Supporting Decisions on Patient Prioritization at Admission to Homecare

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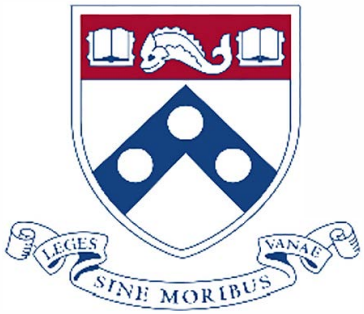
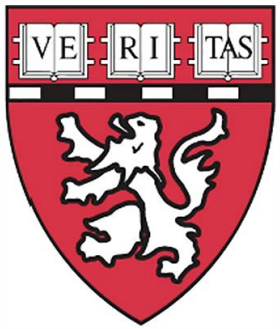
COLUMBIA UNIVERSITY
School of Nursing

Research trajectory



Tool development
(UPenn)



Tool pilot testing
(Harvard & BWH)

Current work
(Columbia & VNSNY)

Funding

Study

1. Frank Morgan Jones Fund (Center for Integrative Science in Aging)

2. Office of Nursing Research- UPenn, Faculty Senate Council Grant

3. Doyle Research Partnership Fund - VNSNY

Personal

1. Spencer scholarship for PhD studies in the US (University of Haifa)

2. Fulbright Fellowship (U.S. Department of State)

PROBLEM

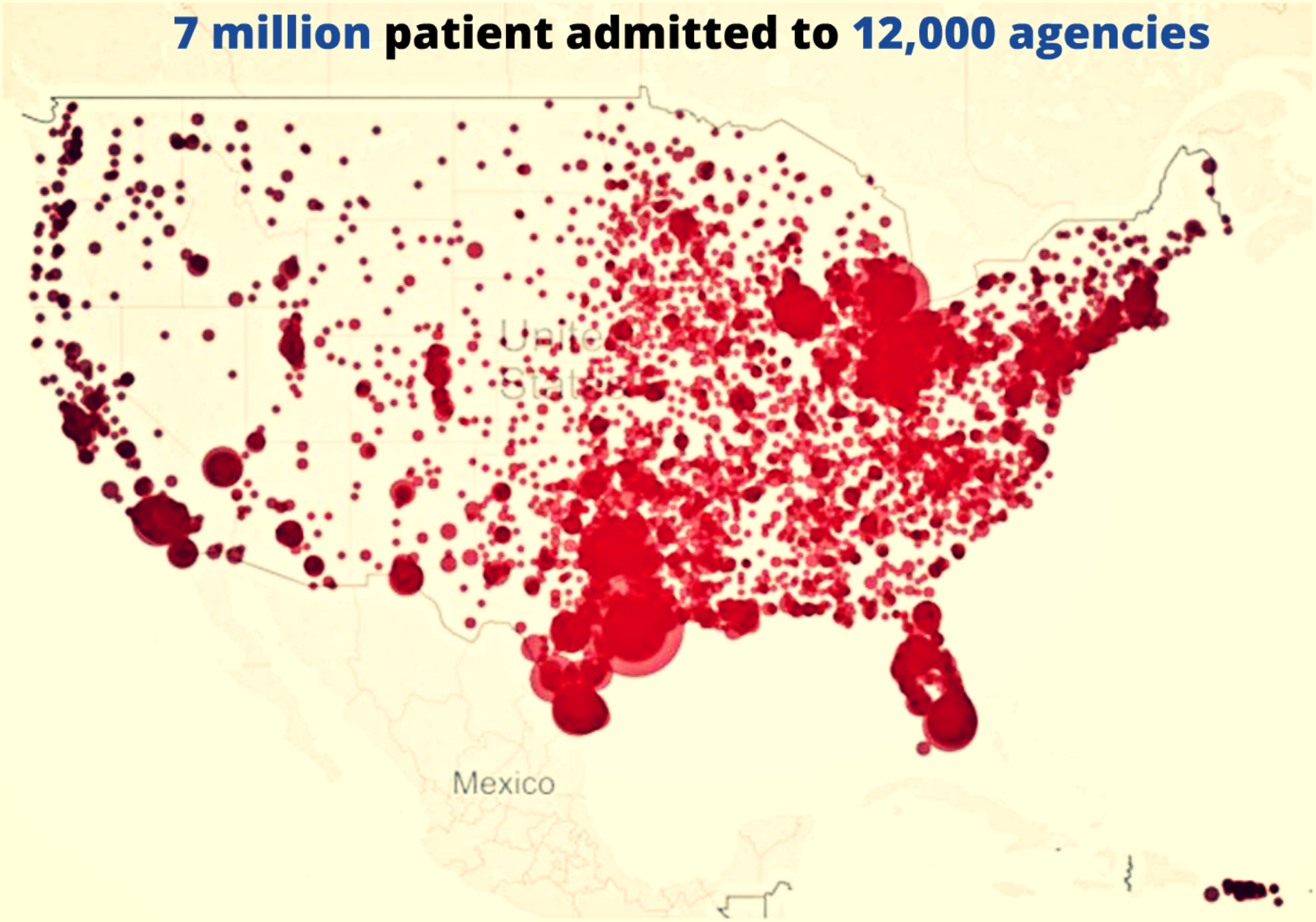
- Up to 20% are readmitted within first two weeks.

