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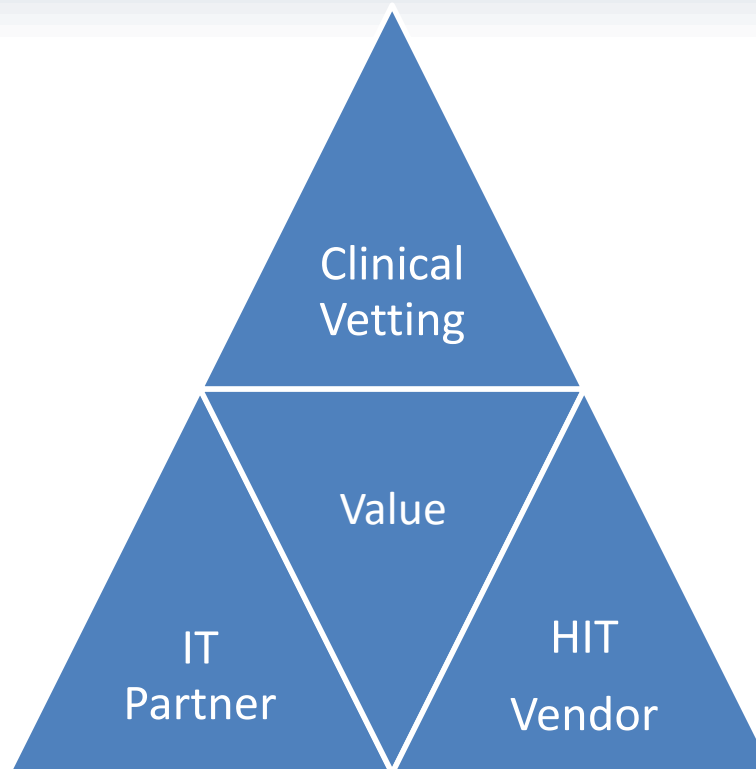
COMPREHENSIVE POST-ACUTE STROKE SERVICES

eCOMPASS for Health: Precision health at its best

Pamela Duncan, Ph.D
PI COMPASS Trial

Scott Rushing, Director Research
Information Systems

Clinical Informatics Solutions Require



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What is a PRO?

...is any report of the status of a patient's health condition that comes directly from the patient, without interpretation of the patient's response by a clinician or anyone else.

— FDA [2009](#)



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What is a PRO?

Less Complex:
Symptomatic (i.e
response to headache)

More Complex:
(Ability to carry out
activities of daily living)

Extremely Complex:
Quality of Life (multi
domain concept w/
physical, psychological
and social components)



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Why are PROs Important?

- Provide information not available from other sources. (i.e. insights of patient health status using past performance)
- Incorporates the patients personal standards, values, and expectations.
- Ability for patient to adhere self manage and follow recommended treatments and identify drivers of poor self-management) .
- Regulatory Decision influence both quantity of life and quality of life. Important to have the patients perspective in perception of the illness experience and the treatment/therapy.



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CMS Mandates

- CMS is mandating new care directions and payment models to improve care coordination and chronic care management.
 - Bundled Payments
 - MACRA
 - Chronic Care Plus
 - TCM & CCM
- Common to all CMS mandates for new care models is an individualized electronically available care plan.
- The care plan must be electronically available to all providers and the patient.

COMPASS Principal Investigators

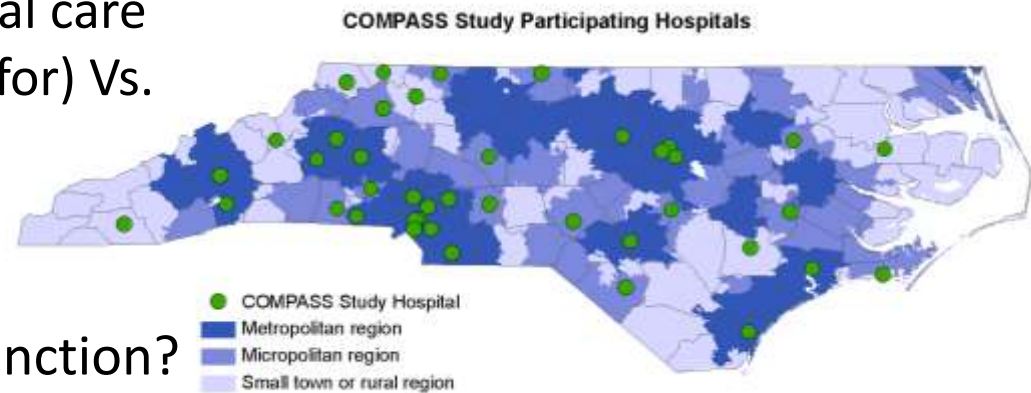
- PI: **Pamela Duncan**, PhD, PT, FAPTA, FAHA
Professor of Neurology, Wake Forest Baptist Health
- Co-PI: **Cheryl Bushnell**, MD, MHS, FAHA
Professor of Neurology and Director, WFB Comprehensive Stroke Center
- Co-PI: **Wayne Rosamond**, PhD, MS, FAHA
Professor of Epidemiology, UNC Gillings School of Global Public Health and Director, North Carolina Stroke Care Collaborative



