

Preliminary Outcomes of a Survivor-Centric Digital Platform in Stroke Recovery

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Introduction

This study evaluates the outcomes of a **survivor-centric, navigator driven, technology-enabled platform to support stroke survivors and care partners** during the post-stroke recovery period.

Navigator support time and social determinants of health are explored in this population with regards to outcome measures of independence, readmission rates, and quality of life.

Methods

Participants (n=60) were facilitated by a clinical navigator (occupational therapist or licensed clinical social worker) with the goals of:

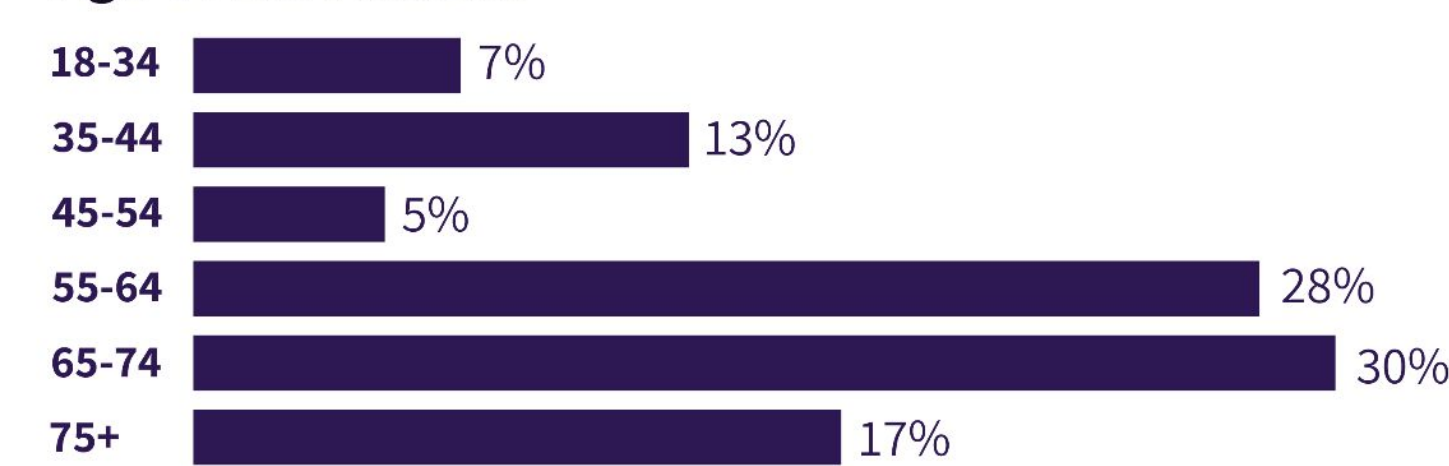
- Reducing barriers to recovery
- Increasing survivor health literacy and agency, and
- Improving post-stroke quality of life.

Clinicians worked through phone, asynchronous messaging, and video calls with the survivor and care partner who had shared access within the app, with separate profiles.

