Stroke Transitional Care and the Continuum of Acute, Prevention, and Rehab StrokeNet Trials

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Disclosures

• Research salary support from
  • PCORI as co-PI of the COMPASS Study
  • AHRQ R01 co-PI of analyses to assess the cost of implementing COMPASS
• Ownership in Care Directions, LLC; a new company to commercialize the COMPASS-Care Plan
PCORI Disclosure and Disclaimer

Funding: Patient-Centered Outcomes Research Institute (PCORI) Award (PCS-1403-14532).

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
Objectives

• To describe what stroke transitional care looks like
• To provide the results of the COMPASS Study: A Transitional Care Model
• To discuss the potential impact of transitional care on StrokeNet trials
• To list the next steps for stroke transitional care models
Stroke Transitional Care

What does this look like?
Background

- Over 50% of stroke and TIA patients are discharged directly home after a brief hospital stay (e.g. 3 days) or observation
- Multiple comorbidities, suboptimal risk factor management, residual disabilities and at risk for complication
- Recurrent stroke risk highest in first 30 days
  - Secondary prevention is critical

- Post-acute care is fragmented

- Effective transitional care (TC) is a priority for improved care coordination
Why is transitional care so hard?

• Lack of integration between hospital and outpatient settings
  • Different facilities and health systems
  • Different providers (primary care or specialist is out of network) and ineffective handoffs about the care plan post-stroke
• Differences in insurance coverage (many home health agencies do not take certain types of insurance)
• Variability in community resources
• Distance between hospital and home—transportation can be a major barrier
Health Literacy and Transitional Care

Figure 1. Health literacy nested within social determinants of health (education, race/ethnicity, income and wealth, community and environment, and English proficiency), which in turn are associated with a range of intermediate- and long-term healthcare outcomes.
Many patients do not receive any post-acute stroke services

What do our stroke patients say about transitional care?

"I am not a clinician, I just know what I needed; and I know what other stroke patients need."

"So what is in place for the patient? Nothing. Seriously: nothing. No visiting nurse, no one to answer questions, or help them get what they need. That is why people end up back in the hospital."

I ignored the symptoms of my first stroke because I didn’t know enough.
Stroke systems of care recommendations post-acute care

1. Stroke centers should use organized approaches to ensure that all patients receive appropriate postacute care

2. Stroke centers should adopt approaches to secondary prevention that address all major modifiable risk factors and are consistent with the national guidelines for all patients with a history or a suspected history of stroke or TIA.

Stroke systems of care recommendations for post-acute care

3. A stroke system should establish support systems to ensure that all patients discharge from hospitals and other facilities to their homes have appropriate follow-up with specialized stroke services when needed and primary care arranged on discharge.

4. To standardize postacute care after stroke discharge, stroke centers should comprehensively screen for postacute complications, provide individualized care plans during the transition of care, provide referrals to community services, and reinforce secondary prevention and self-management of stroke risk factors and lifestyle changes to decrease risk of recurrent stroke.

Centers for Medicaid and Medicare Services (CMS)

- Transitional Care Management (TCM) codes
- From date of discharge through first 30 days
- Only one provider can bill these codes, CMS will pay the first claim it receives

### 99495 TCM Moderate Complexity
- Communication with patient and/or caregiver within 2 business days post-discharge
- Medical decision making of at least moderate complexity
- **Face-to-face visit within 14 days post-discharge**
- Medicare fee schedule: **$152.02**

### 99496 TCM High Complexity
- Communication within 2 business days post-discharge
- Medical decision making of high complexity
- **Face-to-face visit within 7 calendar days post-discharge**
- Medicare fee schedule: **$214.76**
# Hospital Survey Stroke Transitional Care

<table>
<thead>
<tr>
<th>TCM Components</th>
<th>TCM qualifying services of all 41 hospitals, n (%)</th>
<th>Hospitals with 1 TCM component, n (%)</th>
<th>TCM definition met (all 3 components), n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone f/u 48-72 h</td>
<td></td>
<td>15 (36.6)</td>
<td>13 (31.7)</td>
</tr>
<tr>
<td>Face-to-face provider f/u within 14 d</td>
<td></td>
<td></td>
<td>31 (75.6)</td>
</tr>
<tr>
<td>&gt;80% of patients with PCP appointment w/in 14 d</td>
<td>15 (36.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke f/u with neurology w/in 14 d</td>
<td>4 (9.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/u within 14 d any PCP, specialist, APP</td>
<td>26 (63.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13 or 32% of hospitals reported services that met TCM criteria
One third of hospitals used stroke service personnel for telephone f/u