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COMPASS Overview

- Multi-site, pragmatic, clinical trial
- Stroke patients who go home directly from the hospital
- COMPASS (combines transitional care and early supported discharge for) Vs. usual care



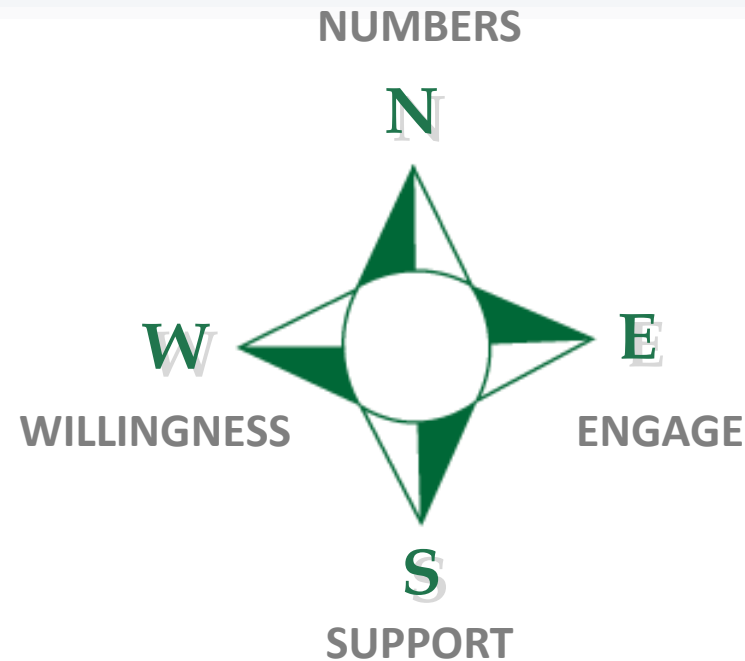
Does COMPASS...

- Improve patients' daily function?
- Reduces caregiver strain?
- Reduce hospital readmission rates?
- Reduce use of health care?
- Reduce mortality



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Finding the Way Forward



Numbers

Know your numbers -blood pressure, blood sugar, cholesterol, etc.

Engage

Be active - engage your mind and body

Support

Ask for help - for yourself and your caregivers from community resources

Willingness

Be willing – manage your medicines and lifestyle choices



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COMPASS Care Model



- **Model:** Early supported discharge
- **Care Team:** stroke trained APP and post-acute coordinator (RN) for care coordination
- **eCOMPASS:**
 - **Chronic disease management:** Connects hospitals, community providers, and community agencies
 - **Billable** with Transitional Care Management or Complex Clinical Management, consistent with MACRA requirements
 - **Individualized care plan** addresses the needs of stroke survivors and their caregivers



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PRO example

Post Stroke Functional Assessment for Personalized Care

12% Complete

Have you fallen in the last 3 months?

☒ Yes

☐ No

a. In the last 3 months, did you get injured and need to go to the doctor or emergency room due to a fall?

☒ Yes

☐ No

☐ No Response

b. Have you fallen more than once in the last 3 months?

☒ Yes

☐ No

☐ No Response



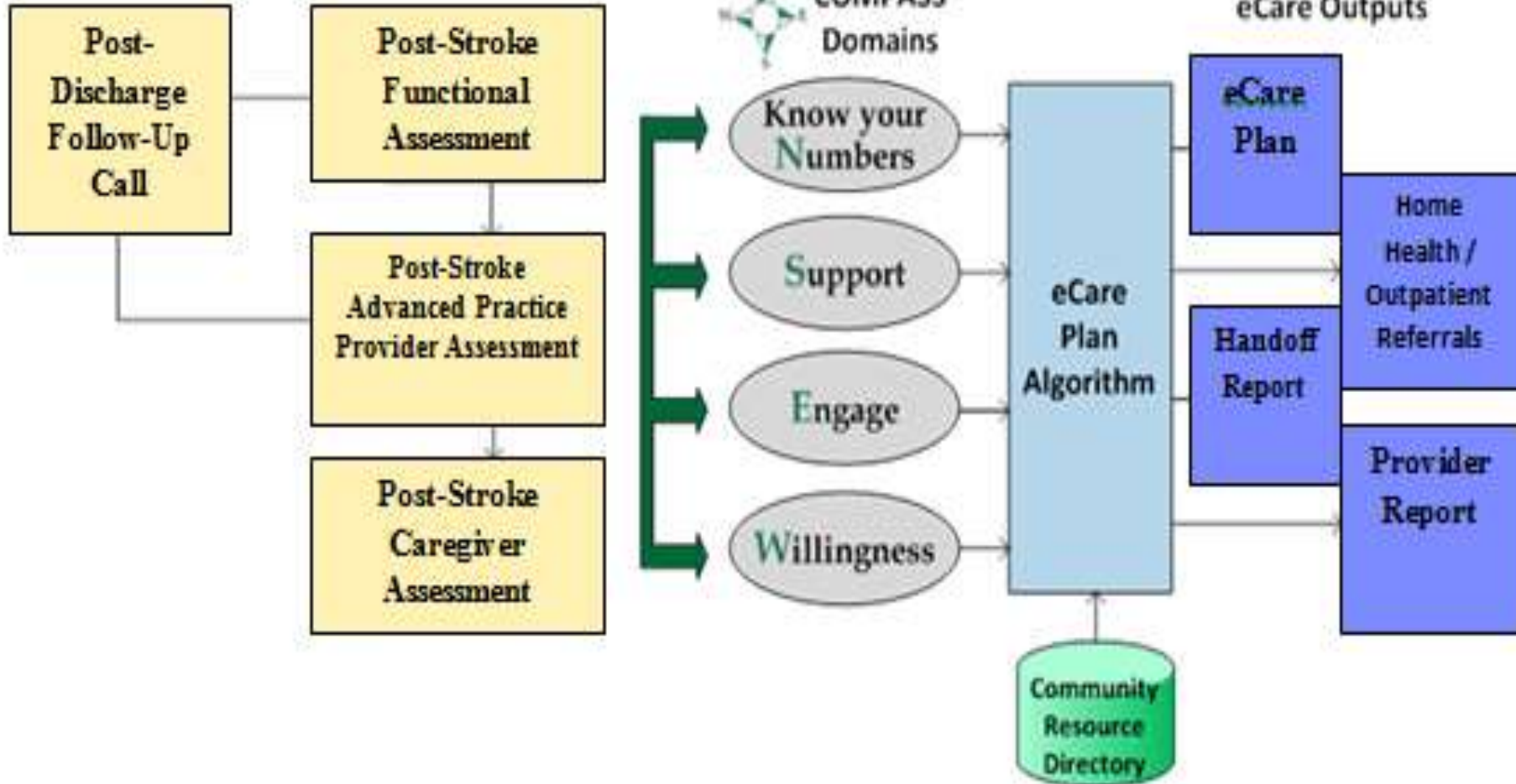
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2-Day Call