(Anderson, Clarke, Helms, & Foreman, 2005; Berry et al., 2011; Bowles, 2012; Markley, Sabharwal, Wang, Bigbee, & Whitmire, 2012; C. Murtaugh, 2013; O'Connor, Hanlon, & Bowles, 2014)

  - Study: High priority patients are not seen on time (Topaz, 2013).

- Lack of tools for patient prioritization.

7 million patient admitted to 12,000 agencies



FINANCIAL IMPACT

$6,200/hospital day

$135/homecare visit

98% savings

$225 million fines incurred by hospitals (CMS)

Gaps in the literature…

- It is critical to identify patients at risk for poor outcomes (e.g. readmissions) and intervene at the right time.
- A variety of clinical, sociodemographic and functional status characteristics associated with poor outcomes and timing for the first nursing visit.
- There is a lack of evidence to support patient prioritization at the admission to home health.

The proposed solution:

Decision support tool for patient prioritization for the first home health nursing visit.

Specific Aims:

Aim 1) To identify disease characteristics, medications, patient needs, social support characteristics, and other factors identified by experts as associated with patient's priority for the first home health nursing visit.

Aim 2) To construct and validate the best predictive model imitating experts' decisions on patient's priority for the first home health nursing visit.

Background and Review of Literature: Theoretical Framework

1. Transitions theory (Meleis, 2010): to examine the process of an individual's transition from hospital to home health settings.

2. The Data Information Knowledge Wisdom framework (American Nurses Association, 2008; Graves & Corcoran, 1989): to explicitly present all the informatics steps during the construction of a decision support tool.

METHODS

Prospective predictive study

Participants:

1. 20 Registered nurse (further experts) with at least a Baccalaureate degree in nursing from 4 geographic areas in US.

2. At least five years of experience working as a transitional care nurse, care manager or care coordinator with responsibilities to assist in patient transfer from hospitals to home.

Case summaries:

- Case summaries (R01- NR007674; UPHS health system).

- Website construction (Metter Interactive)
- Step 1: Case review

Step 2: Priority choice

Step 3: Factors choice

Step 4: Final review

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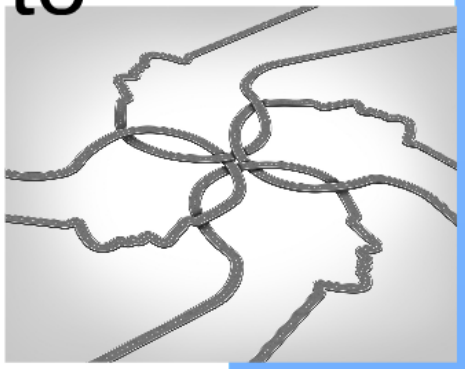

