From Risk Scores to Impactability Scores: Innovations in Care Management

Carlos T. Jackson, Ph.D.
September 14, 2015
Outline

Population Health
What is Impactability?
Complex Care Management
Transitional Care Management
Population Health and Care Management Resources

Population Needs

System Resources
Dallas, September 5, 2014 /PRNewswire/ --

According to the new market research report "Care Management Solutions Market by Component (Software & Services), Delivery Mode (On-premise, Web, & Cloud), End-user (Payer, Provider, Employer Groups, & Government Bodies) - Trends & Global Forecasts to 2018", published by MarketsandMarkets, analyzes and studies the major market drivers, threats, opportunities, and challenges in North America, Europe, Asia, and Rest of the World (RoW).

Browse 34 market data tables and 27 figures spread through 154 pages and in-depth TOC on "Care Management Solutions Market"


Early buyers will receive 10% customization on this report.

This report studies the global Care Management Solutions Market over the forecast period of 2013 to 2018. This market was valued at $2.8 Billion in 2013 and is poised to grow at a CAGR of 21% from 2013 to 2018, to reach $7.3 Billion by 2018.

The care management solutions market is segmented into four broad segments, namely, components, delivery modes, end users, and geographies. The market by component is further categorized into software and services. Based on delivery modes, the market is categorized into web-based, on-premise, and cloud-based. The market by end users is categorized into providers, payers, employer groups, and government bodies. Based on geography, the market is divided into North America, Europe, Asia, and Rest of the World (RoW: Pacific countries, Africa, and Latin America).

The major factors driving the care management solutions market are the legislative reforms of Affordable Care Act (ACA) in the U.S., demand for the improved quality of care, rise in aging population, and incentives by the various governments for the adoption of HCIT and care management solutions. The benefits provided by the care management solutions such as cost reduction, reduced hospital
Using BIG Data to Make a Smarter “First Pass”

• **Administrative data can never tell the whole story.**
  • However, in the context of managing a large, complex population, care managers need tools to help them narrow down the pool to those with the greatest likelihood of benefitting from their service.

• **We are talking about using data for a smarter and more efficient “first pass.”**
  • Goal is to make best use of the scarce CM resource, and enable those personal care team-patient interactions to be more impactful.

• **How you make that “first pass” is important:**
  • the goal is to find patients very likely to benefit from the intervention.…
  • And high risk is NOT the same thing as highly impactable.
Of the 20 programs interviewed:

• 15 used some formal risk score (Ex: HCC and LACE are most common “off the shelf”; some use proprietary risk scores which aim to predict who will go to the hospital next),

• 4 used a total cost criteria (Ex: “>$50K annual spend)

• 4 used a condition criteria (Ex: “High risk diagnoses”)

• 8 used a utilization criteria (Ex: “2+ admits in past 6 mos”)

• 1 (CCNC) used Impactability Scores which take risk scores to the next level by applying them to real-world settings and measuring the observed impact from care management.
Key Discoveries:

High Risk $\neq$ High Impactable
Difference Between Impactability and Risk

- **Risk Scores:**
  - Predict the likelihood of a given event.
  - However, typically only predict events/outcomes as part of usual care (i.e., if we didn’t intervene, what might be expected to happen).

- **Impactability Scores** identify members who will benefit the most from a given intervention:
  - There is **strong evidence** from our prior experience that a given intervention will result in a significant change in future cost and utilization.
  - Requires controlled analyses to detect intervention impacts beyond “regression to the mean”.

Impactability vs. Risk

Impactability scores predict how much change can be expected when intervened.