Clinic Visit at 7-14 Days

eCare Plan Generation





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COMPASS: Finding my Way for Recovery, Independence, and Health

Name: Christina Condon ID: 7 January 19, 2016 Page 3

 COMPASS <small>COMPREHENSIVE POST-ACUTE STROKE SERVICES</small>	What are my concerns?	Why is this important to me?	How do I find my way forward?
<p>Engage: Be engaged in my overall health and well-being</p> 	<p>It is difficult to use my hand affected by my stroke.</p>	<p>Therapy, exercise, and physical activity will improve the use of my hand and arm.</p>	<p>I can improve the use of my hand and arm by:</p> <ul style="list-style-type: none"> • Working with a physical and/or occupational therapist in my home or an outpatient clinic. • Exercising regularly on my own or in an exercise class. • Being physically active in my daily life and trying to use my arm and hand as much as possible.
	<p>My muscles feel stiff and I am having trouble moving, walking, or using my hand and arm.</p>	<p>Medicines, therapy, exercise, and physical activity can decrease the stiffness (also called spasticity) in my muscles. This will help me be more independent and safe in my daily activities.</p>	<p>I can decrease the stiffness in my muscles by:</p> <ul style="list-style-type: none"> • Working with a physical and/or occupational therapist in my home or an outpatient clinic. • Doing stretching and strengthening exercises. • Taking medicines to relax my muscles. • Seeing a specialist in spasticity treatment.
	<p>I have fallen or I am at risk for falling.</p>	<p>I am more likely to fall since I had a stroke. Improving my balance and strength will help decrease my chances of falling and improve my overall independence.</p>	<p>I can decrease my chances of falling by:</p> <ul style="list-style-type: none"> • Working with a physical therapist in my home or an outpatient clinic. • Attending a falls prevention class • Using appropriate walking aids for support • Having a home safety assessment
	<p>I am not independent in some of my routine activities like dressing or bathing myself, or being able to control my bladder/bowels.</p>	<p>Being as independent as possible will increase my confidence in my recovery. This will make it easier for my loved ones to care for me.</p>	<p>I can become more independent in my routine activities by:</p> <ul style="list-style-type: none"> • Working with a physical and/or occupational therapist in my home or an outpatient clinic. • Working with a home health aide on bathing and dressing • Getting adaptive equipment (e.g., tub chair) that can help with my activities



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Community Resources

Community Resources: Numbers

Piedmont Triad Regional Council Area Agency on Aging Extended Health Community Programs

Organization and Program Information: (336) 904-0300
1398 Carrollton Crossing Drive,
Kernersville, NC 27284
<http://www.ptrc.org/index.aspx?page=204>

This program has a special referral process, please see website.

NC DHHS Vocational Rehabilitation

Organization and Program Information: (919) 855-3500
101 Blair Drive
Raleigh, NC 27603
<https://www.ncdhhs.gov/divisions/dvrs/vr-local-offices>

This program has special eligibility requirements, please see website.