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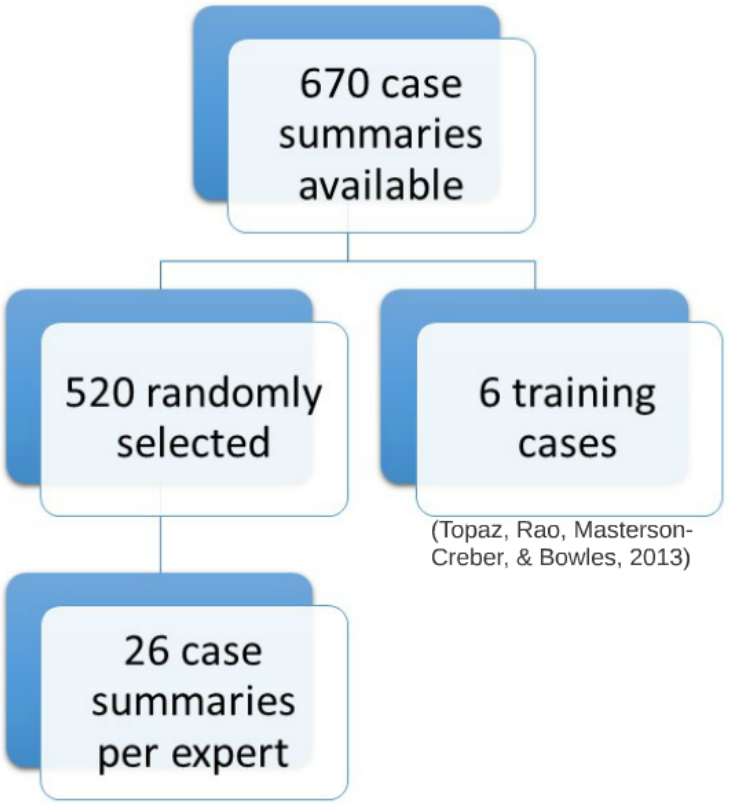

(Topaz, Rao, Masterson-Creber, & Bowles, 2013)

- Website construction (Metter Interactive)
- Step 1: Case review

Sociodemographics

Age:	68
Race:	White
Ethnicity:	non-Hispanic/-Latino
Gender:	male
Marital Status:	married
Employment:	unemployed
Education:	high school

Hospital Stay Summary

The patient was admitted as a(n) elective admission with a primary diagnosis of: Malignant neoplasm of bladder, part unspecified.

The patient has the following secondary diagnoses:

Acute posthemorrhagic anemia
Acute venous embolism and thrombosis of deep vessels of proximal lower extremity
Acute venous embolism and thrombosis of superficial veins of upper extremity
Chronic airway obstruction, not elsewhere classified
Chronic kidney disease, unspecified

Step 2: Priority choice

Based on your expertise, what priority would you place on making the first nursing homecare visit? Base your decision solely on patient characteristics and/or needs. Do not consider insurance, common organizational practices, or other barriers to care.

Please drag the slider to indicate your priority

- Rationale in 30% of the cases

Step 3: Factors choice

Sociodemographics

Age:	68 ✓
Race:	White ☐
Ethnicity:	non-Hispanic/-Latino ☐
Gender:	male ☐
Marital Status:	married ☐
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Education:	high school ☐

Hospital Stay Summary

The patient was admitted as a(n) elective ☐ admission with a primary diagnosis of: Malignant neoplasm of bladder, part unspecified ☐ .

The patient has the following secondary diagnoses:

- ☐ Acute posthemorrhagic anemia
- ☐ Acute venous embolism and thrombosis of deep vessels of proximal lower extremity
- ☐ Acute venous embolism and thrombosis of superficial veins of upper extremity
- ✓ Chronic airway obstruction, not elsewhere classified
- ✓ Chronic kidney disease, unspecified

Step 4: Final review

Your Priority for the First Homecare Nursing Visit Decision:

Medium priority (4.3 on the priority scale from 0-10).