Typical “risk scores predict where a person is expected to be in the future.
Building Blocks for CCNC’s HealthCare Analytics

- Rx Fill Data
- Inpatient Pattern
- ED Pattern
- Cost Trend
- Demographics
- Real-time ADT Feeds
- 3M Potentially Preventable Visits
- 3M Clinical Risk Groups

CCNC’s Real-World Care Management Experience, and analysis of outcomes
CCNC’s Vast Experience Has Been Key to Identifying Opportunities

- Through CCNC’s Care Management Information System, we are able to capture a variety of interventions delivered to a variety of patients
  - Diverse population
  - Diverse clinical complexity
  - Diverse healthcare systems
  - Diverse interventions

- CCNC also has the necessary volume to conduct these types of evaluations:
  - 100,000+ receiving transitional care
  - 100,000+ receiving complex care management
  - Lots of opportunity for naturalistic experiments
The Pitfall of Targeting the Highest Risk

Historically, care management efforts have been targeted at the highest risk.

Total Enrolled Population

= Total costs for an individual
The Pitfall of Targeting the Highest Risk

Total Enrolled Population

● = Total costs for an individual
The Pitfall of Targeting the Highest Risk

Under conventional flagging methodology, all of these people might have been flagged; care management would likely have had minimal impact for most of them.
A “risk”-based model would target everybody in Risk Group #3 for care management because they have the greatest likelihood of incurring future spend/utilization. However, looking within individual risk groups, you see *pockets of undiscovered opportunity*, or “impactability”, for care management.

*Potentially preventable* hospital costs for an individual
## Care Management Impactability Score™

<table>
<thead>
<tr>
<th>Score</th>
<th>How Defined?</th>
<th>What it means?</th>
<th>Key Drivers</th>
</tr>
</thead>
</table>
| **Care Management Impactability Score™** | A score from 0-1,000 reflecting likely cost saving, per month (over 6 months following care management); CCNC prioritizes patients with a CM Impactability Score above 200 | Clinical characteristics and utilization patterns indicate a high likelihood of benefitting from care management. | Claims-derived measures including:  
  - Above-Expected Potentially Preventable Hospital Costs:  
    - 3M Clinical Risk Groups  
    - 3M Potentially Preventable Flags  
  - Clinical Characteristics  
  - Utilization Patterns  
  - Demographics |

**Take-away points**

Prioritizing patients with a score of 200-1,000 flags less than 1% of the Medicaid population, but for these patients, we are confident that we can expect an average savings of $1,200 - $6,000 per patient receiving care management.
## Conditions Themselves Don’t Drive CM Impactability

<table>
<thead>
<tr>
<th>Select CRG’s (for illustrative purposes)</th>
<th>All Members</th>
<th>Members w/ a CM Impactability Score™ = 200+</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Acute Lymphoid Leukemia Level - 2</td>
<td>135</td>
<td>6</td>
</tr>
<tr>
<td>Asthma and Hypertension Level - 2</td>
<td>1,303</td>
<td>19</td>
</tr>
<tr>
<td>COPD and Other Dominant Chronic Disease Level - 4</td>
<td>1,126</td>
<td>67</td>
</tr>
<tr>
<td>Chronic Renal Failure - Diabetes - Other Dominant Chronic Disease Level - 2</td>
<td>101</td>
<td>2</td>
</tr>
<tr>
<td>Congenital Quadriplegia, Diplegia or Hemiplegia Level - 2</td>
<td>1,086</td>
<td>10</td>
</tr>
<tr>
<td>Congestive Heart Failure – COPD - Other Dominant Chronic Disease Level - 6</td>
<td>130</td>
<td>5</td>
</tr>
<tr>
<td>Congestive Heart Failure - Diabetes – COPD Level - 6</td>
<td>251</td>
<td>13</td>
</tr>
<tr>
<td>Diabetes and Asthma Level - 2</td>
<td>1,168</td>
<td>18</td>
</tr>
<tr>
<td>Diabetes and Hypertension Level - 2</td>
<td>2,368</td>
<td>13</td>
</tr>
</tbody>
</table>

### Example: Two patients with advanced coronary artery disease and comorbidities, but very different impactability scores:

- **Age 39**
  - IP visits: 2
  - ED visits: 2
  - Costs above-expected: $0
  - _Impactability Score= 228_

- **Age 53**
  - IP visits: 2
  - ED visits: 47
  - Costs above-expected: $2,005
  - _Impactability Score= 1,000_