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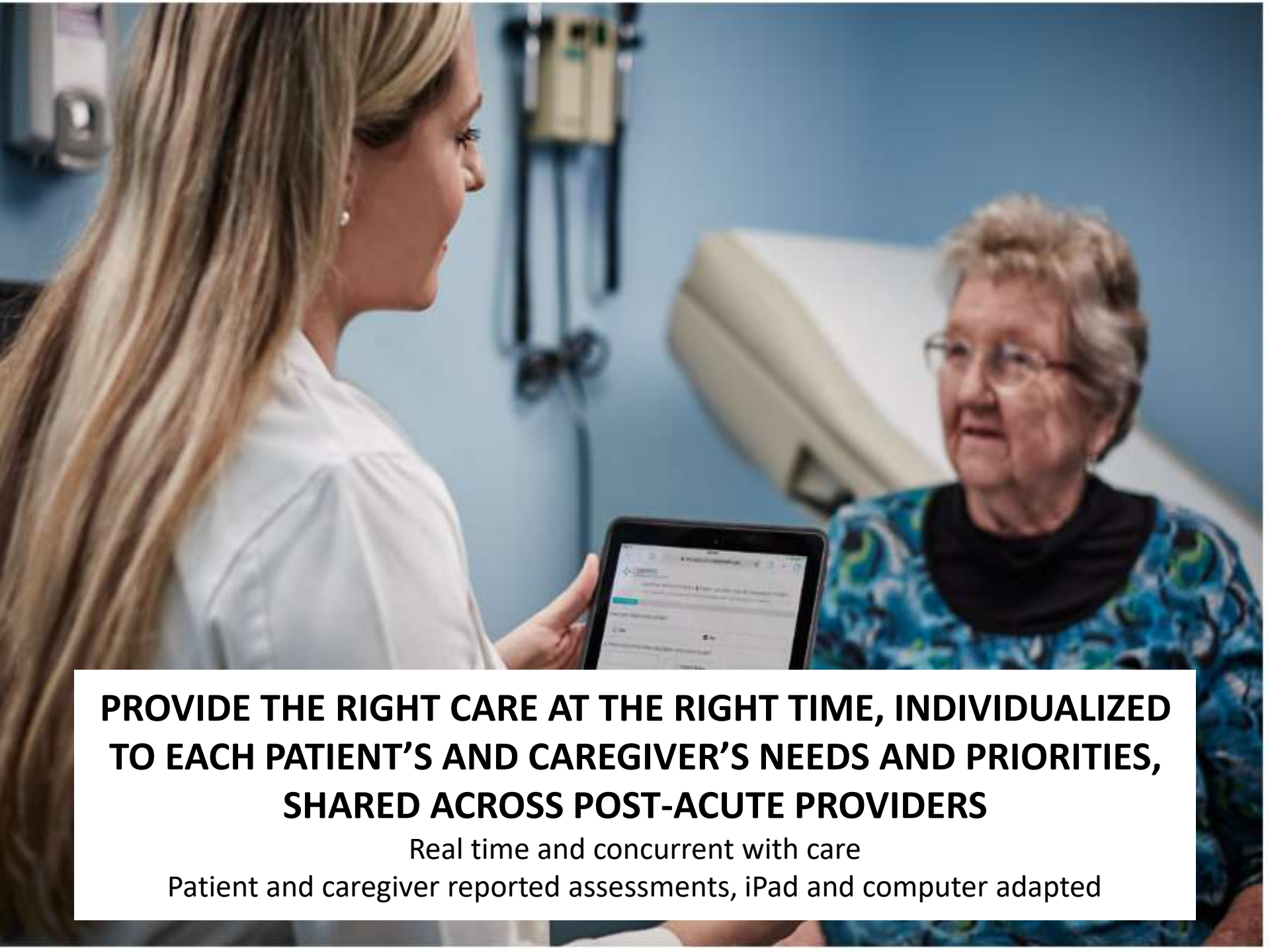
COMPASS an eCare Application

Good Care is Good Business

'' [We] implemented this today and what a difference it made. Our time was greatly reduced from check in to check out~ You can't imagine what a sense of accomplishment that was!!! ''

Young L MCA occlusion stroke w/cryptogenic etiology. PMH included anxiety, pelvic mass suspicious of cancer, heart fluttering (no atrial fib dx to date), PE w/last admission. I saw her during last hospitalization.

She presented today w/initial SBP 170. After visit SBP 140. Again, this was a classic engaged, yet "highly anxious" patient that had multiple t/c appts. Cryptogenic stroke w/high suspicion of hypercoag state (is on heparin). She came to our visit to evaluate "pelvic mass" w/hysterectomy. She did not make it to surgery and came to our hospital. She had an occlusion to her left MCA and was treated with IV tPA (after laboring for 30 minutes). Post tPA, her stroke score was 0-1. Her main concerns today centered around why she was feeling so tired and why her stroke was improving, yet her heart was racing and she couldn't sleep. After our investigation, we determined that her anxiety was significantly reduced and she trusted our plan of care along w/appreciating both of us helping her navigate the multitude



**PROVIDE THE RIGHT CARE AT THE RIGHT TIME, INDIVIDUALIZED
TO EACH PATIENT'S AND CAREGIVER'S NEEDS AND PRIORITIES,
SHARED ACROSS POST-ACUTE PROVIDERS**

Real time and concurrent with care

Patient and caregiver reported assessments, iPad and computer adapted

eCompass Architecture

- Compass is a platform for chronic health management to provide patient specific care plans
 - Patient assessments
 - Provides customized patient-specific care plans through proprietary algorithms
 - Integrated community resources database
 - Care plans remotely accessible by the patient or care team
 - Provides custom reports, performance indicators
- Initially developed for Stroke
 - Capable of being adapted to other domains