COMprehensive Post-Acute Stroke Services (COMPASS)

Transitional care model tested in real world practice
Objective

• Evaluate effectiveness of comprehensive transitional care versus usual care on patient-centered outcomes after stroke or TIA 90 days after discharge
• Primary outcome: Stroke Impact Scale-16 (functional status)
• Secondary outcomes: BP self-monitoring, survival, incident falls, disability (modified Rankin Score), depression, self-rated health, satisfaction with provider communication and care coordination
Pragmatic Trial of Transitional Care Management

• Cluster-randomized pragmatic trial
• 40 randomized hospital units in North Carolina
• 5,882 patients discharged home
• Transitional care was implemented in clinical workflow, consistent with CMS policies and reimbursement
• Primary outcome: 90-day functional status using Stroke Impact Scale (SIS-16)

Duncan et al. 2017 BMC Neurology, 17(133); Duncan et al. A Randomized Pragmatic Trial of Stroke Transitional Care: The COMPASS Study (under review)
Intervention: A Comprehensive Care Model

Care Team:
- Advanced Practice Provider (APP) or Physician
- Post-Acute Care Nurse Coordinator (PAC)

Intervention Highlights:
- Digital tool to assess functional and social determinants of self-management and health
- Individualized care plans:
  - Secondary Prevention
  - Rehabilitation and Recovery
  - Caregiver Support
  - Referrals to Community Resources
- Quality performance measures

Bushnell et al. 2018 American Geriatrics Society, 66(5).
## Patient Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Intervention (N=2689)</th>
<th>Usual Care (N=3193)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, mean years (SD)</strong></td>
<td>68.0 (13.8)</td>
<td>66.3 (13.9)</td>
</tr>
<tr>
<td><strong>Female sex, %</strong></td>
<td>48.3</td>
<td>51.9</td>
</tr>
<tr>
<td><strong>Race, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>79.1</td>
<td>67.2</td>
</tr>
<tr>
<td>Non-white</td>
<td>20.9</td>
<td>32.8</td>
</tr>
<tr>
<td><strong>Diagnosis, %</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>63.3</td>
<td>64.0</td>
</tr>
<tr>
<td>TIA</td>
<td>36.7</td>
<td>36.0</td>
</tr>
<tr>
<td><strong>NIH Stroke Scale Score, median (IQR)</strong></td>
<td>1 (0-3)</td>
<td>1 (0-3)</td>
</tr>
<tr>
<td><strong>Missing</strong></td>
<td>45</td>
<td>120</td>
</tr>
</tbody>
</table>

Duncan et al: Randomized Pragmatic Trial of Stroke Transitional Care The COMPASS Study. Circ Qual Cardiovasc Outcomes 2020; Volume 13, Issue 6, June 2020; e006285. [https://doi.org/10.1161/CIRCOUTCOMES.119.006285](https://doi.org/10.1161/CIRCOUTCOMES.119.006285)
Statistical Analyses

- Primary analysis: Intention-to-treat (ITT) compared intervention versus usual care using mixed linear/logistic regression with random effect for hospital
- Adjustment for age, sex, race, stroke severity (NIHSS), and diagnosis
- Inverse probability of ascertainment weights accounted for outcome nonresponse

Variable Receipt of Care Model Across Hospitals: Implementation Analysis

- **System-level barriers**: consistent staffing, competing priorities, did not enroll or schedule patients prior to acute care hospital discharge.
- Only 58% of hospitals delivered the intervention uninterrupted.

Duncan et al: Randomized Pragmatic Trial of Stroke Transitional Care The COMPASS Study. Circ Qual Cardiovasc Outcomes 2020; Volume 13, Issue 6, June 2020; e006285. [https://doi.org/10.1161/CIRCOUTCOMES.119.006285](https://doi.org/10.1161/CIRCOUTCOMES.119.006285)
Primary Results: Intention to Treat (ITT)

- All of the patients in the “COMPASS Intervention” group compared to all of the patients in the “Usual Care” group.

Duncan et al: Randomized Pragmatic Trial of Stroke Transitional Care The COMPASS Study. Circ Qual Cardiovasc Outcomes 2020; Volume 13, Issue 6, June 2020; e006285. [https://doi.org/10.1161/CIRCOUTCOMES.119.006285](https://doi.org/10.1161/CIRCOUTCOMES.119.006285)
Results: SIS-16

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Intervention</th>
<th>Usual Care</th>
<th>Adjusted ITT Treatment Effect (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional status (SIS-16)</td>
<td>80.6 ± 21.1</td>
<td>79.9 ± 21.4</td>
<td>0.61 (-1.74 to 2.97)</td>
</tr>
</tbody>
</table>

Linear mixed model included hospital-specific random effect and was adjusted for randomization stratum, stroke diagnosis, NIHSS score, age, and race. Inverse probability weights accounted for outcome nonresponse.