Only a small percentage within any clinical risk group is flagged as “impactable”
Naturalistic Experiment

Sample of 38,294 Non-dual Medicaid, CCNC-enrolled recipients with at least one prior ED or inpatient utilization:

- 23,455 Intervention patients who received some complex care management during FY12-13
- 14,839 historical Controls who did not receive care management

Primary Outcome Measure

Total Medicaid Spending

- During the 6-months after intervention, relative to spending during the 6-months prior to intervention
- Difference-in-difference approach comparing pre/post spend in control group
Total Sample = 38,294 CCNC Enrollees w/ history of inpatient and/or ED utilization
Baseline spending among Random sample of 5,000 patients = $1,095 PMPM
Mean number of ED = 2.8, IP = 0.4

The next slides will illustrate what happens to each of these populations when they receive care management versus not.
5,000 highest Inpatient Utilizers
Baseline spending = $4,024 PMPM

Net savings = $363 PMPM

- $379

- $742
Net savings = $458 PMPM

5,000 highest ED “Superutilizers”
Baseline spending = $2,547 PMPM

Net savings = $458 PMPM
Total Sample = 38,294 CCNC Enrollees w/ history of inpatient and/or ED utilization
Baseline spending among Random sample of 5,000 patients = $1,095 PMPM

Net savings = $245 PMPM
5,000 Patients w/ highest CM Impactability Scores™
Baseline spending = $2,754 PMPM

Net savings = $748 PMPM

$43

$705
The same investment in care managing 5,000 patients yields VERY different results depending on who you choose to manage.
Transitional Care Context
What about Impactability in the Context of Transitional Care?

In general, we know Transitional Care (TC) works:
- Effectively reduces risk of future readmissions
- Effectively reduces risk of additional admissions
- Effect is long-lasting (differences still seen a year later)
- Effectively lowers future total cost of care

Works better for some than others!
- Only about 25% of Medicaid discharges are likely to benefit meaningfully from a comprehensive TC care team support;
- Even within this 25% priority population, a smaller segment is most likely to benefit meaningfully from specific components that require higher resource intensity:
  - home visit,
  - pharmacist involvement,
  - palliative care considerations,
  - early outpatient follow-up

A positive ROI from TC is highly dependent upon discerning and targeting the patients most likely to benefit.
ABSTRACT Recurrent hospitalizations represent a substantial and often preventable human and financial burden in the United States. In 2008 North Carolina initiated a statewide population-based transitional care initiative to prevent recurrent hospitalizations among high-risk Medicaid recipients with complex chronic medical conditions. In a study of patients hospitalized during 2010–11, we found that those who received transitional care were 20 percent less likely to experience a readmission during the subsequent year, compared to clinically similar patients who received usual care. Benefits of the intervention were greatest among patients with the highest readmission risk. One readmission was averted for every six patients who received transitional care services and one for every three of the highest-risk patients. This study suggests that locally embedded, targeted care coordination interventions can effectively reduce hospitalizations for high-risk populations.
Time to First Readmission for Patients Receiving Transitional Care Vs. Usual Care Among CCNC Transitional Care Priority Patients

Survival Function

Proportion still out of the hospital

Take-away points

Patients with multiple chronic conditions, at high risk of readmission, will benefit greatly from transitional care. Effect is long-lasting.

“Impactability”
Separating the Concepts of Risk and Impactability: Time to First Readmission for Patients Receiving Transitional Care Vs. Usual Care

Survival Function

Take-away points

Not all patients benefit from transitional care intervention!
Timeliness of Outpatient Follow-up: An Evidence-Based Approach for Planning After Hospital Discharge

Carlos Jackson, Ph.D.
Mohammad Shabsabehi, MD, MBA
Tiffany Weidlake, MD, MPH
C. Annette DuBard, MD, MPH

1Community Care of North Carolina, Raleigh, North Carolina
2Duke Family Medicine, Duke University Medical Center, Durham, North Carolina

ABSTRACT

PURPOSE Timely outpatient follow-up has been promoted as a key strategy to reduce hospital readmissions, though one-half of patients readmitted within 30 days of hospital discharge do not have follow-up before the readmission. Guidance is needed to identify the optimal timing of hospital follow-up for patients with conditions of varying complexity.