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eCompass Architecture

- Considered using a 3rd party tool – TONIC for Healthcare but the customization limitations were too great
- Could have used an existing PopHealth tool integrated into EHR platform itself (Healthy Planet for Epic)
 - Would require every site to have the same PopHealth solution or we have to develop a version for each HIT platform
 - Potential licensing challenges
 - We found insufficient capabilities for our needs
 - Most population health tools allow you to manage groups of patients (registry) but not as individuals



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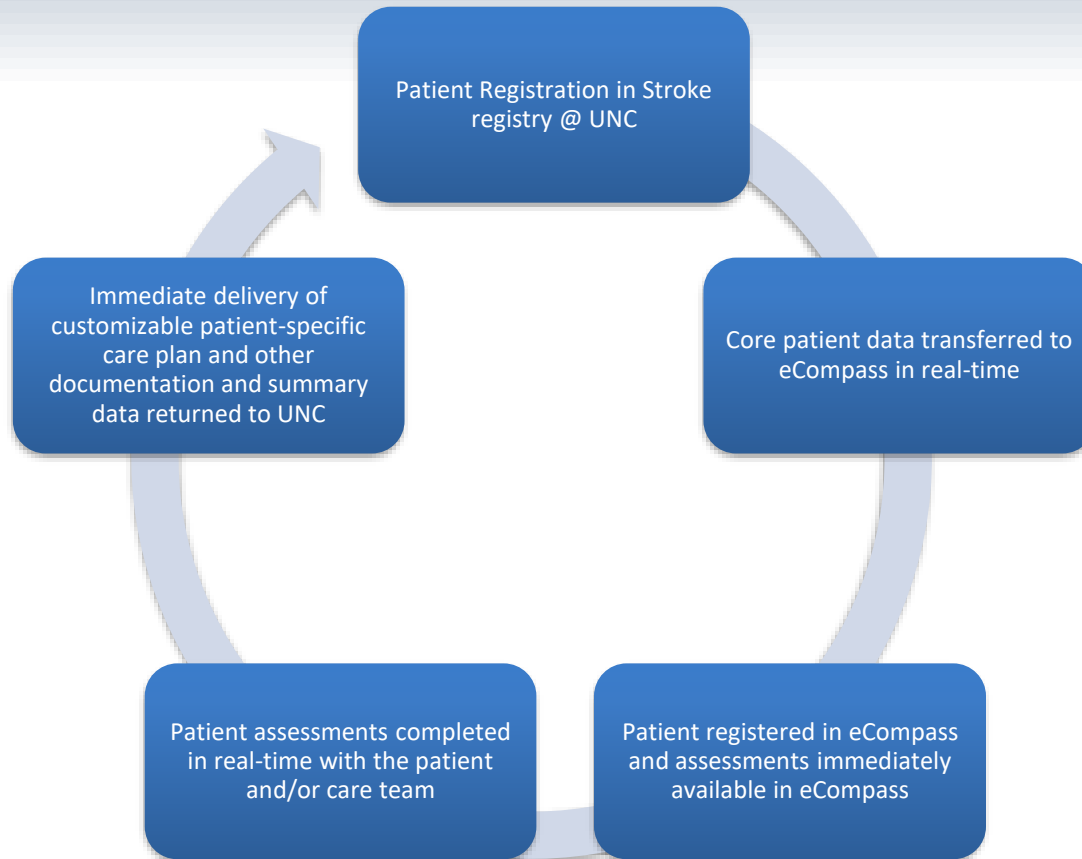
eCompass Architecture

- eCompass developed using an existing research platform, using existing expertise/tools
 - Developed a web-based application that is used by all hospitals for care plan generation
 - Data are transferred in real-time from UNC Stroke Registry and assessments are entered in real-time
 - Patient-specific, care plans are generated while the patient is still here



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eCompass Data Flow



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eCompass Architecture

- eCompass Research Platform Implementation
 - Used existing resources and expertise
 - Web-application
 - Adobe ColdFusion application server
 - HTML forms, responsive UI
 - SQL Server RDBMS
 - SAS
 - Was tedious & time consuming, not complicated
 - Technology isn't the challenge
 - Luxury of identification of cases from registry @ UNC



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eCompass Architecture

- Implementation within the HIT platform would have been limited by
 - How would we identify cases within the HIT platform? ICD10 codes at discharge?
 - HIT standardization across 41 participating hospitals
 - Where/how does the app get launched? Security?
 - Inabilities to easily save data in discrete fields
 - Lack of suitable workflows to customize care plans
 - How would PROs work within that environment?
 - Getting priority within HIT team to build what ever was possible is a challenge



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Patient Specific Care Plans

- Generated using proprietary algorithms
 - SAS code is dynamically run each time care plan is generated
 - Gathers most current data we have from that patient or their care team
 - Runs through a series of algorithms to determine what specific health concerns exist for this patient
 - Prompt provider for customizations
 - Generate PDF, available electronically

Medication Management Issues

If.....

