenge of linking different operating systems e.g. CPNG, McKesson, ECIN, PowerChart, soon to be Epic

Software Systems

- Docsite Registry→ move to Epic
- Use of concurrent hospital admission/discharge, ED visit lists
- Epic State subcommittee; potential to share at regional level

High Risk for Readmission Criteria

Old

1. 7 or more medications
2. Discharged to or admitted from SNF/Rehab facility
3. Fall risk
4. Frail/elderly
5. Homeless/shelter
6. Insurance/financial barriers limiting care access
7. Left this admission or last admission AMA
8. LOS greater than 14 days
9. New diagnosis of ongoing or chronic illness
10. No current PCP
11. Non-compliant with medical treatment plan in place
12. Declined home health services
13. Readmission in last 30 days
14. Lives alone and has weak support system
15. Provider determines patient is high-risk
16. Third admission in past 6 months

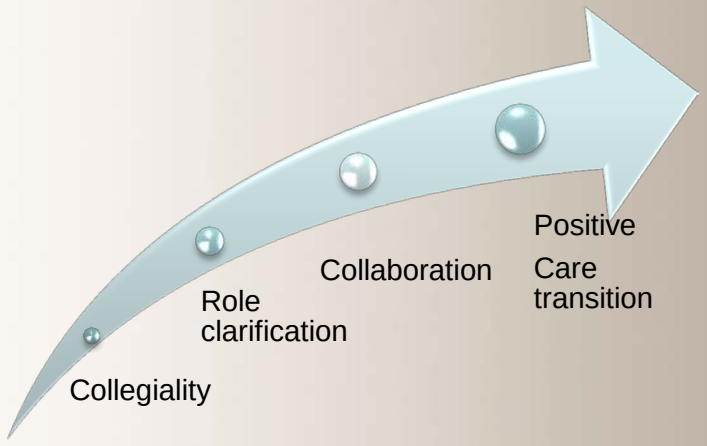
New

1. Provider (any) determines patient is at high risk
2. New diagnosis of ongoing or chronic illness
3. Readmission is past 30 days or 3rd admission in past 6 months

Designing Effective Hand-off

Identify opportunities for hand off and collaboration between:

- Inpatient case management
- Ambulatory case management
- Clinic nurses
- Home Health care
- E-Home Care Tele-health nurse
- HAP case management
- Pharmacy – Medication Therapy Management Program
- Anticoagulation nurses
- Diabetes Center Nurses
- Psych Nurse Practitioners

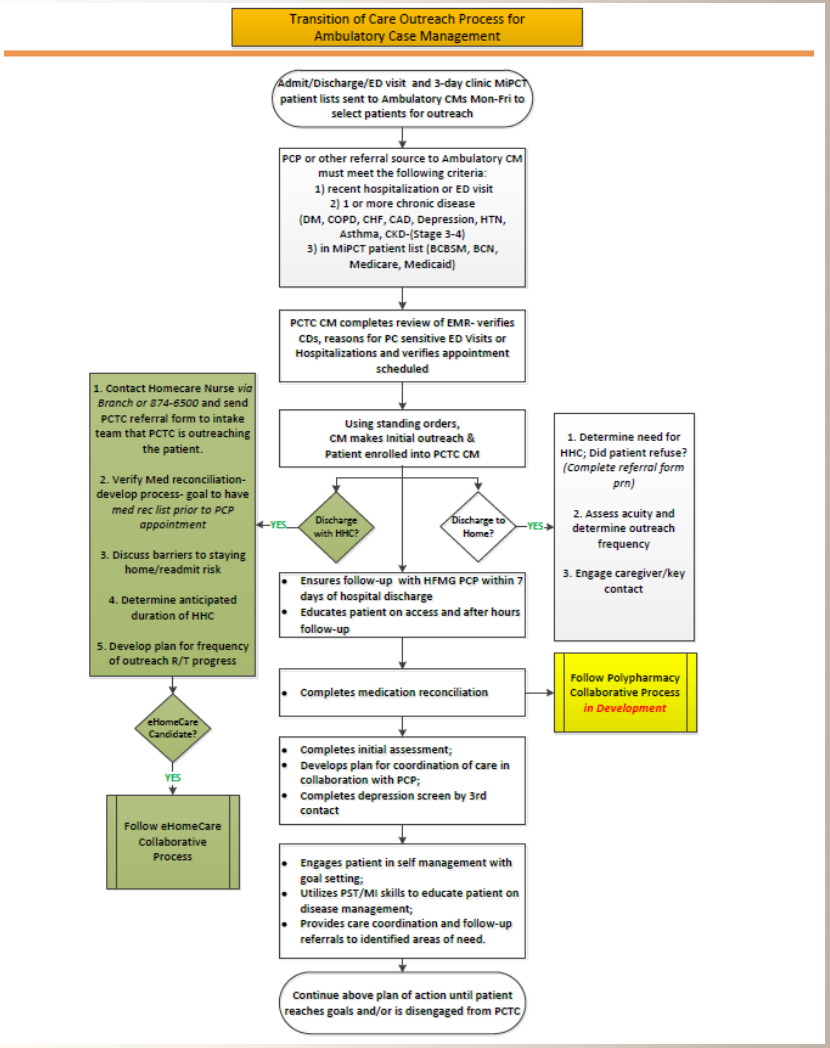


Putting MinedShare Together With Standardized Protocol

- Saw opportunity to collaborate with Community Care Services
- Need to reduce avoidable utilization
- Predictive model validated with our test samples
- Enhance the patient experience and maximize nursing areas of expertise for max. benefit
- Mapped out model following transitions of care focus, cross collaboration with all teams, final input from PCPs dedicated to Tele-health model

