BEHAVIOR MATTERS
Patients, Populations and Policy-makers: behavioural medicine in practice

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Center for Behavioral Cardiovascular Health
I have no conflicts for this talk to declare

I am the co-owner of MJBK, a small business that provides mhealth technology solutions to consumers. I am also the co-owner of IOHealthWorks, a small consulting services company. I have disclosed these interests to Columbia University Medical Center, and have in place an approved plan for managing any potential conflicts arising from this arrangement.
Innovative Intervention Strategies to Decrease 30-day Readmissions through Improving Patient, Provider & System Behavior
Readmissions

Behavior
Patient, provider and system behavior

Creativity
How creativity science can help
Readmissions
What is old is new

American Journal of Psychiatry, 1956

DISCHARGE AND READMISSION RATES IN 4,254 CONSECUTIVE FIRST ADMISSIONS OF SCHIZOPHRENIA

ROBERT H. ISRAEL, M.D., AND NELSON A. JOHNSON, M.S.W.
WARREN, PA.

The literature on prognosis in schizophrenia is confused and contradictory. Overall statistics on discharges of schizophrenic patients from mental hospitals are usually quite misleading because they report on discharge rates in relationship to resident populations in the hospitals.

There is, to the best of our knowledge, no study which has followed massive numbers of first admissions to one hospital over such leaves in which the patient must return to the hospital at the end of a specified time. The word “readmission” means literally that and has no reference to “commitment.” It refers to any patient returned for further care, whether one day, one month, or many years after the medical staff gave approval for the patient’s discharge to community life. This type of literal follow-up of every movement in and out of the hospital is much more
Readmissions
Affordable Care Act, Penalties, and Incentives

- In 2000s, recognition that many Medicare patients are readmitted early after discharge
  - 15-20% of Medicare patients readmitted within 30 days
  - Thought to be a marker for quality of care, e.g., gaps in transition of care, poor medication reconciliation
  - Considerable geographic variation and associated cost

- As part of the Affordable Care Act, CMS began penalizing hospitals with high 30-day readmission rates in FY2013
Geographic Variations for Rates of Readmissions

Readmissions
2014 CMS penalties

Hospital Penalties Year 2
Medicare Readmissions Reduction Program

2,225 hospitals will be penalized

1,154 hospitals won’t be fined

1,371 will get lower penalty than in Year 1;
1,074 will get higher penalty

0.38%
The average penalty, down from the 0.42% average penalty in FY2013

Source: KHN analysis of data from the Centers for Medicare & Medicaid Services
Readmissions
Concerns and criticisms

› Preventable versus necessary readmissions
  • Reasons for readmissions unclear / heterogeneous
    - Limits of administrative data

› How to identify patients at risk for readmissions?
  • What to intervene on, in whom, and when?
  • Factors at the level of patient, hospitals, and provider, can all lead to readmissions
    - Medical, psychosocial, behavioral
Readmissions
Complex phenomenon

Behavior
Patient, provider and system behavior

Creativity
How creativity science can help
Readmissions
Factors that lead to readmissions