- (MedDiff <=4) AND
- (MMAS2_SF = 0 OR 1) AND
- (MMAS1_SF = 0) AND
- (MedMng_SF = 1 OR -6) AND
- (Cogmed_SF = 1 OR -6) AND
- (Cogseq_SF = 1) AND
- (Cogdate_SF = 1 OR -6) AND
- (CogRcl_SF = 1 OR -6) AND
- (PurMed_SF = 1) AND
- (MedMny_SF =0)



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eCare App Patient Demo



Date: 04/16/2017 11:09 AM / Patient: Mary Poppins / Age: 67 / Compass ID: 320205

Home

- Build eCare Plan
- View eCare Plan
- Provider Report
- Provider Report Comment

Patient Form Status

- Two-Day Post-Discharge Follow-up
- Post Stroke Functional Assessment
- Stroke Caregiver Assessment
- Post Stroke Advanced Practice Assessment
- Post-Discharge Follow-up Call Disposition
- 7-14 Day Visit Disposition
- Clinical Research Consent iPad

Patient Demographics

Compass ID:	320205 (COMPASS)	Patient Name:	Mary Poppins
Date of Birth:	August 2, 1949	Age:	67
Gender:	Female	State / County of Residence:	NC / Orange



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eCompass Sustainability

- Sustainability of eCompass as a research platform is quite limited
 - Once Compass funding ends, support for the research platform ends, data transfer issues, etc.
 - Long term sustainability requires integration with EHR
 - Could build the functionality into the EHR but would be time consuming, \$\$\$\$, etc.
 - Could leverage the EHR system as a software platform...
 - Cloud-based application
 - Enter Smart on FHIR...



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eCompass Smart on FHIR

- SMART on FHIR is an open, standards-based platform for building reusable/interchangeable medical apps
 - SMART, which stands for Substitutable Medical Applications & Reusable Technologies
 - SMART’s mission was to create a platform specification allowing app developers to write medical apps once and have them run (“plug-and-play”) across diverse healthcare IT systems



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eCompass Smart on FHIR

- SMART
 - The building blocks would be common data models, vocabularies, and APIs.
 - Modern standards would be supported, lowering the barriers to development (e.g. HTML, JavaScript, Java)
 - SMART aimed to shield medical app developers from the low-level and widely divergent details of each healthcare IT vendor's system, such as vendor-specific data schemas, proprietary coding, and workflow environment



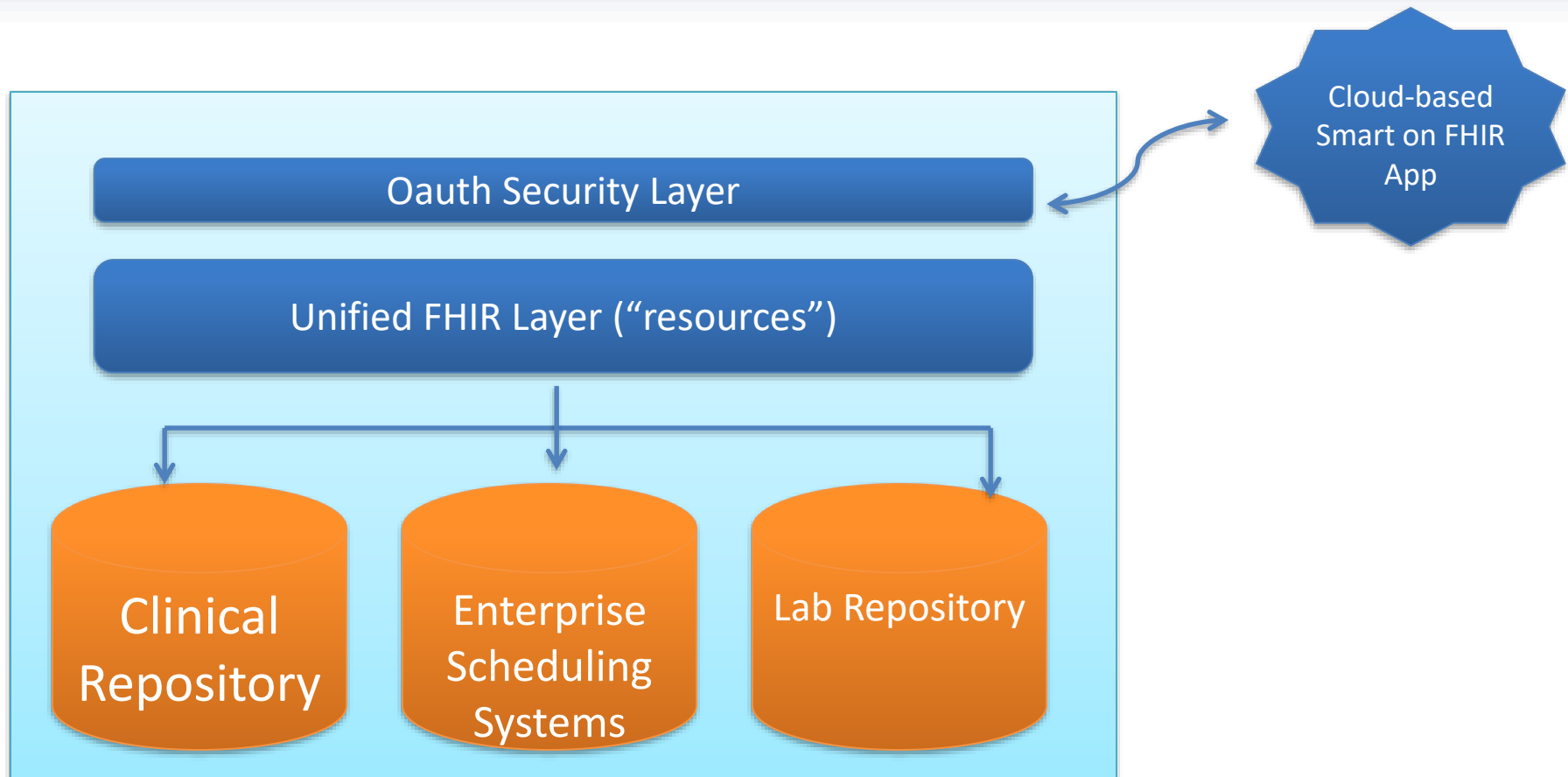
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eCompass Smart on FHIR