### Results: ITT Secondary Outcomes: Continuous

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Standardized Estimate (mean/SD, 95% CI)</th>
<th>Mean Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke Impact Scale 16</td>
<td></td>
<td>0.61 (-1.74 to 2.97)</td>
</tr>
<tr>
<td>Cognition</td>
<td></td>
<td>-0.19 (-0.77 to 0.38)</td>
</tr>
<tr>
<td>Self-rated health</td>
<td></td>
<td>-0.49 (-3.09 to 2.12)</td>
</tr>
<tr>
<td>Less fatigue</td>
<td></td>
<td>-0.18 (-1.22 to 0.86)</td>
</tr>
<tr>
<td>Satisfaction - provider communication</td>
<td></td>
<td>0.71 (-0.88 to 2.31)</td>
</tr>
<tr>
<td>Satisfaction - care coordination</td>
<td></td>
<td>0.08 (-0.05 to 0.20)</td>
</tr>
</tbody>
</table>

The figure shows a forest plot with the standardized estimate for each outcome, indicating whether the COMPASS Care Model favors the intervention (favors COMPASS Care Model).
Results: ITT Secondary Outcomes Categorical

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure monitoring</td>
<td>1.43 (1.21 to 1.70)</td>
</tr>
<tr>
<td>Survival to 90 days</td>
<td>1.04 (0.62 to 1.75)</td>
</tr>
<tr>
<td>No incident fall</td>
<td>1.00 (0.83 to 1.21)</td>
</tr>
<tr>
<td>Less disability</td>
<td>0.88 (0.77 to 1.01)</td>
</tr>
<tr>
<td>Medication adherence</td>
<td>1.15 (0.78 to 1.68)</td>
</tr>
<tr>
<td>No depression</td>
<td>0.97 (0.74 to 1.26)</td>
</tr>
<tr>
<td>Physical activity (150+ min/wk)</td>
<td>0.93 (0.79 to 1.09)</td>
</tr>
</tbody>
</table>
Readmissions Analysis with Claims

Medicare linkage to COMPASS participants


<table>
<thead>
<tr>
<th>Baseline Characteristics of Hospitals and Patients by Study Arm for those with baseline CMS Medicare FFS Coverage</th>
<th>Treatment Arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>INV (N=1070)</td>
</tr>
<tr>
<td><strong>Hospitals</strong></td>
<td></td>
</tr>
<tr>
<td>No. of hospital units</td>
<td>19</td>
</tr>
<tr>
<td>Joint Commission Primary Certified Stroke Center - n (%)</td>
<td>868 (81.1)</td>
</tr>
<tr>
<td>Academic affiliation - n (%)</td>
<td>276 (25.8)</td>
</tr>
<tr>
<td>Urban-rural classification – n (%)</td>
<td></td>
</tr>
<tr>
<td>Metro</td>
<td>591 (55.2)</td>
</tr>
<tr>
<td>Micro</td>
<td>355 (33.2)</td>
</tr>
<tr>
<td>Rural</td>
<td>124 (11.6)</td>
</tr>
<tr>
<td><strong>Patients</strong></td>
<td></td>
</tr>
<tr>
<td>Age mean years (SD)</td>
<td>74.9 (10.15)</td>
</tr>
<tr>
<td>Female sex - n (%)</td>
<td>525 (49.1)</td>
</tr>
<tr>
<td>White race - n (%)</td>
<td>912 (85.6)</td>
</tr>
<tr>
<td>Stroke – n (%)</td>
<td>649 (60.7)</td>
</tr>
<tr>
<td>TIA – n (%)</td>
<td>421 (39.4)</td>
</tr>
<tr>
<td>NIHSS Score(median (IQR))</td>
<td>1 (0-3)</td>
</tr>
<tr>
<td>Medical history &amp; comorbidity - n (%)</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>850 (79.4)</td>
</tr>
<tr>
<td>Prior Stroke</td>
<td>229 (21.4)</td>
</tr>
<tr>
<td>Prior TIA</td>
<td>132 (12.3)</td>
</tr>
<tr>
<td>Atrial Fibrillation or flutter</td>
<td>204 (19.1)</td>
</tr>
<tr>
<td>Heart Failure</td>
<td>99 (9.3)</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>267 (25.0)</td>
</tr>
<tr>
<td>Depression</td>
<td>97 (9.1)</td>
</tr>
<tr>
<td>Smoking in past year</td>
<td>143 (13.4)</td>
</tr>
</tbody>
</table>
# Readmissions and Mortality
(Medicare Fee-for-service, Intention-to-treat Analysis)