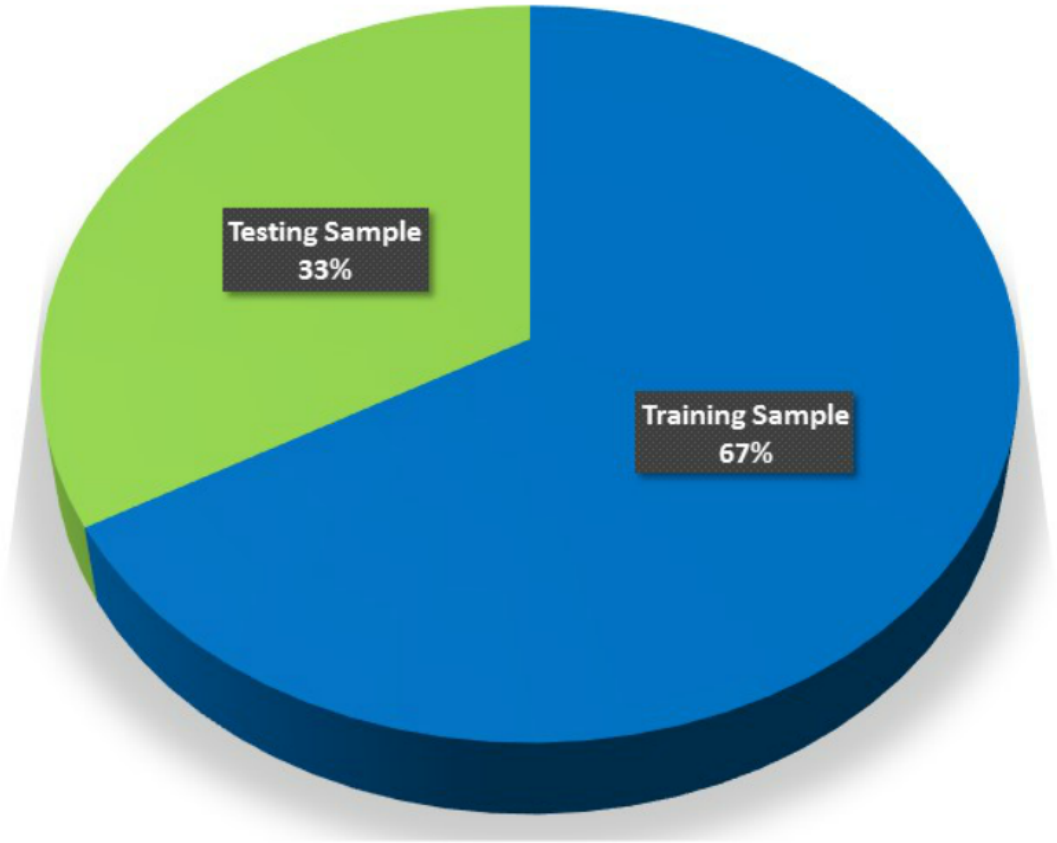
Case characteristics that influenced your priority decision:

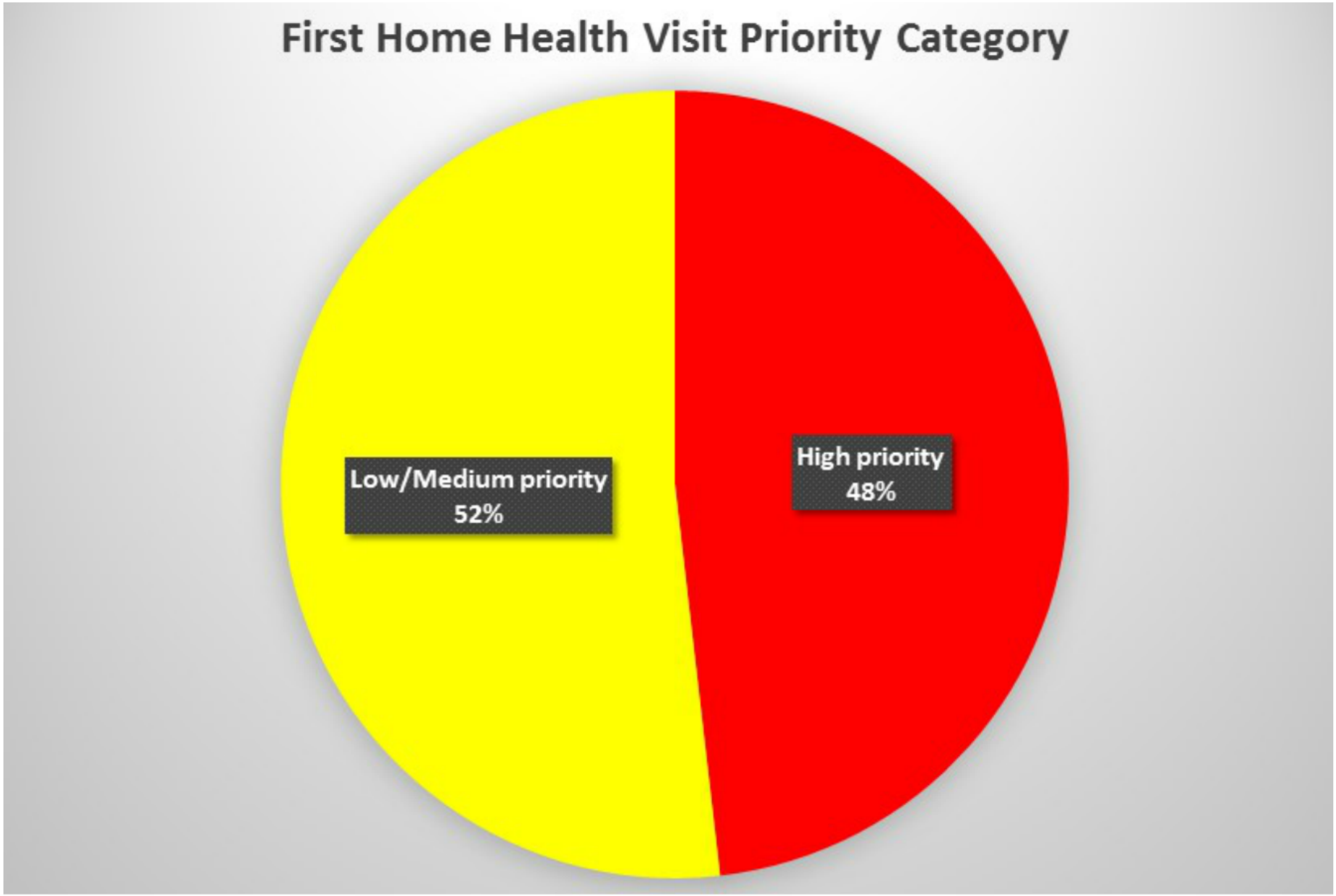
Variable Name	Variable Value
Age	68
Secondary Diagnosis	Chronic airway obstruction, not elsewhere classified
Secondary Diagnosis	Chronic kidney disease, unspecified