- FHIR
 - Health Level 7 (HL7®) developed a new clinical data standard called Fast Health Information Resources (FHIR®).
 - Defines a set of "[Resources](#)" that represent granular clinical concepts (patients, encounters, allergy tolerance, etc)
 - FHIR developed its data models and API in a manner very similar to SMART: translating medical concepts into resource definitions and providing for granular data access of data through APIs.
 - In addition, FHIR provided API support for population queries and write-back capability.



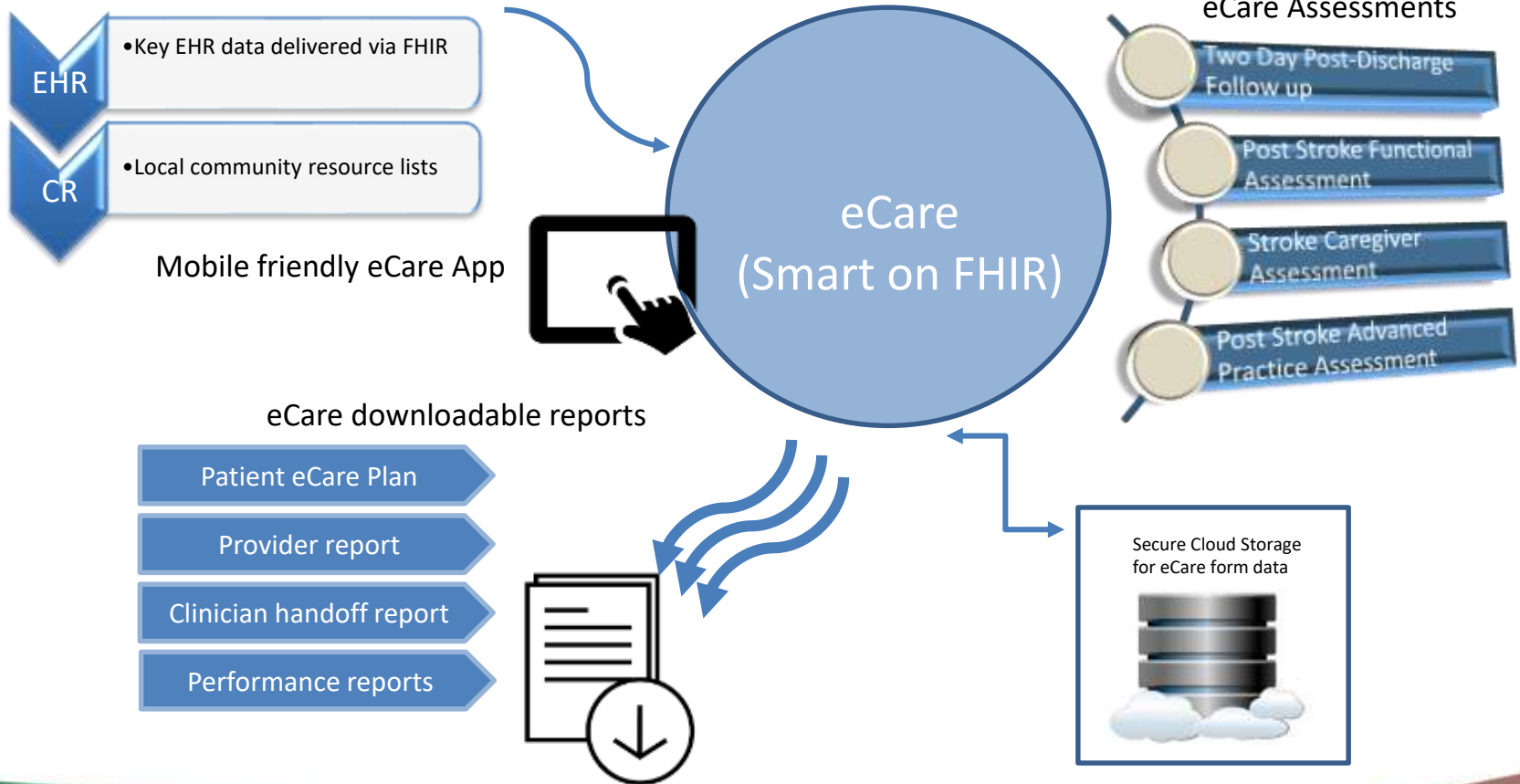
Unified Data Access via FHIR





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eCompass Long Range Plan

- Compass - EHR Integration will be required
 - Eventual development of a SMART/FHIR-based version of eCompass
 - Cloud-hosted making it available to any number of health systems which have a FHIR-enabled EHR platform
 - Integrated chronic health care plans for patients with multiple chronic conditions
 - Addition of predictive analytics to improve the current 'static' algorithms



