Remote Neurology Consults to a Rural Mississippi Hospital: A Model for Addressing Specialist Workforce Shortage

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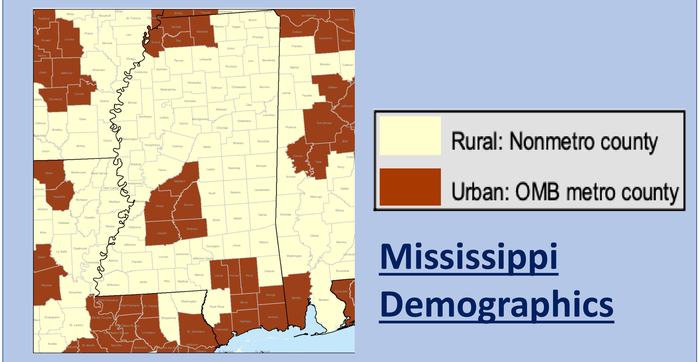
INTRODUCTION

Limited Access to Neurologists



Mississippi Demographics

- Over half (54%) of Mississippians live in a rural or nonmetropolitan area.
- Recruitment and retention of neurologists in rural MS is a challenge and barrier to access.

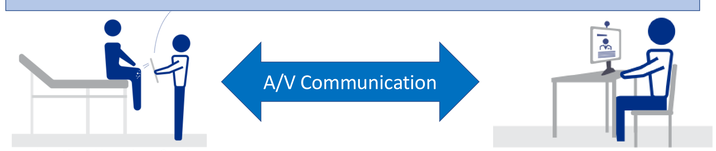
AIM

- Measure outcomes related to implementation of a hybrid TeleNeurology model in a rural Mississippi hospital.

METHODS

- For inpatient consultations, UMMC collaborated with South Central Regional Medical Center in Laurel, MS to implement a hybrid care model (~15 days of inpatient consult service provided by bedside Neurologist each month and ~15 days of inpatient consult service provided by remote UMMC 'TeleNeurologists').

Study Design:
Retrospective chart review; study period January – December 2023



- Inpatient Neurology Service at South Central Regional Medical Center
- Rounding facilitated by NPs
- 10-15 days / month

- 8 remote neurologists at UMMC
- Access to EMR
- Access to PACS
- Block schedule

RESULTS

Characteristic	N = 279
Age, Mean (SD)	67 (16)
Sex, n (%)	
Female	136 (49%)
Male	143 (51%)
Race, n (%)	
Black	116 (42%)
White	160 (57%)
Other	3 (1.1%)
Payor, n (%)	
Medicare	195 (70%)
Private	54 (19%)
Medicaid	27 (9.7%)
Multiple	2 (0.7%)
Self	1 (0.4%)
Lives in Rural County, n (%)[1]	274 (98%)

[1]As defined by HRSA

Table 1: Descriptive statistics for whole study population (all patients who received at least one teleneurology consult at local hospital in 2023).

Characteristic	N = 105
LOS, Mean (SD)	14 days (12)
Discharge Outcome, n (%)	
Home	54 (51%)
Other	36 (34%)
Terminal	15 (14%)
Excess Days of teleneurology, Mean (SD)	1 (5)
Age, Mean (SD)	69 (14)
Private Insurance, n (%)	15 (14%)
Medicaid, n (%)	13 (12%)
Stroke, n (%)	39 (37%)
Dementia, n (%)	12 (11%)
Epilepsy, n (%)	26 (25%)
Encephalopathy, n (%)	30 (29%)
Sex, n (%)	
Female	51 (49%)
Male	54 (51%)
Race, n (%)	
Black	47 (45%)
White	58 (55%)

Table 2: Covariate summary statistics for restricted model population (first hospitalization among patients who received at least one teleneurology consult during local hospital in 2023 and also were under in-patient service during that hospitalization).