Submit Case

RESULTS

- Holdout (testing) sample with one-third (n=176) of the cases.




First Home Health Visit Priority Category
Low/Medium priority
52%
High priority
48%

RESULTS

STEP 1: Examining optimal variable categorization with data mining and other quantitative analysis

- ICD 9 categories, Medication groups (VA drug classes with natural language processing).

RESULTS

Socio-demographics:

- 70 years old,
- 2/3 white
- 51% male
- 60% high school or less
- 2/3 not employed

Health characteristics:

- 50% average/poor self rated health
- 14% wounds
- 50% no 6 month hospital stay

Functional status:

- 50% ambulation issues
- 32.9% toileting issues

Caregiver:

- 83% caregiver present
- 67.1% spouse/child

Individual and living environment:

- 11% self reported depression
- 20% mental health issues
- Most lived in houses with family

RESULTS

Step 2.b: Selecting the most informative variable subset for the final model

1. Subset selection (Information Gain, Gain Ration, Chi-square evaluator, and Correlation Feature Selection) (Witten et al., 2011).

2. Bootstrap subset selection method in STATA (50 iterations)

26 unique variables (70% agreement)

RESULTS

Step 2.c: Qualitative validation based on experts' rationale descriptions

- Example "Patient is high priority due to number of comorbidities that must be controlled, polypharmacy, multiple readmissions/ER visits and wound care".

RESULTS

STEP 3: Constructing and validating the best predictive model imitating experts' decisions on patient's priority (Aim 2).

a. Construction and validation of a predictive model

ROC= 75.9, Sensitivity= 80% , Specificity= 57.9%.

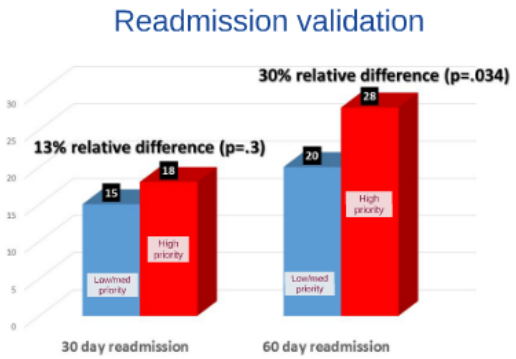
RESULTS

- Number of comorbid conditions (OR 1.04, p=.11, CI: .99-1.08)
- Number of discharge medications (OR 1.04, p=.08, CI: .87-1.09)
- Presence of wounds (OR 1.88, p=.06, CI: .95-3.7)
- Limitation in current toileting status (OR 2.02, p=.004, CI: .1.25-3.26)
- Presence of a comorbid condition of depression (OR 1.73, p=.15, CI: .8-3.6).