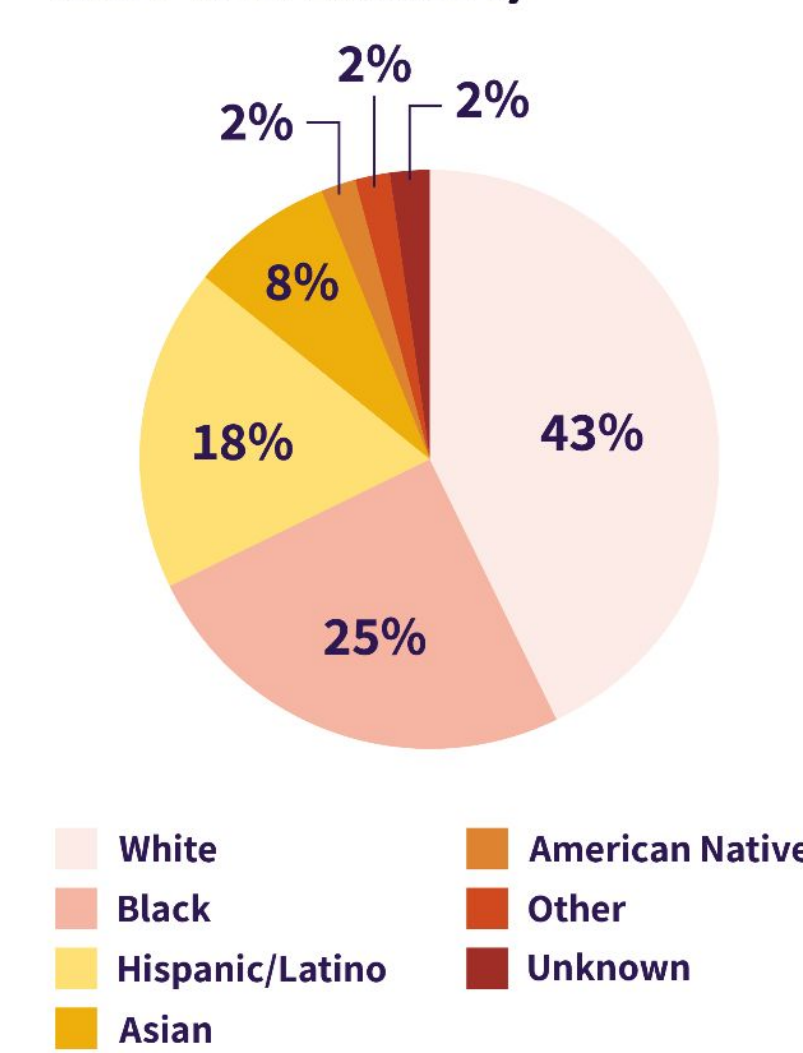
Demographics

- Survivors' ages ranged between 27-86.
- Modified Rankin Scale (mRS) at the start of the program ranged from 0-5.
- 34% of survivors were on Medicare, 12% were on Medicaid, 52% of survivors were commercially insured, and 4% were uninsured or unknown.

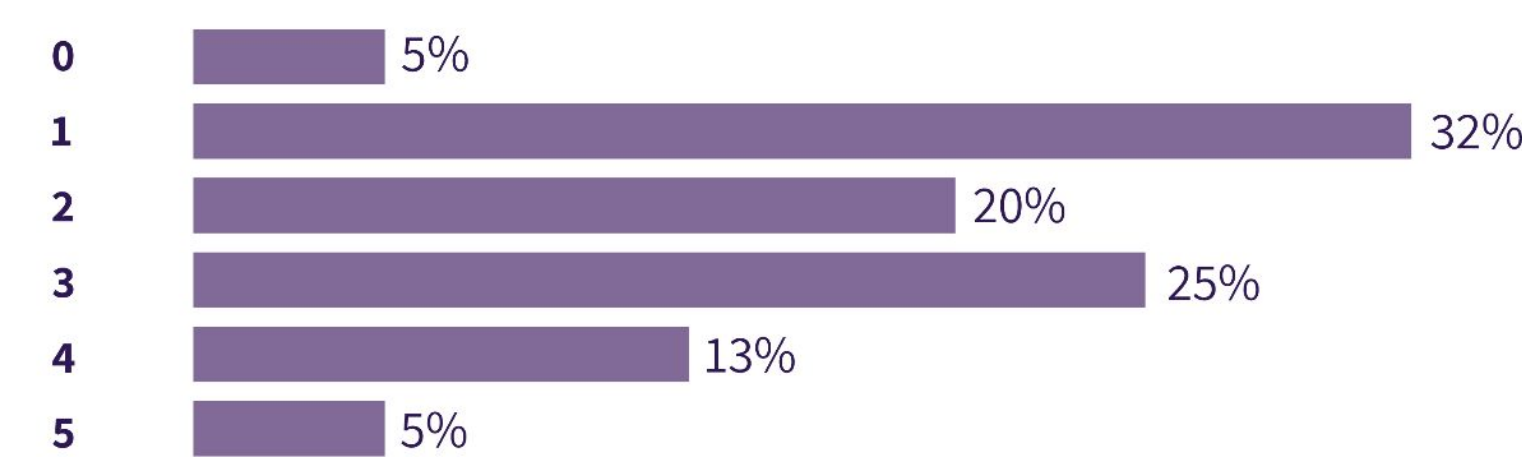
Age of Enrollment



Race and Ethnicity



Kandu Enrollment mRS



The average participant had:

- 10 Navigator touchpoints totaling
- 5.8 hours of direct contact over the average of 12 weeks. Program length was tailored to individual needs.