Covariate	Test	Statistic	df	p-value	95% CI
Stroke	Welch's t-test	0.780	76.8	0.438	(-1.34, 3.06)
Encephalopathy	Welch's t-test	0.173	43.1	0.864	(-2.42, 2.87)
Private Insurance	Welch's t-test	-0.403	17.8	0.692	(-4.15, 2.81)
Dementia	Welch's t-test	1.72	14.2	0.107	(-0.676, 6.2)
Sex	Welch's t-test	-0.847	101	0.399	(-2.99, 1.2)
Medicaid	Welch's t-test	-0.753	14.1	0.464	(-5.62, 2.7)
Epilepsy	Welch's t-test	-1.32	35.7	0.197	(-4.58, 0.976)
Race	Welch's t-test	0.710	96.4	0.479	(-1.36, 2.87)
Age	t-test (Pearson's r)	0.564	103	0.574	(-0.138, 0.245)
COMBINED	Fischer's Chi-Squared	16.4	18.0	0.567	NA

Table 3: Statistical tests for covariate balance against primary outcome variable, Excess of Days of teleneurology.
Welch's independent sample t-test for binary variables;
Pearson's linear correlation test for age;
Fischer's χ^2 pooled hypothesis test;

	Untransformed Model	Transformed Model
Characteristic	exp(Beta) (95% CI)	exp(Beta) (95% CI)
Excess Days of teleneurology	0.99 (0.97 to 1.01) p = .1455	
Log(EDT + 15)		0.76 (0.57 to 1.01) p = .0303**
Log(Age)	1.72 (0.86 to 3.36)	1.81 (0.91 to 3.51)
Medicaid		
FALSE	—	—
TRUE	1.86 (1.22 to 2.83)	1.78 (1.18 to 2.70)
Encephalopathy		
FALSE	—	—
TRUE	1.22 (0.92 to 1.65)	1.22 (0.92 to 1.64)
Sex		
Male	0.74 (0.56 to 0.98)	0.74 (0.56 to 0.98)
Race		
Black	—	—
White	0.81 (0.61 to 1.07)	0.81 (0.62 to 1.07)

Table 4: Length of stay model results, with best and default non-linear transformation of Excess Days of teleneurology on left, and corresponding model with Excess Days of teleneurology untransformed on right.

Abbreviations: ** = .01 < p < .05, CI = Credible Interval,
p = Posterior probability of increased LOS
log(EDT+15) represents both the default (original) non-linear transformation of Excess Days of teleneurology attempted, as well as the best fitting non-linear transformation attempted.

Sensitivity to other non-linear transformations, as well as detailed interpretation of the non-linear model, is available upon request.

Covariate	Odds Ratio (95% CI)
Excess Days of teleneurology	1.06 (0.98 to 1.15) p =.0711*
Age	0.96 (0.93 to 0.99)
Encephalopathy	
FALSE	—
TRUE	0.35 (0.13 to 0.88)
Abbreviation: * = .05 < p < .1, CI = Credible Interval, p = Posterior probability of decreased odds of discharge to home	

Table 5: Discharge to home regression results, primary outcome is effect of one additional day of teleneurology substituted for in-person neurology service on odds of discharge to home versus all other outcomes.

SIGNIFICANCE

- Our best-fitting log-transformed model showed a **significant reduction in Length of Stay** due to each increase in Excess Days of Teleneurology. An untransformed model was directionally consistent but not statistically significant. (Table 4)
- Our best fitting model for discharge outcome showed a **potentially significant increase in odds of discharge to home** due to each increase in Excess Days of Teleneurology (Table 5)
- Because the schedule was arbitrary relative to pre-existing clinical status and outcomes, we treat exposure to each service as quasi-random. Therefore, we are able to provide more direct evidence of the effectiveness of teleneurology services relative to in-person service than previous studies.

CONCLUSIONS

- TeleNeurology inpatient consults can bridge the gap in service and may reduce interfacility transfers for specialty care.
- Future research is necessary to evaluate the long-term clinical outcomes and financial return on investment.

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