RESULTS

Step 3.c: Experts' model validation (3 experts)

Step 3.d: Other validation (readmissions)



Creating the tool (regression coefficients)

PREVENT

Rule: Sum scores as follows. Any score >26 would suggest high priority for the first home health visit.

Question: (Response =Score)	Score
Count the NUMBER OF MEDICATIONS prescribed to the patient =	
Count the NUMBER OF COMORBID CONDITIONS patient has =	
Does the patient have a comorbid condition of DEPRESSION (e.g. Depressive disorder, NEC)? NO = 0 YES = 15	
Does the patient have WOUND of any type? NO = 0 YES = 15	
Does the patient have LIMITATION IN TOILETING functional ability requiring use of any assistive equipment, assistive person or both? NO = 0 YES = 20	
Total Score:	
If total score is >26 then high priority for the first home health visit If total score is =<26 then low or medium priority for the first home health visit	

DISCUSSION

- Functional status: limitations in toileting

  (O'Connor, 2012; Rosati et al., 2003; Rosati & Huang, 2007)

- Good summary variable but further investigation is needed

DISCUSSION

Number of comorbid conditions

(Rosati et al., 2003; Rosati & Huang, 2007; Berkowitz & Anderson, 2013; Fortinsky et al., 2014; O'Connor, 2012; Silverstein, Qin, Mercer, Fong, & Haydar, 2008)

Number of discharge medications

- Alarming feedback
- No one particular group met the threshold

(O'Connor, 2012; Rosati et al., 2003; Rosati & Huang, 2007)

Wound presence

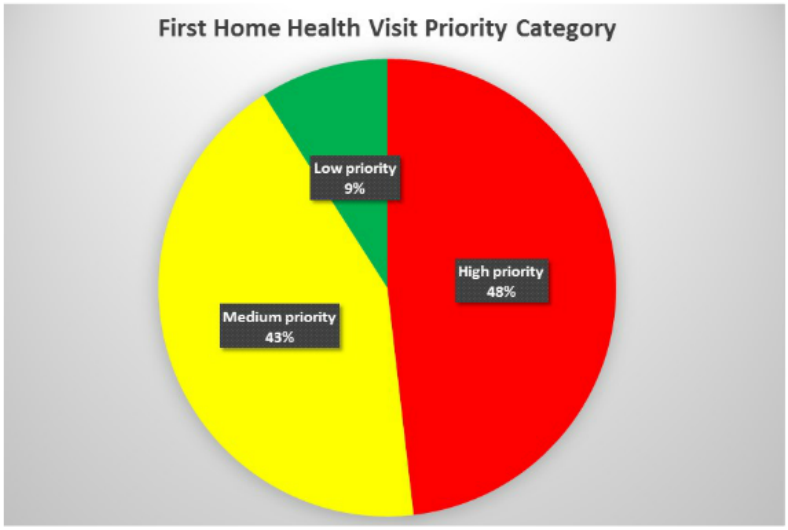
(Fortinsky et al., 2006; Fortinsky et al., 2014; O'Connor, 2012)

Comorbid condition of depression

(Fortinsky et al., 2014; O'Connor, 2012)

DISCUSSION

- Priority categorization (~10% low priority, 40% medium priority, 50% high priority): patient complexity vs. ambiguity of decisions.



LIMITATIONS

- Patients' sample (one hospital system)
- Experts' sample
- Sample size limitations (e.g. only 14 patients with barriers to follow medication schedule)

Doyle fund collaboration pilot

- Pilot with VNSNY funded by Eugene and Joseph Doyle fund

- Visiting Nurse Services of New York
  - Founded in 1893
  - Largest home- and community-based health care organization in the United States
  - On any given day VNSNY has approximately 65,000 patients (2013 --> 2.3 million professional visits).