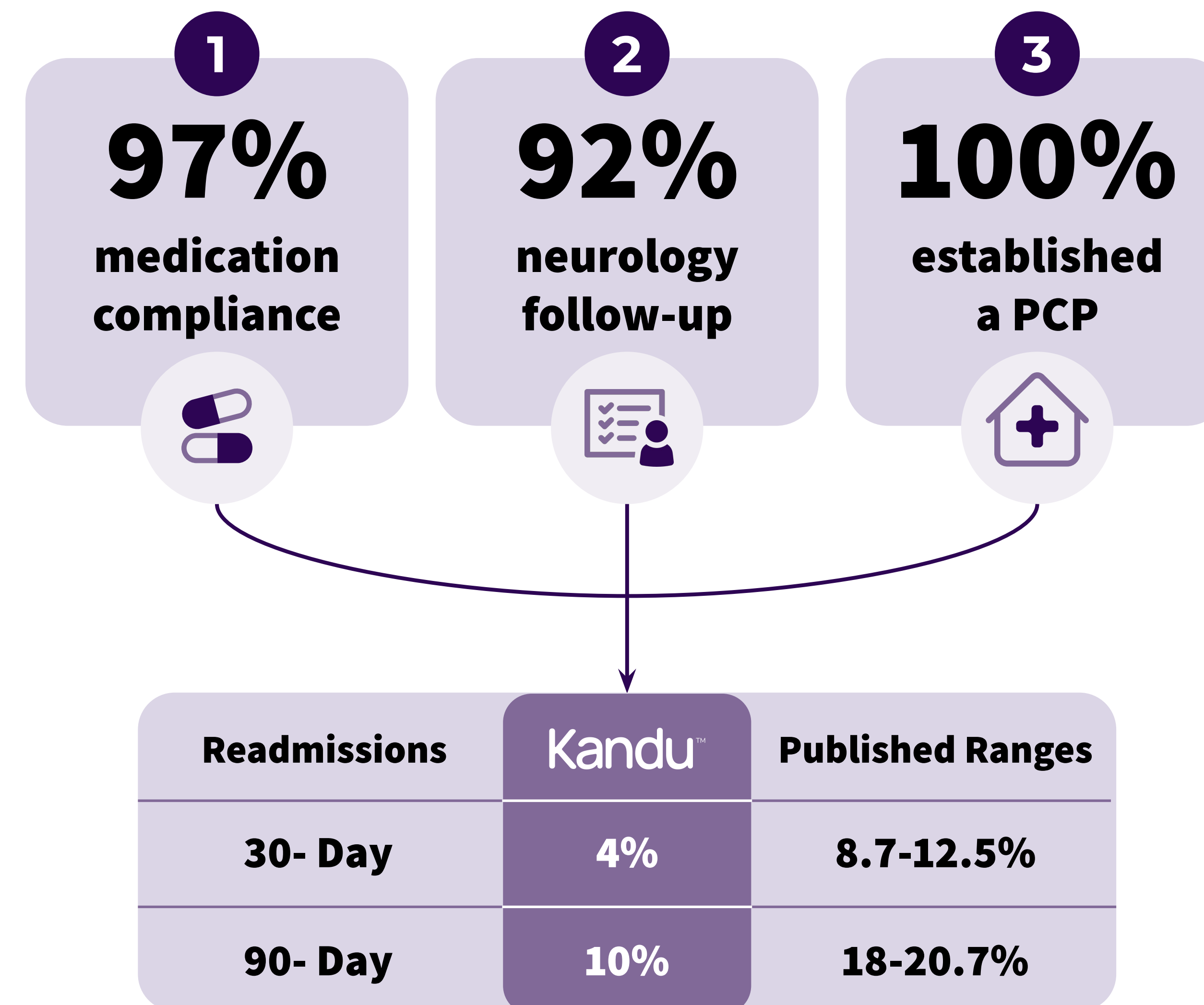
Program Philosophy

Kandu identifies a survivor's motivators through evidence-based interventions such as "Take Charge" while also allowing them to identify the barriers to recovery and stroke risk factors they would like to address.