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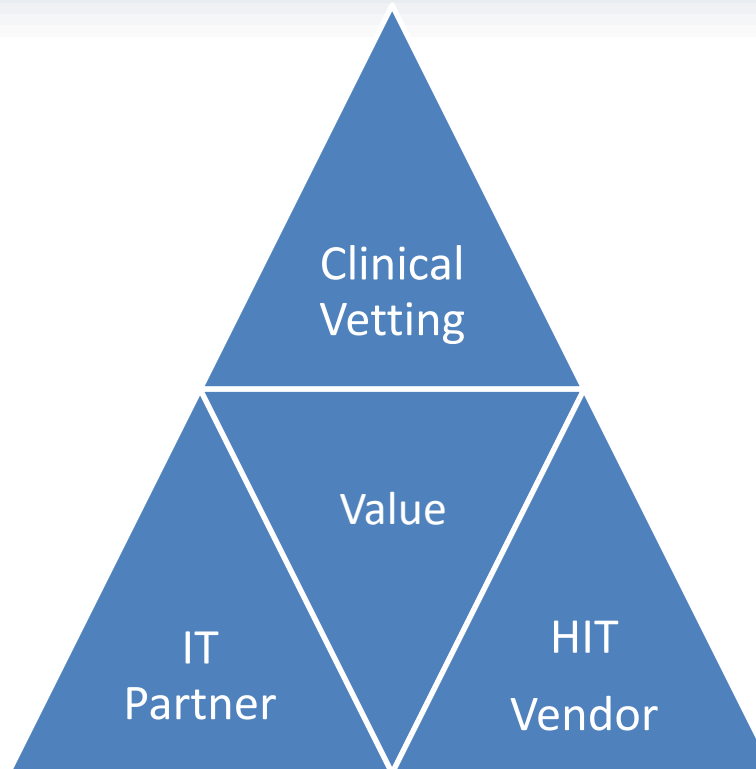
Major Challenges

- Need a HIT independent solution which supports emerging standards for interoperability
- Need HIT support for writing-back of data to the EHR platform
- Other major challenges?



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Results

Presented in Table 1 and Figure 2 are selected findings from the first 342 patients with complete eCOMPASS® care plans, enrolled July 2016 through April 2017.

Table 1. Selected eCOMPASS® Domains Identifying Concerns, N=342, Freq. (%)

Medication Management	
> 5 medications/day	253 (74.0)
Low Adherence	74 (21.6)
Financial Challenges	75 (21.9)
Cognitive / Psychosocial Factors	
Cognitive Deficits	141 (41.2)
Depression	128 (37.4)
Social Isolation	29 (8.5)
Limited Social Support	86 (25.1)
Lack of Risk Factor Knowledge	
Blood Pressure	125 (36.5)
Smoking	247 (72.2)
Diabetes	271 (79.2)
Atrial Fibrillation	320 (93.6)
Heart Disease	304 (88.9)
High Cholesterol	195 (57.0)
Physical Inactivity	288 (84.2)
Healthcare Utilization	
No PCP	23 (6.7)
ED Visit in last 3 mos	63 (18.4)
Hospitalized in last 3 mos	37 (10.8)

Results (continued)

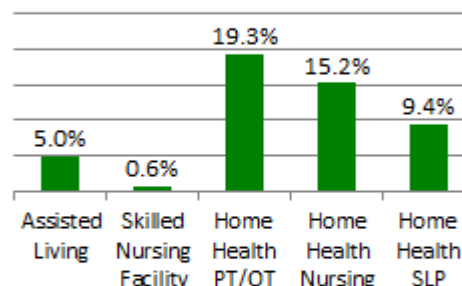
Table 1. (continued)

Functional Health	
Upper extremity difficulty	74 (21.6)
Spasticity	59 (17.3)
Physical mobility/safety	129 (37.7)
Poor/fair self-rated health *	75 (22.1)
Fall in the last 3 mos	80 (23.4)
ADL Limitations	83 (24.3)
IADL Limitations	59 (17.3)
Communication Deficits *	31 (9.8)
Caregiver Health *	
No Able/Willing Caregiver	25 (8.0)
Caregiver Stress	50 (30.7)
Caregiver Requires Help	18 (11.0)
Caregiver Health Limitations	28 (17.2)
Lifestyle Factors*	
Smoking	60 (19.0)
Alcohol Abuse	15 (4.7)
Recreational Drug Use	10 (3.2)
Physical Inactivity	147 (47.1)
Risk Factors *	
Systolic BP > 140	99 (31.3)
Diastolic BP > 90	23 (7.3)
LDL > 100	109 (50.7)
HgbA1c > 8.0	28 (20.7)

* Missing values excluded; Denominator <342

Results (continued)

Figure 2. Selected eCOMPASS® Referrals, N=342



There were significant differences in patients who were identified as needing services by age, gender, insurance type, NIH Stroke Scale, and primary stroke center status, but not race/ethnicity, or geography.



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- **DISCLAIMER:** All statements are solely those of the presenters and do not necessarily represent the views of PCORI or its Board of Governors or Methodology Committee.
- **NCT Number for ClinicalTrials.gov:** NCT02588664

<https://www.nccompass-study.org/>



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