<table>
<thead>
<tr>
<th></th>
<th>Intervention %</th>
<th>Usual Care %</th>
<th>Intervention Effect (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30d All-cause readmission</td>
<td>11.6</td>
<td>9.6</td>
<td><strong>OR: 1.32 (0.88-1.97)</strong></td>
</tr>
<tr>
<td>90d All-cause readmission</td>
<td>22.2</td>
<td>19.8</td>
<td><strong>OR: 1.20 (0.90-1.59)</strong></td>
</tr>
<tr>
<td>1yr All-cause readmissions</td>
<td>38.7</td>
<td>36.3</td>
<td><strong>HR: 1.05 (0.91-1.22)</strong></td>
</tr>
<tr>
<td>1yr Stroke readmissions</td>
<td>6.7</td>
<td>5.0</td>
<td><strong>HR: 1.26 (0.90-1.77)</strong></td>
</tr>
<tr>
<td>1yr Mortality</td>
<td>8.5</td>
<td>8.8</td>
<td><strong>HR: 0.93 (0.70-1.23)</strong></td>
</tr>
</tbody>
</table>

- Overall, one fifth were readmitted at 90 days, and over one third were readmitted within a year.
- 30d risk of readmission was similar between intervention and usual care patients

Results: Within Intervention Hospitals

• We looked at just the COMPASS intervention group and compared the patients who GOT the intervention with the patients who did NOT GET the intervention.

Duncan et al. A Randomized Pragmatic Trial of Stroke Transitional Care: The COMPASS Study (under review)
Post-Hoc Within Hospital Treatment Effect Rationale

• Per protocol analysis assumes usual care hospitals offered little post-acute care. Yet usual care was heterogeneous and some hospitals may deliver TC

• Therefore, we estimated the average within-hospital treatment effect compared outcomes treated versus non-treated patients

• Adjustment for confounding using propensity scores

Results: Post-Hoc within hospital treatment effects

Major Differences Between Functional Status and Readmissions Outcomes/Analyses

**Functional Status at 90 days**
- Dependent on receiving intervention AND capturing outcome
- Similar outcome capture in intervention and usual care groups, but 40% lost to f/u
- Clear linear relationship between discharge and outcome
- Unclear what services were utilized in each group

**Readmissions at 90 days**
- Analysis cohort based on Medicare beneficiaries and successful linking between COMPASS and claims
- Outcomes based on claims and “capture” rate is 100%
- Outcome could occur before the exposure to the intervention, limiting cause and effect conclusion
- Documentation of health care utilization and ambulatory visits
COMPASS: Lessons from Implementation

Pragmatic trials and tribulations
Characteristics of Successful Sites: Implementation Analysis

- Commitment/Champion for the Model in Acute Care
- Vision
- System Resources
- Flexibility/Collaboration
- Location of Practice (Neurology Clinics)
- New Standard of Care

Lutz et al. Implementation of a Transitional Care Model for Stroke: Perspectives from Frontline Clinicians, Administrators, and COMPASS-TC Implementation Staff. *The Gerontologist* 2020; Published online April 20 Doi.org/10.1093/geront/gnaa029
Implementation of a billable transitional care model for stroke patients: the COMPASS study

Characteristics of patients who attended COMPASS clinic visit within 14 days

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic area of residence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban vs Non-urban</td>
<td>0.72</td>
<td>0.50-1.03</td>
</tr>
<tr>
<td>Diagnosis of stroke vs TIA</td>
<td>1.64</td>
<td>1.29-2.08</td>
</tr>
<tr>
<td>Prior History of Stroke/TIA</td>
<td>0.76</td>
<td>0.60-0.97</td>
</tr>
<tr>
<td>Distance to clinic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 15 miles</td>
<td>1.00</td>
<td>(reference)</td>
</tr>
<tr>
<td>15-29 miles</td>
<td>0.85</td>
<td>0.66-1.00</td>
</tr>
<tr>
<td>30-59 miles</td>
<td>0.71</td>
<td>0.50-1.00</td>
</tr>
<tr>
<td>60+ miles</td>
<td>0.33`</td>
<td>0.20-054</td>
</tr>
</tbody>
</table>

Fig. 3 Hospital-Specific Case Ascertainment. Bars represent the proportion of eligible patients enrolled at individual hospitals over the 4 months of case ascertainment audits. The numbers of patients enrolled out of all eligible patients during the audit period are indicated above each bar.
Transitional Care Management Uptake in COMPASS Hospitals

COMPASS Trial in Transitional Stroke Care Navigating Towards True North

Matt Reeves Editorial

“Despite its failure to show a significant change in patient outcomes, the COMPASS study represents an important landmark in the development of large-scale transition-relation intervention work in acute stroke. The study has set the benchmark for how to prepare and study the implementation of complex interventions....