Outcomes

By the end of the program (90 days), results included:

1. 97% medication compliance was reported
2. 92% of survivors had Neurology follow up
3. 100% had established a medical home with a PCP (15% did not have a PCP at enrollment)



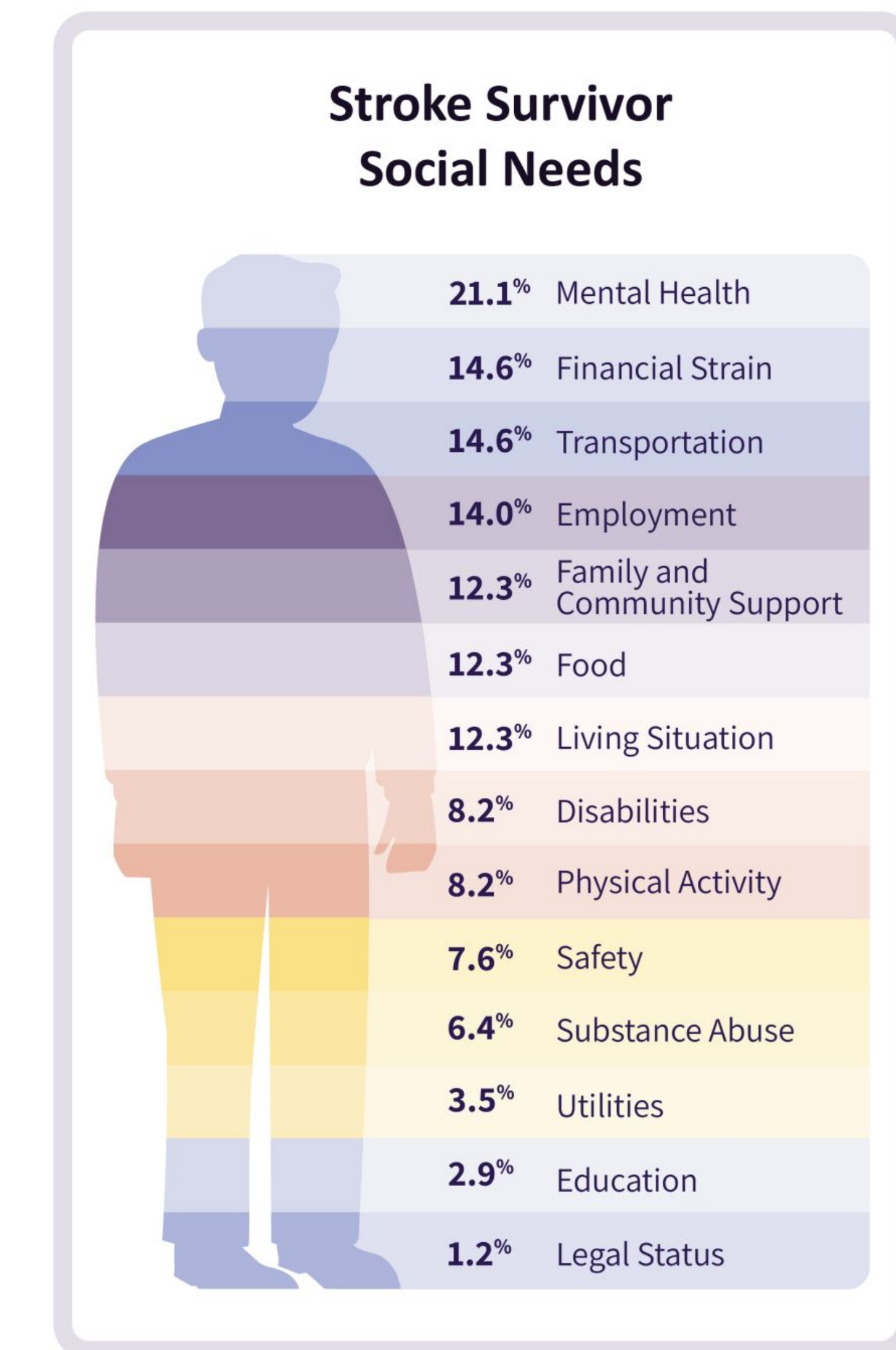
This is correlated with all-cause readmission rates of 4% at 30-days and 10% at 90-days, compared to historical, published unplanned readmission rates of 8.7-12.5% at 30-days and 18.9-20.7% at 90-days.^{1,4}

References

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Social Needs

While the follow-up needs of stroke survivors are many, one theme that emerged from this study is the **prevalence of mental health needs post-stroke** as the number one need identified by stroke survivors and care partners.