METHODS Using North Carolina Medicaid claims data for hospital-discharged patients from April 2012 through March 2013, we constructed variables indicating whether patients received follow-up visits within successive intervals and whether these patients were readmitted within 30 days. We constructed 7 clinical risk strata based on 3M Clinical Risk Groups (CRGs) and determined expected readmission rates within each CRG. We applied survival modeling to identify groups that appear to benefit from outpatient follow-up within 3, 7, 14, 21, and 30 days after discharge.

RESULTS The final study sample included 44,473 Medicaid recipients with 65,085 qualifying discharges. The benefit of early follow-up varied according to baseline readmission risk. For example, follow-up within 14 days after discharge was associated with a 1.5%-point reduction in readmissions in the lowest risk strata (P < .001) and a 19.1%-point reduction in the highest risk strata (P < .001). Follow-up within 7 days was associated with meaningful reductions in readmission risk for patients with multiple chronic conditions and a greater than 20% baseline risk of readmission, a group that represented 24% of discharged patients.

CONCLUSIONS Most patients do not meaningfully benefit from early outpatient follow-up. Transitional care resources would be best allocated toward ensuring that highest risk patients receive follow-up within 7 days.

Incremental Benefit of a Home Visit Following Discharge for Patients with Multiple Chronic Conditions Receiving Transitional Care

Carlos Jackson, PhD, Elizabeth W. Kasper, MSPH, Christianna Williams, PhD, C. Annette DuBard, MD, MPH

Abstract

Purpose: Transitional care management is effective at reducing hospital readmissions among patients with multiple chronic conditions, but evidence is lacking on the relative benefit the home visit as a component of transitional care.

Methods: The sample included non-dual Medicaid recipients with multiple chronic conditions enrolled in Community Care of North Carolina (CCNC), with a hospital discharge between July 2010 and December 2012. Using claims data and care management records, we retrospectively examined whether home visits reduced the odds of 30-day readmission compared to less intensive transitional care support, using multivariate logistic regression to control for demographic and clinical characteristics. Additionally, we examined group differences within clinical risk strata on inpatient admissions and total cost of care in the 6 months following hospital discharge.

Results: Of 35,174 discharges receiving transitional care from a CCNC care manager, 21% (N=7,468) included a home visit. In multivariate analysis, home visits significantly reduced the odds of readmission within 30 days (OR=0.52, 95% CI 0.48-0.57). In the six month follow-up, home visits were associated with fewer inpatient admissions within four of six clinical risk strata, and lower total costs of care for highest risk patients (average per member per month cost difference $970; p<0.01).

Conclusions: For complex chronic patients, home visits reduced the likelihood of a 30-day readmission by almost half compared to less intensive forms of nurse-led transitional care support. Higher risk patients experienced greatest benefit in terms of number of inpatient admissions and total cost of care in the six months following discharge.
Relative Impact of Different Face-to-Face Encounters on Reducing Readmissions Among TC Priority Patients

Lines represent the upper and lower confidence intervals; lines that cross 1.0 are considered not statistically significant.
## Putting it into Action

### Real-time notification of care opportunities with care management priorities

#### Current Hospital Visits - Your Network

![Image of current hospital visits table]

#### Other Flags to Inform Next Steps:

- **Home Visit Priority**
  - Readmission risk >30%

- **Palliative Care Priority**
  - High risk of mortality and preventable end-of-life spend

- **Chronic Pain Priority**
  - Pattern of frequent narcotic fills and ED visits

- **Risk of Drug Therapy Problem**
  - Risk of drug interaction, duplication, or adherence problems based on real-time medication data from multiple sources
Transitional Care

- MUST be targeted toward patients with multiple chronic or catastrophic conditions to optimize ROI
- REQUIRES real-time notification of hospital admission/discharge; historical claims are most helpful for risk segmentation
- MOST EFFECTIVE as a community-level strategy with multidisciplinary care team approach