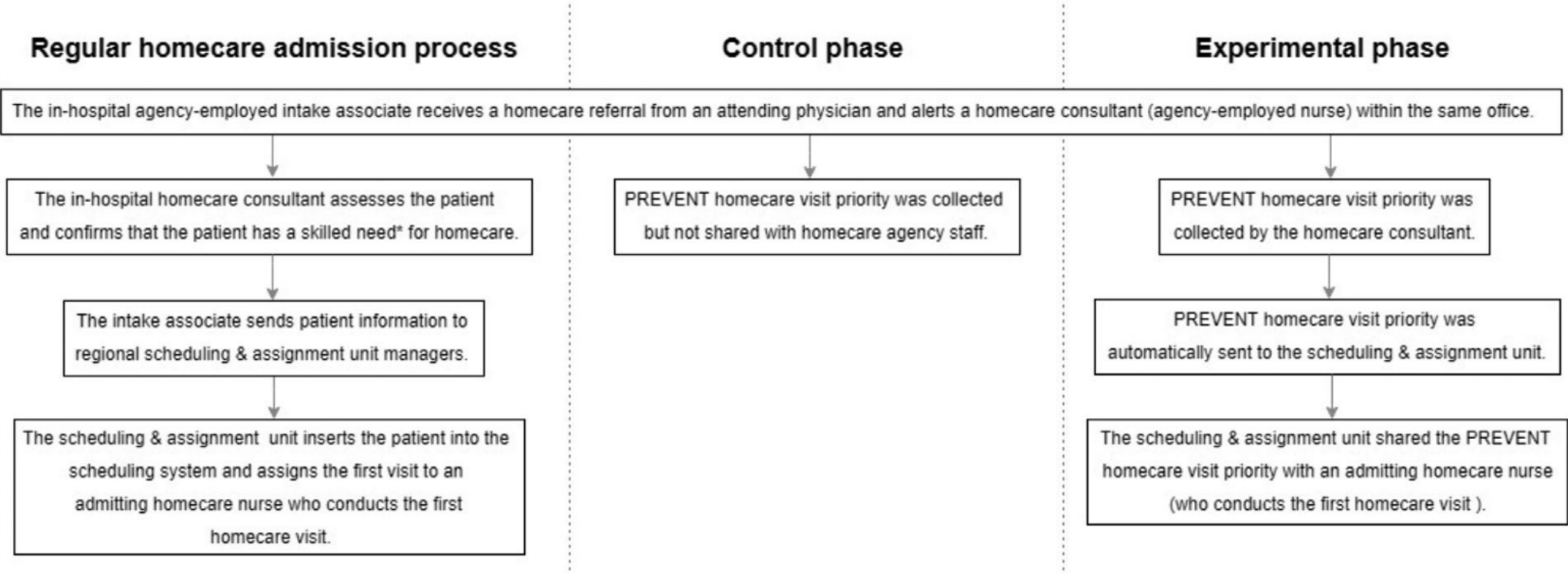
Topaz M, Trifilio M, Maloney D, Bar-Bachar O, Bowles KH. Improving patient prioritization during hospital-homecare transition: A pilot study of a clinical decision support tool. Res Nurs Health. 2018 Oct;41(5):440-447. doi: 10.1002/nur.21907. Epub 2018 Sep 11. PubMed PMID: 30203417.

Doyle fund collab

Methods

Pre-post, quasi-experimental design

- Pre-experimental phase – PREVENT not shared (n=90).
- Experimental phase- PREVENT shared (n=86).


Regular homecare admission process
Control phase
Experimental phase
The in-hospital agency-employed intake associate receives a homecare referral from an attending physician and alerts a homecare consultant (agency-employed nurse) within the same office.
The in-hospital homecare consultant assesses the patient and confirms that the patient has a skilled need* for homecare.
The intake associate sends patient information to regional scheduling & assignment unit managers.
The scheduling & assignment unit inserts the patient into the scheduling system and assigns the first visit to an admitting homecare nurse who conducts the first homecare visit.
PREVENT homecare visit priority was collected but not shared with homecare agency staff.
PREVENT homecare visit priority was collected by the homecare consultant.
PREVENT homecare visit priority was automatically sent to the scheduling & assignment unit.
The scheduling & assignment unit shared the PREVENT homecare visit priority with an admitting homecare nurse (who conducts the first homecare visit).

Results

Pre-experimental phase--- high and medium/low priority patients were admitted within 2.2 days

VS

Experimental phase--- high risk patients admitted one-half day sooner (1.8 days) and medium/low priority patients within 2.6 days.

