Telemedicine as an Alternative to Improving Health Care Services to Youth in State Custody

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Effects and Benefits of eHealth: Lessons Learned on Four Continents

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Background

- Tennessee Juvenile Justice System
- Challenges to delivering adequate medical care
- Consent decrees

Youth Development Centers

Purpose of the Study

- The purpose of this study is to examine the effectiveness of a telemedicine program in improving services delivered to youth in State custody
- The purpose is addressed by focusing on three areas:
  - Access to Care
  - Timeliness of Care
  - Cost of Care

Telemedicine in Prisons

- Adult prison telemedicine is the third largest use of telemedicine in the country (Corrections Forum 1998, 2001)
  - Prisons who implement telemedicine save approximately $102 per patient encounter (Prison Health Services, 2002; Proctor 2000, Stryhorn 1999)
- To date, no studies evaluating telemedicine in juvenile facilities

Research Questions

- Does the Telemedicine program improve access to care?
  - Hypotheses:
    - The telemedicine program increases utilization of outpatient specialty services as compared to pre-implementation.
    - The telemedicine program decreases emergency room use as compared to pre-implementation
    - The telemedicine program decreases inpatient hospital use as compared to pre-implementation

Research Questions

- Does the Telemedicine program improve timeliness of care?
  - Hypothesis:
    - The telemedicine program will reduce time from referral to specialty consult as compared to pre-implementation.

Research Questions

- Does the Telemedicine program reduce overall costs?
  - Hypothesis:
    - The telemedicine program will reduce overall cost per student month as compared to pre-implementation.

Study Overview and Data Collection

- This is a pre/post implementation quasi-experimental study design
- Data were gathered for the year prior to telemedicine intervention and the first year of intervention
- Data collection focused on existing data sources

Methods

- Access to Care
  - Dependent variables
    - rates per YDC per month
    - Outpatient visits, ER visits, inpatient visits
  - Independent variables
    - YDC, month, treatment
  - Other explanatory variables – age, sex, race
  - Negative binomial regression

Methods

- Timeliness
  - Dependent variable – time to treatment
  - Independent variables – YDC, treatment
  - Behavioral health visits only
  - Survival analysis
  - Cox Proportional hazards model

Methods

- Cost
  - Dependent variables (per student per month)
    - Total costs
    - transportation costs
    - average medical costs
  - Independent variables – YDC, treatment, months

Methods

- Cost
  - Other variables of interest
    - Medical cost per encounter
    - Transportation cost per encounter
    - Outpatient cost per center per month
    - ER cost per center per month
    - Inpatient cost per center per month
  - Generalized linear model – multivariate analysis of variance

Results

- Research Questions
  - **Does the Telemedicine program improve access to care?**
  - Does the Telemedicine program improve timeliness of care?
  - Does the Telemedicine program reduce overall costs?

Table IV.3 Effect of Treatment Intervention on Outcome Measures

Outcomes Measure	Coefficient	Odds Ratios	P - Value
Outpatient Visits			
WH	0.74	2.10	0.002
T	0.017	1.02	0.79
MV	0.33	1.39	0.01
W	0.79	2.20	0.0002

Table IV.3 Effect of Treatment Intervention on Outcome Measures (continued)

Outcome Measure	Coefficient	Odds Ratios	P- Value
Emergency Room Visits			
WH	0.12	1.13	0.66
T	0.12	1.13	0.47
MV	0.53	1.70	0.11
W	0.98	2.66	0.21

Table IV.3 Effect of Treatment Intervention on Outcome Measures (continued)

Outcome Measure	Coefficient	Odds Ratios	P- Value
Inpatient Visits			
WH	-1.61	0.20	0.06
T	0.68	1.97	0.53
MV	unestimateable		
W	unestimateable		

Table IV.4 Effect of Treatment Intervention on Access: Level of Telemedicine Implementation

Access Measure	Cofficient	95% Conf. Limits	P-value
ER Visits	-0.07	-0.11, -0.04	<0.0001
Inpatient Visits	-0.01	-0.08, 0.05	0.736
Outpatient Visits	0.01	0.001, 0.03	<0.0365

Results

- Research Questions
  - Does the Telemedicine program improve access to care?
  - **Does the Telemedicine program improve timeliness of care?**
  - Does the Telemedicine program reduce overall costs?