Volume of Medicaid Hospital Discharges, by Patient Risk of 90-day Readmission

- Prioritized for High-Intensity TC support (home visit, pharmacist)
  - NNT=3
  - Avg. savings $4,000

- Prioritized for Lower-Intensity TC support
  - NNT=6
  - Avg savings $1,000

* Reflects distribution of discharges after excluding deliveries and newborns
Validation of TC Impactability Score: Methodology

We took a sample of ~60,000 Non-dual Medicaid recipients discharged from the hospital to their home during fiscal year 2011:

We included all hospital discharges, excluding deliveries/newborns

Then, we looked at what happened when looking at discharges in the top 25% for each approach:

- The 25% of discharges with the highest TC Impactability Scores

Compared to:

- The 25% of discharges with the highest risk of an inpatient admission
  - A validated risk model based on historical inpatient and pharmacy utilization

- The 25% of discharges with the highest Charlson Comorbidity Index
  - A score denoting degree of clinical complexity and risk of mortality; often used to prioritize patients for transitional care management.

- Random 25% of discharges

The next slides will illustrate what happens to each of these populations when they receive care management versus not.
25% w/ highest Admission Risk

5.6 averted readmissions per 100 patients receiving transitional care

Readmissions (per 100 patients) in 6-Month Follow-up

45.7

40.1
5.9 averted readmissions per 100 patients receiving transitional care

25% w/ highest Charlson Comorbidity Index
24.7

21.2

3.5 averted readmissions per 100 patients receiving transitional care

25% of discharges (randomly chosen)

Readmissions (per 100 patients) in 6-Month Follow-up
25% w/ highest TC Impactability Score™

10.7 averted readmissions per 100 patients receiving transitional care

Readmissions (per 100 patients) in 6-Month Follow-up
The same investment in providing care transitions to 25% of the hospital discharges yields VERY different results depending on who you choose to manage.
The same investment in providing care transitions to 25% of the hospital discharges yields VERY different results depending on who you choose to manage.
## Special Case: Medicare Duals

<table>
<thead>
<tr>
<th>Group</th>
<th>Percent Readmitted within 30 Days of Discharge</th>
<th>Difference in Percent Readmitted</th>
<th>Medicare Spend During the 6-Month Follow-up Period</th>
<th>Difference in Medicare Spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest TC Impactability Score</td>
<td>Control</td>
<td>38%</td>
<td>$7,753</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>24%</td>
<td>$6,015</td>
<td>-$1,738</td>
</tr>
<tr>
<td>Highest HCC Score</td>
<td>Control</td>
<td>30%</td>
<td>$6,603</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>21%</td>
<td>$5,890</td>
<td>-$713</td>
</tr>
</tbody>
</table>

Source: ~2,000 inpatient discharges for Medicare Duals. Intervention was transitional care by a CCNC care manager that included a home visit for medication reconciliation. Control were patients that received no CCNC transitional care management.

> Twofold Medicare Savings using TC Impactability Score vs. HCC Score as targeting strategy
CCNC’s Transitional Care Impactability Scores™:
Real-world Applications
Cost vs. Savings

• So, far, we have only discussed the savings side of the equation.
• There is also a cost side.
• One of the advantages of CCNC’s Impactability Scores™ is that they readily provide users with a measure of expected savings, equipping users with the ability to “right-size” their intervention to ensure a positive return on investment.
• CCNC has already made a significant investment in its infrastructure, thus minimizing the cost of the intervention for CCNC.
Impactability Scores and Resource Planning

- Impactability Score values represent expected average savings from defined intervention. For example, a patient with a **CM Impactability Score™** of ‘300’ is a patient for whom, if care managed, one could expect to achieve savings of $300 PMPM over the next 6 months, or $1,800 total.
- Helpful for resource planning to optimize return on investment