“The COMPASS study demonstrates that it is time to start addressing the problem of stroke transition with greater seriousness—the problem is complex and the challenges great, but the need of the patient with stroke and caregiver has never been greater.”

Reeves. Circ Cardiovasc Qual Outcomes 2020
How does transitional care fit with StrokeNet trials?

Focus on acute and prevention trials
MOST

• What happens to patients enrolled in MOST in the early post-discharge transition?
• How many MOST patients are seen for clinical follow-up within the first 14 days?
• What impact would this transitional clinical care have on the primary and secondary outcomes?
• What proportion of MOST patients received rehabilitation?
ARCADIA

• Does transitional care impact enrollment?
• Does the quality of transitional care impact the primary outcome of stroke prevention?
• Does the quality of secondary prevention long term impact the primary outcome?
How to account for transitional care services in multi-center phase III trials

• Link to Claims
  • Lose a large proportion of patients and need to account for specific coverage for beneficiaries

• Link to Electronic Health Records
  • Increasingly used in pragmatic trials (ADAPTABLE)
  • Dependent on quality of documentation
  • Clinical Research Networks using this method (PCORNet and BP Control Laboratory)

• Patient reported outcomes via EHR portals, texting (Twillio), REDCap
• REDCap is now integrated with Epic through SMART on FIHR
Long term follow-up of chronic conditions: Link to clinical trials or interventions?

• CMS Chronic Care Management coding

• Requirements CPT 99490:
  • Minimum 20 minutes of clinical staff time directed by physician or other qualified health care professional, per calendar month in patients with:
    • multiple chronic conditions expected to last at least 12 months
    • Chronic conditions place patient at significant risk of death, acute exacerbation/decompensation, or functional decline
    • Comprehensive care plan established, implemented, revised, or monitored

• CPT 99487:
  • Same conditions as above
  • Moderate or high complexity medical decision making
  • 60 minutes of clinical staff time directed by physician or other qualified health care professional, per calendar month

• Patients sign consent for participation and have a co-pay
Next steps for COMPASS
Focused on secondary prevention
Advancements since the pragmatic trial

- COMPASS-CP has been integrated into Epic and the clinical workflow
  - Identifies patients with stroke ICD-10 codes in the hospital or ED
Dashboard and clinical workflow
What outcome is most relevant for stroke transitional care trials?

- Recovery
- Blood pressure
- Major Adverse Cardiovascular Events and Stroke
  - Physical Activity
  - Medication Adherence
  - Lifestyle Change
Conceptual model for BP management post-stroke

Medical Management
- Multidisciplinary team
- Monitoring BP
- Medication adjustments

Positive Lifestyle Changes
- Healthy diet (e.g., ↓ Sodium intake)
- Increased physical activity
- Stress management
- Medication adherence
- Home BP monitoring

Improved Patient Activation

Lower Blood Pressure

Improved Outcomes
- ↓ Stroke, MI, death
- ↓ Disability
- ↑ Physical function
- ↑ Cognitive function
- ↑ Satisfaction with care
Take Home Messages

• Stroke transitional care is challenging and new models are not easily adopted
• More trials are needed to determine:
  1) the components of the ideal stroke transitional care model and
  2) which aspects of recovery and secondary prevention should include the post-acute transition
• Leaders in clinical trial design and clinical care can identify the appropriate outcomes that are achievable, and account for the implementation challenges for new models
• Transitional care could be aligned with a variety of stroke clinical trials (or vice versa) to reduce heterogeneity in trial follow-up
COMPASS Study Website and Resources

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

• Numerous resources are now freely available on the website:
  • Patient Educational Materials
  • Community Resource Directory
  • Training videos and Materials

• For full website tutorials contact:
  • Meghan Radman
  • 336-713-4367
  • mradman@wakehealth.edu
Team, Hospitals and Communities

A multidisciplinary team with a shared vision, respectful of diversity, accountable, committed to patient and community engagement, perseverance and innovation.