Modified Rankin Capture Rate and Improvement

Clinician assessed mRS was captured for 95% of participants at 90 days:

- 81% achieved mRS scores of 0-2 at 90 days,
- At enrollment 56% of participants were mRS 0-2.

Conclusion

Kandu's post-acute healthcare navigation, social needs support, and health behavior change approach have demonstrated outcomes that impact survivor independence, readmissions, quality of life, and compliance with discharge follow-up.



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Risk Factors in 90-Day All-Cause Ischemic Stroke Readmissions

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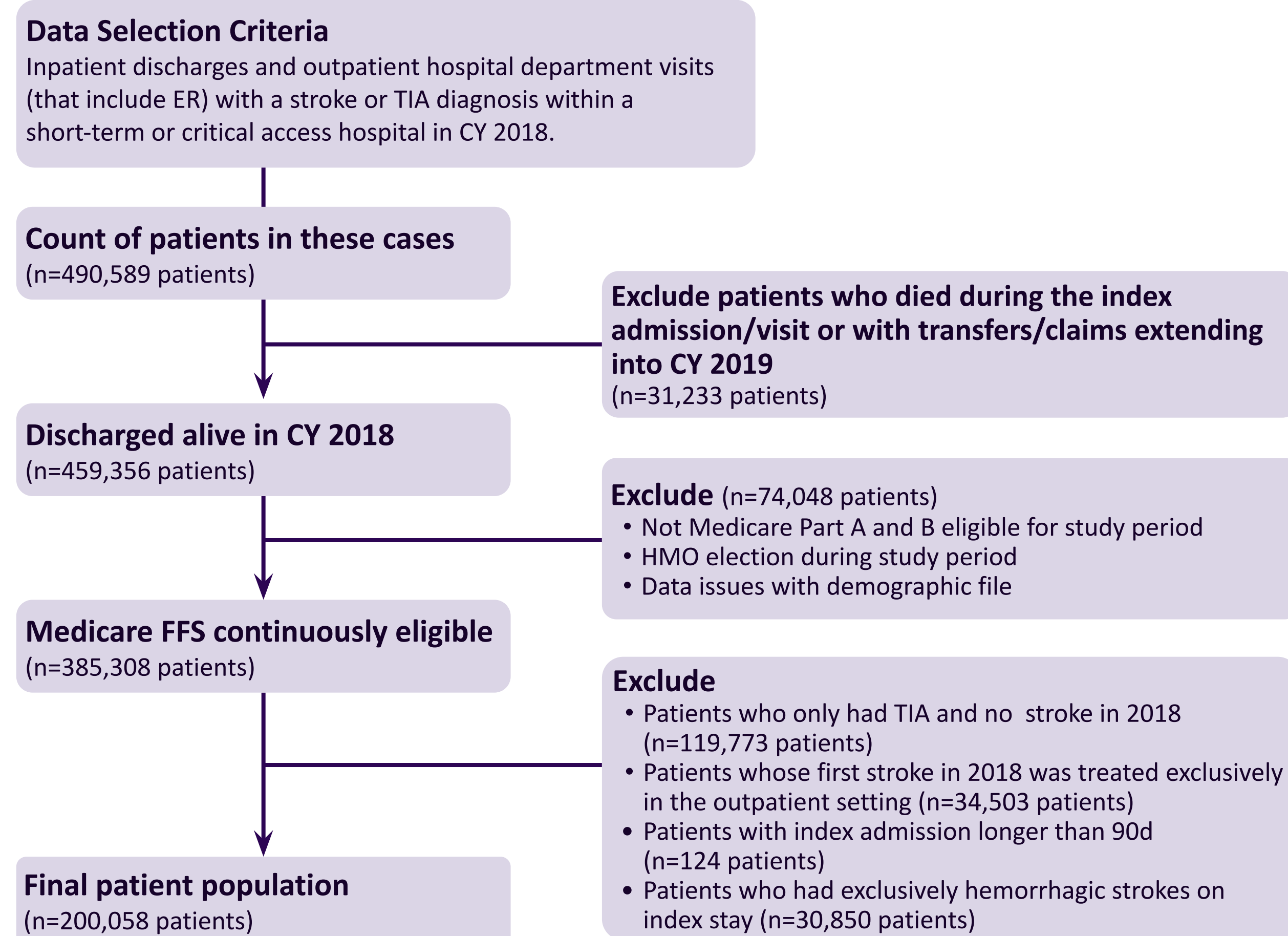
Introduction