### Example ROI Calculator

| Inputs | | | | |
|---|---|---|---|
| **Outputs** | Minutes | hourly salary/rate | Cost |
| Task category | | | |
| Home Visit | 90 | $35 | $73.56 |
| Other Face to Face Encounters | 65 | $35 | $16.77 |
| Pharmacist | 45 | $60 | $53.65 |
| Non Face to Face Encounter BY a Care Manager | 35 | $35 | $210.79 |
| Non Face to Face Encounter BY Non Clinician | 30 | $25 | $44.61 |
| Travel (in miles one-way) | 50 | $0.50 | $50 |
| Total | | | **$449** |

**How much savings can you expect?**

<table>
<thead>
<tr>
<th></th>
<th>High TC</th>
<th>Low TC</th>
<th>ED-Supers</th>
<th>PPL</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>1,598</strong></td>
</tr>
<tr>
<td>Cost per patient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$449</strong></td>
</tr>
<tr>
<td>Savings per patient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$4,000</strong></td>
</tr>
<tr>
<td>ROI per patient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$3,551</strong></td>
</tr>
<tr>
<td>ROI per Quarter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>$2,407,323</strong></td>
</tr>
</tbody>
</table>

**High TC**

**Low TC**

**ED-Supers**

**PPL**

**TOTAL**

**COMMUNITY CARE OF NORTH CAROLINA**  Improving care through shared knowledge
Case Example: Uninsured Population

Hospitals incur substantial costs for delivering inpatient care to the uninsured, but it would be cost-prohibitive to provide transitional care to all uninsured patients. With intelligent targeting of the right patients, then the “right” amount of resources could be deployed to ensure a positive return on investment.

Given typical readmission rates and avg. cost of hospital stay for uninsured, we can expect that 32 of 100 patients will be flagged for TC priority. TC for those 32 will prevent 5.3 readmissions and avert $44,000 of uncompensated care. Alternative targeting strategies would yield less savings.

### Approach

<table>
<thead>
<tr>
<th>Approach</th>
<th>Estimated cost savings from providing transitional care to 32 out of every 100 uninsured patients (depending on the targeting strategy used).</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCNC’s TC Impactability Score™</td>
<td>$43,990</td>
</tr>
<tr>
<td>Admission Risk Score</td>
<td>$23,023</td>
</tr>
<tr>
<td>Charlson Comorbidity Index</td>
<td>$24,256</td>
</tr>
<tr>
<td>Random</td>
<td>$14,389</td>
</tr>
</tbody>
</table>
Case Example: Medicare Readmission Penalties

If your current all-cause readmission rate is 18% and your aim is to bring that down to 14% (to avoid penalties), you would need to provide transitional care to just 20 of the highest impactable patients per 100 discharges.

Number Needed to Treat using alternative targeting strategies:

<table>
<thead>
<tr>
<th>Approach</th>
<th>Number Needed to Treat in Every 100 Discharges</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCNC’s TC Impactability Score™</td>
<td>20</td>
</tr>
<tr>
<td>Admission Risk Score</td>
<td>38</td>
</tr>
<tr>
<td>Charlson Comorbidity Index</td>
<td>36</td>
</tr>
<tr>
<td>Random</td>
<td>61</td>
</tr>
</tbody>
</table>
Building Blocks for CCNC’s HealthCare Analytics

- Rx Fill Data
- Inpatient Pattern
- ED Pattern
- Cost Trend
- Demographics

- Real-time ADT Feeds
- 3M Potentially Preventable Visits

CCNC’s Real-World Care Management Experience, and analysis of outcomes
Summary

Population Health programs need tools to help them target patients for complex care management.

“Off-the-shelf” risk scores are typically better than nothing at all for targeting patients most likely to benefit from either complex care management or transitional care management.

Targeting the most impactable, however, can increase your return-on-investment two-fold in most cases.

Its many years of experience has equipped CCNC with the ability to know who those most impactable patients are – which often aren’t the highest risk patients.

All interventions come with costs of implementation, and CCNC also has the experience necessary to right-size interventions so that the cost of delivering the intervention does not outweigh the expected benefit.