**Patient**
- Severity of illness
- Social support
- Patient behaviors

**Hospital**
- Processes of care
- Hospital environment
- Care transition

**Provider**
- Timely follow up
- Ability to escalate care without hospitalization
- Risk aversion
# Readmissions

Patient level behavioral risk factors

**Table 3. Multivariate Analysis of Predictors of Readmission Risk**

<table>
<thead>
<tr>
<th>Factor</th>
<th>ACR, OR (95% CI)</th>
<th>PAR, OR (95% CI)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likely psychiatric disease</td>
<td>0.97 (0.82-1.14)</td>
<td>1.20 (0.92-1.56)</td>
</tr>
<tr>
<td>Likely and possible psychiatric disease</td>
<td>1.07 (0.94-1.22)</td>
<td>1.18 (0.94-1.47)</td>
</tr>
<tr>
<td>Likely substance abuse</td>
<td>0.83 (0.69-0.99)</td>
<td>0.85 (0.63-1.16)</td>
</tr>
<tr>
<td>Psychiatric diagnosis on outpatient problem list</td>
<td>0.97 (0.76-1.23)</td>
<td>1.04 (0.70-1.55)</td>
</tr>
<tr>
<td>Substance abuse diagnosis on outpatient problem list</td>
<td>0.63 (0.39-1.02)</td>
<td>0.65 (0.28-1.52)</td>
</tr>
<tr>
<td>Increasing number of prescribed psychiatric medications</td>
<td>1.10 (1.01-1.20)</td>
<td>1.00 (0.86-1.16)</td>
</tr>
<tr>
<td>Outpatient prescription for antidepressant</td>
<td>1.10 (0.94-1.29)</td>
<td>0.86 (0.66-1.13)</td>
</tr>
<tr>
<td>Outpatient prescription for antipsychotic</td>
<td>1.03 (0.79-1.34)</td>
<td>0.93 (0.59-1.45)</td>
</tr>
<tr>
<td>Outpatient prescription for anxiolytic</td>
<td>1.16 (1.00-1.35)</td>
<td>1.13 (0.88-1.44)</td>
</tr>
<tr>
<td>Outpatient prescription for methadone or buprenorphine</td>
<td>1.15 (0.67-1.98)</td>
<td>0.18 (0.03-1.36)</td>
</tr>
<tr>
<td>Discharge diagnosis of depression</td>
<td>1.06 (0.86-1.30)</td>
<td>1.49 (1.09-2.04)</td>
</tr>
<tr>
<td>Discharge diagnosis of schizophrenia</td>
<td>1.43 (0.75-2.74)</td>
<td>2.63 (1.13-6.13)</td>
</tr>
<tr>
<td>Discharge diagnosis of bipolar disorder</td>
<td>0.53 (0.28-1.02)</td>
<td>0.35 (0.09-1.45)</td>
</tr>
<tr>
<td>Discharge diagnosis of anxiety</td>
<td>0.82 (0.68-0.99)</td>
<td>1.11 (0.83-1.49)</td>
</tr>
<tr>
<td>Discharge diagnosis of substance abuse</td>
<td>0.80 (0.65-0.99)</td>
<td>1.05 (0.75-1.46)</td>
</tr>
<tr>
<td>Discharge diagnosis of any psychiatric illness</td>
<td>0.88 (0.75-1.02)</td>
<td>1.22 (0.96-1.56)</td>
</tr>
<tr>
<td>Addiction team consult while inpatient</td>
<td>0.82 (0.58-1.17)</td>
<td>0.58 (0.29-1.17)</td>
</tr>
</tbody>
</table>
Readmissions

Provider Behavior

- Decision to readmit often made at provider level
  - Some preventable readmissions may occur because of discontinuity of care

- Emphasis on early follow-up
  - However, risk aversion can also paradoxically increase readmissions
Readmissions
Provider Behavior

Figure 3: Unadjusted Kaplan–Meier curves for time to death or urgent readmission after discharge from index hospital admission. *A physician who had seen the patient at least twice in the year before the index admission or once during the index admission.
Readmissions
Conventional approaches to change provider behavior

- Improve communication process
  - Lower barriers to reach across healthcare institutions
    - Phone hotlines, health information exchanges

- Improve decision making
  - Decision support to clarify readmission risk
  - Care pathways for high risk patients
Readmissions
Conventional Approaches to change System behavior

- Penalties as blunt instruments
  - Resource constraints, especially for safety net hospitals
  - Unintended consequences (admitting less sick patients, or penalizing hospitals with good outpatient care that send patients back appropriately)
Readmissions
Conventional approaches to change system behavior

› **Features of high performance systems**
  • Performance excellent, accountability of results, and leadership execution

› **Align incentives with desired behavior**
  • Both at system and individual levels

Readmissions

Conventional approaches to change system behavior

Figure. Number of selected strategies implemented and risk-standardized readmission rates (RSRRs). Note: $B=−0.34$, $SE=0.04$, $P<0.001$ in multivariable model adjusting for teaching status, region, and number of hospital beds. Number of selected strategies (possible range, 0–10) was calculated by assigning a 1 to every strategy implemented that was positively associated with RSRRs and assigning a 1 to every strategy not implemented that was negatively associated with RSRRs. Adjusted $R^2=0.14$.

From Bradley et al., Circ Cardiovasc Qual Outcomes, 2013
Readmissions

QI improves unnecessary readmissions, but not the rate

iSCRIPT Center

Innovative Strategies to decrease Readmissions through Improving Patient & System Stress & behavior

› Inter-disciplinary Center from Biomedical Informatics, Biomedical Engineering, Cardiology, General Internal Medicine, Emergency Medicine, the CTSA, and the Center for Behavioral Cardiovascular Health (CBCH)

› Aim to identify novel hospital system, care processes, and patient factors that adversely influence 30-day readmissions, and to test and implement novel behavioral strategies targeting these factors to reduce readmission rates and increase patient satisfaction
Potential approaches

‣ Understanding hospital stressors
  • Using sensors to monitor sound and light exposure
  • Devices to monitor sleep disruption, walking
  • Smartphone to assess subjective stress

‣ Improve risk prediction
  • Robust electronic health records data
  • Natural language processing
  • Focus on modifiable mechanisms or processes

‣ Better transitions
  • Improved, user-tested decision support
  • EHR tools to improve communication between providers
Potential approaches

› **Home environment**
  • Automated hovering
  • Physical activity, medication adherence, subjective stress, sleep patterns, adherence with discharge instructions
  • Complement existing home nurse visits
  • Focus on clinically actionable data

› **Improve patient access and engagement**
  • Remotely deliver educational material
  • Connect patients to providers at needed moments
Readmissions
Readmissions as a complex phenomenon