This research explores demographic, hospitalization and comorbidity risk factors associated with 90 day readmissions following hospital discharge from inpatient treatment of ischemic stroke.

Methods

We constructed an analytic data set using Center for Medicare and Medicaid Services Standard Analytic File Longitudinal Data Set 100% inpatient and outpatient claims for Medicare Fee for Service (FFS) patients who experienced ischemic stroke in CY 2018.

Data Selection Criteria



Patients needed to have maintained continuous Medicare FFS insurance coverage for the year preceding and following their index stroke. Claims across time were linked using an encrypted identifier. Pre-existing comorbidities were identified using ICD-10 diagnoses on the index admission and on facility claims in the year prior to the index discharge.



Demographic Differences

Patient Demographics	90-Day Readmission Cohort (% or Ave.)	No 90-Day Readmission Cohort (% or Ave.)	Difference Between Cohorts	p-value	
N	25.9%	74.1%			
Patient Average Age	76.3	77.5	(1.12)	<0.0001	
Female %	53.5%	55.5%	-2.0%	<0.0001	
White %	79.4%	83.1%	-3.7%	<0.0001	
Disabled or ESRD %	24.8%	19.2%	5.6%	<0.0001	
Dually eligible for Medicaid %	26.9%	20.9%	6.0%	<0.0001	
Hospital Type %s	Teaching	63.5%	2.2%	<0.0001	
	Not Teaching	34.3%	36.5%	<0.0001	
Hospital Location %s	Urban	91.2%	1.2%	<0.0001	
	Rural	8.8%	10.0%	<0.0001	
	Acute Rehab.	24.2%	20.5%	3.7%	<0.0001
Hospital Discharge Location	Home	36.0%	-5.7%	<0.0001	
	Hospice	0.5%	10.5%	-10.0%	<0.0001
	SNF	36.1%	24.9%	11.2%	<0.0001
Other	3.3%	2.5%	0.8%	<0.0001	

Of the 200,058 patient data set, 51,860 (25.9%) had at least one readmission within 90 days. In the readmission cohort, the following demographics were **overrepresented**; being non-white, disabled or in ESRD, dually eligible patients, those at a teaching hospital, in an urban setting and returning home or going to acute rehab after hospitalization rather than a skilled nursing facility.

Index Hospital Stay Differences

Hospital Stay Features	90-Day Readmission Cohort (% or Ave.)	No 90-Day Readmission Cohort (% or Ave.)	Difference Between Cohorts	p-value
Conditions on the Index Hospital Claims				
Intracerebral Hemorrhage (ICH)	4.22%	3.86%	0.36%	0.0003
Hospital Index Treatment Variables				
Thrombectomy Treatment(s) combined	3.62%	3.33%	0.29%	0.0019
Use of IV-tPA	6.75%	7.79%	-1.04%	<0.0001
Index Hospital and Claim Characteristics Variables				
Index stay includes transfer	11.82%	11.40%	0.42%	0.0098
Length of stay of index hospital stay	7.05	5.19	1.86	<0.0001
Number of beds for the index hospital	478.01	459.93	18.08	<0.0001
Index provider is a teaching hospital	65.74%	63.54%	2.20%	<0.0001

In the readmission cohort, there was **overrepresentation** of patients with long index stays, transfers between hospitals, and stays in teaching hospitals. There was **underrepresentation** of patients who received lytics during their index hospitalization.