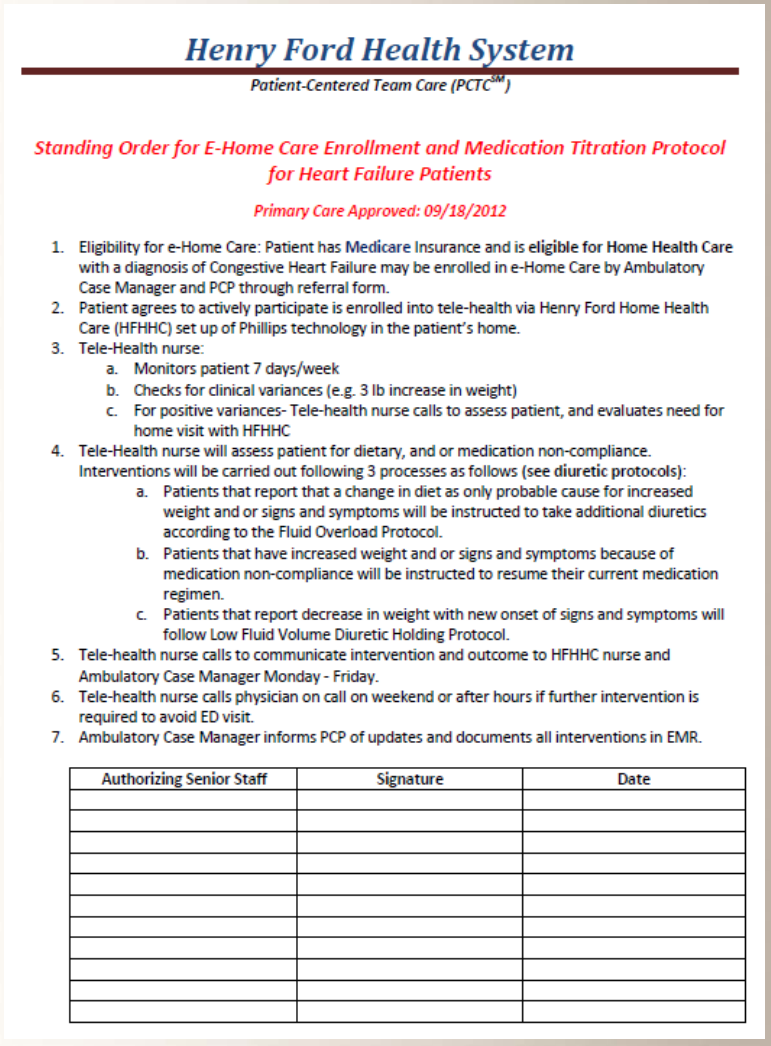
Outreach Protocols- Flow Charts

- Facilitates CM outreach within 24-48 hours
- Educates team on role
- Decreases physician interruptions
- Leveraging technology
  - Daily lists and reports for all admissions, discharges and ED Visits
  - Potential to have electronic flag for high risk for readmission



Use of Standing Orders

- Collaboration between Primary Care and Cardiology
- Ambulatory Intensivist Clinic follow-up in both Primary Care Cardiology
- Follow-up appointment within 3-5 days and Home Care arranged prior to discharge
- Home Care frontloads first visit within 24-48 hours and sets up e-Home Care services
- Medication titration protocols
- Track percentage of follow-up appointments kept within 7 days hospital discharge or ED Visit



Henry Ford Health System

Patient-Centered Team Care (PCTC℠)

Standing Order for E-Home Care Enrollment and Medication Titration Protocol for Heart Failure Patients

Primary Care Approved: 09/18/2012

1. Eligibility for e-Home Care: Patient has Medicare Insurance and is eligible for Home Health Care with a diagnosis of Congestive Heart Failure may be enrolled in e-Home Care by Ambulatory Case Manager and PCP through referral form.
2. Patient agrees to actively participate is enrolled into tele-health via Henry Ford Home Health Care (HFHHC) set up of Phillips technology in the patient's home.
3. Tele-Health nurse:
   a. Monitors patient 7 days/week
   b. Checks for clinical variances (e.g. 3 lb increase in weight)
   c. For positive variances- Tele-health nurse calls to assess patient, and evaluates need for home visit with HFHHC
4. Tele-Health nurse will assess patient for dietary, and or medication non-compliance. Interventions will be carried out following 3 processes as follows (see diuretic protocols):
   a. Patients that report that a change in diet as only probable cause for increased weight and or signs and symptoms will be instructed to take additional diuretics according to the Fluid Overload Protocol.
   b. Patients that have increased weight and or signs and symptoms because of medication non-compliance will be instructed to resume their current medication regimen.
   c. Patients that report decrease in weight with new onset of signs and symptoms will follow Low Fluid Volume Diuretic Holding Protocol.
5. Tele-health nurse calls to communicate intervention and outcome to HFHHC nurse and Ambulatory Case Manager Monday - Friday.
6. Tele-health nurse calls physician on call on weekend or after hours if further intervention is required to avoid ED visit.
7. Ambulatory Case Manager informs PCP of updates and documents all interventions in EMR.

Authorizing Senior Staff	Signature	Date

Process Focuses on Care Transitions

- **e-Home Care installs** equipment in the home and educates participants on 7 day/week service
- **Tele-health nurse** assesses patient **variances** and involves CM as first line for interventions with protocols
- **CM meets min. monthly & prn (up to 90 days)** with patient to review condition, readmission potential, variances requiring intervention, active changes in plan or meds and ability to self-manage
- **Clear collaboration with PCP-** enrollment, documentation, disenrollment

Enrolling Now! Criteria for Patient Inclusion in CHF Cohort

- Primary diagnosis of CHF
- Aligned with PCP or Cardiologist
- Admission/ED visit within last 90 days
- Patient eligible for Home Health Care and agrees to services

Questions?