Behavior
Patient, provider and system behavior

Creativity
How creativity science can help?
Creativity Science

Press
the environment which
makes us Creative

Product
now we reached our
creative goal

Process

Intrinsically Motivated

Habit + Practical

Divergent

SCAMPER

Threaten

Amate

Clarifier

Puccio

Implementer

CPS model

seeing wild and unusual

habit # blocks

Creative preferences

# Convergent

Divergent

Creativity

Force connections
don't shoot down ideas

Brain writing

Cognitive thinking

wild & unusual

See quantity

Over judgment

Extraordinary innovation
Creativity Science
Foursight Approach

- **Clarify** — Ask the right question.
- **Ideate** — Create multiple ideas/brainstorm
- **Develop** — Build out a solution
- **Implement** --- Rally others and execute solution

Team members will have natural talents in one of these areas—build teams to represent all four processes.
Open Hallways and Sandpits

- Structurally create an environment where creativity can occur
Creativity Science
Open hallways and sandpits
Liquid networks

- provide a happy medium between excessive order and anarchy
- new configurations can emerge through random connections
- the system isn’t so wildly unstable that it instantly destroys its new creations
"Slow hunches" colliding

- good ideas usually start out as half-baked
- turn into crucial insights through time, toil, and "collision" with other hunches
- big ideas often need time to percolate
- connections that enable the biggest changes are often serendipitous: two hunches happen to collide through a liquid network
Creativity Science

• On-demand creativity is not as outrageous as it sounds.

• Employ divergent thinking (create multiple ideas; fluency, flexibility, or originality)

• Employ convergent thinking (find what works)
Creativity Science

Thinking outside the box

“Never, ever, think outside the box.”
Creativity Science applied to our hospital—Open hallways and sandpits?
iSCRIPT Center

Innovative Strategies to decrease Readmissions through Improving Patient & System stress & behavior

- Deploy a rapid, sequential intervention strategy design
- ONLY examine novel, intervenvable behavior change targets
Creativity Science
Behavior Change Wheel

Michie et al. Implementation Science 2011 6:42
Readmissions
New paradigms?

Hospital Stressors
- Discomfort
- Noise
- Pain
- Poor sleep

Depression
PTSD

Poor Health Behaviors
- Low physical activity
- Poor diet
- Poor sleep
- Medication non-adherence

Readmissions
ACS Event within 30 days
Readmissions
A Complex Phenomenon

Processes
- System Medication Discrepancies
- Inconsistent Information: Among Providers & Patients
- Decrease in Length of Stay

Patient Factors (Beneficiaries)
- Lack of Physician Follow-up
- Aging Population
- Decreased Mortality
- Patient Medication Discrepancies

Physicians Not Willing To Follow-up with Recent Discharges
Inadequate Discharge Follow-Up
Economic Impact

Economic Impact
Increase in HF 30-Day Readmission Rates

Systems (Environment)

Measures
- Increased Incidence of HF
- Nutritional Deficiencies
Creativity Science

My Approach

Failure 101

(missing the engineer)
“This is a classic example of impoverished data, on a huge, intractable problem, with poorly defined hypotheses, for which we have no useful tools or interventions.”
Readmissions
A Complex Phenomenon
### Weather Forecasting

**How to Approach Complexity**

- **LaPlace’s Demon**
  - If “all positions of all items of which nature is composed” can be known, and if the knowledge of laws of physics is perfect, then weather can be predicted perfectly

- **Weather forecasting**
  - Non-linear process and chaos theory
  - … but has improved tremendously due improved data collection and analysis
Weather Forecasting

Complexity and non-linearity
Re-admission Data as Big Data
Similar to weather analogy we are collecting more data on patients, providers, and systems than ever before.
Readmissions
Another Approach for Patient Level Behavior Change

- **Better data for patient behavior / exposures**
  - Hospitalization related stressors, such as noise, light, sleep disruption
  - Post-discharge behavior, such as medication adherence, and physical activity
  - Identifying “triggers” that initiate sequent of events leading to readmissions

- **Real-time feedback to patients and providers**
Behavior Matters:
Can We Integrate Novel Paradigms into our Science?

- We have the CMO taking all responsible out for positive affect inducing dinners
- We have 180 house staff randomized to 2 different team care approaches they created
- We have RFID bracelets about to be placed on all ED admitted patients (through 30 day readmission)
- We will fail, but we will help improve the behavior of the scientists, patients, providers and system
• To the team at CBCH, who are my pride and joy, and who make every day at work fun

• To my NIH project officers, Peter Kaufmann, whose sage advice taught me strategic vision, and Susan Czajkowski, who taught me to try to always see the best in others

• To my sandpit pals, Paige McDonald and Jerry Suls, who have inspired me to pursue better group executive function
• In memory of my boss, **Tom Pickering**, whose sense of humor and delight in our honor to get to engage in science inspires me still

• In honor of my friend, **Jessie Gruman**, who put up with me and who managed to steer me in the right direction despite myself

• To my children, **Liam and Merete Chaplin**, who are well-rounded, wonderful human beings despite having had a distracted and absent-minded scientist mother, and whom I love with all my heart