Comorbidity Differences

Comorbidities Presenting in the Year Pre-Stroke	90-Day Readmission Cohort	No 90-Day Readmission Cohort	Difference Between Cohorts	p-value
Condition Definition	25.9%	74.1%		
Hypertension	93.90%	91.79%	2.11%	<0.0001
Hyperlipidemia	75.41%	72.88%	2.53%	<0.0001
Coronary cardiac disease	60.48%	49.87%	10.61%	<0.0001
Diabetes	48.31%	39.90%	8.41%	<0.0001
History of stroke and sequelae diagnosis	41.74%	37.61%	4.13%	<0.0001
Atrial fibrillation	40.45%	35.35%	5.10%	<0.0001
Chronic kidney disease	39.82%	28.22%	11.60%	<0.0001
Heart failure	37.85%	26.22%	11.62%	<0.0001
Peripheral vascular disease (PVD)	29.02%	21.85%	7.17%	<0.0001
Valvular disease, use to capture "mechanical valve replacement"	25.04%	20.11%	4.92%	<0.0001
High (7 or more conditions)	43.80%	29.58%	0.1426	<0.0001
Medium (4-6 conditions)	40.80%	45.60%	-0.0484	
Low (1-3 conditions)	15.00%	24.23%	-0.0919	
None	0.40%	0.59%	-0.0024	

Stroke survivors with 7 or more comorbidities were **overrepresented** in the readmission cohort. Individual conditions that were most **overrepresented** in the readmission cohort were heart failure, chronic kidney disease (CKD) and coronary cardiac disease (CCD).

Odds Ratio Estimates

*Additional support by Mary Jo Braid-Forbes, MPH, Braid-Forbes Health Research.

Odds Ratio Estimates for 90-Day Readmissions				
Description	Odds Ratio	Confidence Interval	↑	↓
Hypercoagulation	1.36	1.27-1.45		●
Opioid abuse and dependence	1.35	1.24-1.48		●
Chronic kidney disease	1.35	1.32-1.38		●
Liver Disease, Cirrhosis, and Other Liver Conditions (except Viral Hepatitis)	1.32	1.26-1.38		●
Heart Failure	1.28	1.25-1.32		●
Coronary cardiac disease	1.25	1.22-1.28		●
Hypocoagulation	1.22	1.17-1.26		●
Peripheral vascular disease (PVD)	1.16	1.14-1.19		●
Atrial fibrillation	1.14	1.12-1.17		●
Dual eligible for Medicaid	1.14	1.11-1.17	●	
Diabetes	1.14	1.11-1.16		●
Tobacco Use	1.13	1.09-1.16	●	
Index hospital is in urban area	1.10	1.06-1.15	●	
Valvular disease, use to capture "mechanical valve replacement"	1.09	1.06-1.11		●
Depression (excludes bipolar)	1.08	1.06-1.11		●
Dementia	1.07	1.04-1.10		●
History of stroke and sequelae diagnosis	1.07	1.04-1.09		●
Disabled (as qualification for Medicare)	1.07	1.04-1.10	●	
Length of stay of index hospital stay	1.03	1.03-1.04	●	
Hyperlipidemia	0.95	0.92-0.97		●
White	0.94	0.91-0.96	●	
Index stay includes transfer	0.92	0.89-0.96	●	
Treatment during index: Use of IV-tPA	0.91	0.88-0.95	●	
Index hospital in Western Region	0.90	0.87-0.93	●	
Discharge to home	0.79	0.77-0.81	●	
Discharge to hospice	0.03	0.03-0.03	●	

Conclusion

25.9% of Medicare Fee for Service members discharged alive from an inpatient stroke admission are readmitted to a hospital within 90 days.

Multiple comorbidities and demographic features significantly increase the odds of readmission. These include race, differences in index hospital stay characteristics, eligibility for Medicaid, and geographic region. Efforts to reduce readmissions should be holistic and informed by both comorbidities and SDOH. Our findings may inform ongoing or future strategies aimed at reducing this highly prevalent occurrence that negatively impacts patient outcomes and cost of care.



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