Results

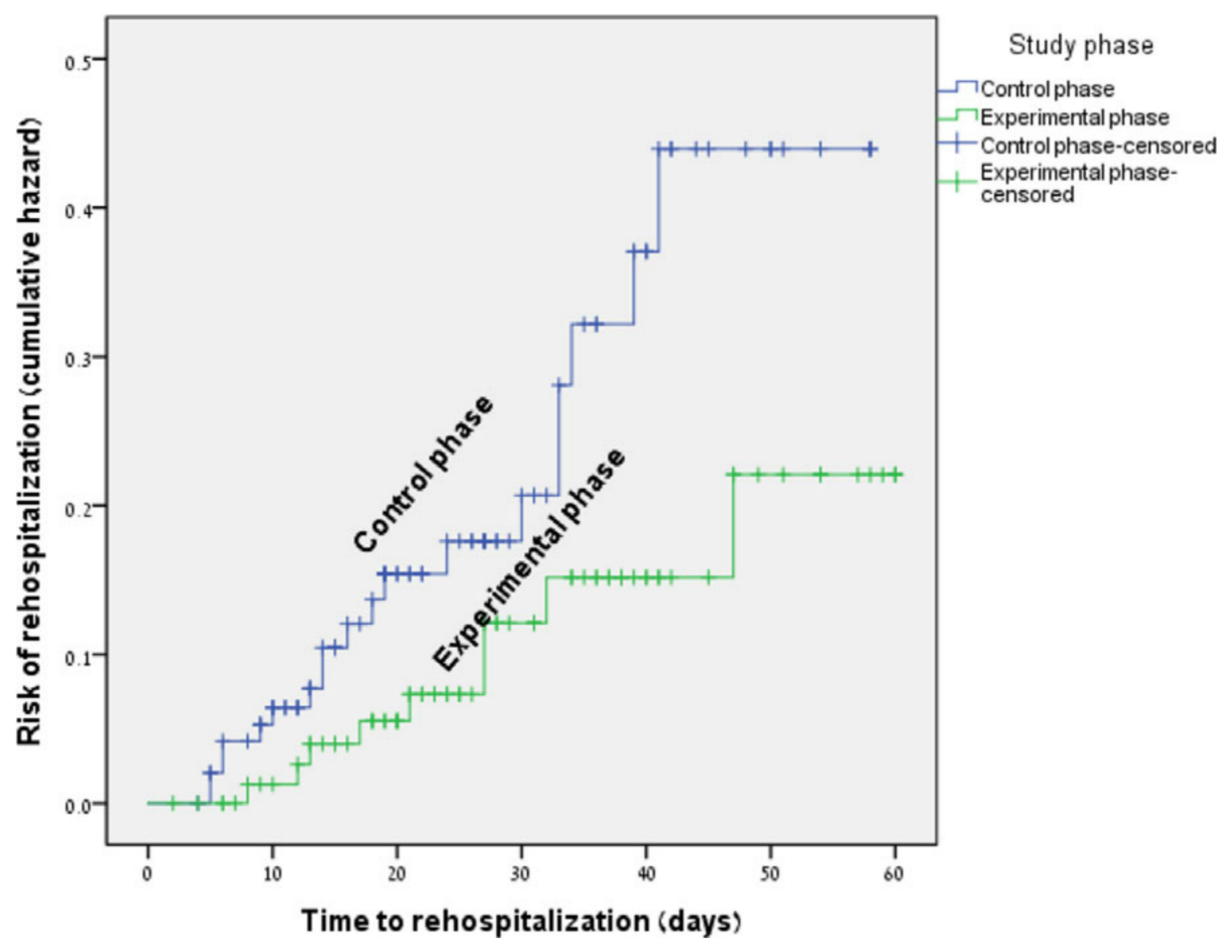
21.1% of patients were readmitted in pre-experimental phase

VS

11.7% of patients in the experimental phase

~40% relative percent reduction in readmission

Hospital admission rates decreased in both high risk (and medium/low risk patients between the pre- and experimental phases.


Study phase
Control phase
Experimental phase
Control phase-censored
Experimental phase-censored
Risk of rehospitalization (cumulative hazard)
0.5
0.4
0.3
0.2
0.1
0.0
Control phase
Experimental phase
0
10
20
30
40
50
60
Time to rehospitalization (days)

CONCLUSIONS

- One of the first clinical decision support tools for home health, the “PREVENT”- Priority for Home Health Visit Tool.
- Further work is needed to test the tool's effects on patient outcomes.

CURRENT WORK

- NINR R01 submitted (21% score)
- Learning algorithms vs. "rigid" tools
- Incorporating natural language processing to identify risk factors

THANK YOU

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