Table IV.5 Time from Referral toTreatment by YDC

YDC	Hazard Ratio	Inverse	P-value	Percent Decrease Associated with Treatment
WH	3.50	0.29	<.0001	74.42
T	1.09	0.92	0.6805	8.26
MV	1.71	0.58	0.04	41.52
W	1.48	0.67	0.13	32.43

Results

- Research Questions
  - Does the Telemedicine program improve access to care?
  - Does the Telemedicine program improve timeliness of care?
  - **Does the Telemedicine program reduce overall costs?**

Table IV.6 Effect of Treatment Intervention on Cost Measures: Level of Telemedicine Implementation

Cost Measure	N	YDC	Comparison Treatment Parameter	Standard Error	P Value	Marginal Impact Estimate
Outpatient Cost	48	WH	-1.57	1.075	0.186	?$59.74
Per center/		T	-7.18	1.306	0.0003	?$489.72
Per month		MV	-3.59	1.887	0.09	?$446.79
		W	2.58	0.727	0.005	?$73.72
ER Cost	48	WH	0.811	2.685	0.77	?$9.76
Per center/		T	-2.46	1.976	0.24	?$130.54
Per month		MV	-2.17	10.853	0.85	?$30.92
		W	-3.53	2.77	0.23	?$0.68
Inpatient Cost	48	WH	-3.53	3.923	0.39	?$0.23
Per center		T	-2.68	7.028	0.71	?$0.14
Per month		MV	-3.16	8.03	0.70	?$0.05
		W	0.35	1.983	0.86	?$0.01

Table IV.6 Effect of Treatment Intervention on Cost Measures: Level of Telemedicine Implementation (continued)

Cost Measure	N	YDC	Comparison Treatment Parameter	Standard Error	P-Value	Marginal Impact Estimate
Med Cost Per student/ Per month	48	WH	-0.35	0.369	0.37	?$1.42
		T	-3.37	0.856	0.003	?$10.26
		MV	-1.61	2.079	0.46	?$5.77
		W	-0.90	0.387	0.04	?$1.50
Transportation Cost Per student/Per month	48	WH	0.02	0.038	0.60	?$0.02
		T	-0.07	0.283	0.80	?$0.10
		MV	-0.32	0.484	0.52	?$0.19
		W	-0.14	0.211	0.51	?$0.06

Table IV.6 Effect of Treatment Intervention on Cost Measures: Level of Telemedicine Implementation (continued)

Cost Measure	N	YDC	Comparison Treatment Parameter	Standard Error	P - Value	Marginal Impact
Average Med	48	WH	-0.734	0.468	0.15	?$0.40
Cost Per student/		T	-5.13	1.148	0.001	?$6.42
Per month		MV	-4.01	1.998	0.07	?$4.96
		W	1.11	0.512	0.05	?$0.42
Transportation	48	WH	-0.09	0.279	0.75	?$0.02
Cost Per student		T	-4.40	0.857	0.0004	?$1.09
/Per month		MV	-1.29	0.849	0.150	?$0.17
		W	-0.63	0.301	0.06	?$0.03
Total Cost	48	WH	-0.59	0.345	0.19	?$0.45
Per student/		T	-4.93	0.977	0.0005	?$7.55
Per month		MV	-3.65	1.76	0.06	?$5.06
		W	0.74	0.44	0.13	?$0.34

Conclusions

- Access
  - Outpatient utilization increased 40- 50% among YDCs
  - With each 1% increase in the use of telemedicine visits, ER visits decreased 7%
- Timeliness – overall wait times from referral to treatment reduced 38% overall

Conclusions

- Cost
  - Total cost of care increased significantly for three of the eight cost measures
  - As the level of telemedicine implementation went up,
    - Average outpatient costs per month decreased in 2 of 4 centers
    - Medical cost per encounter decreased in 2 of 4 centers

Conclusions

- 11.3% decrease in spending on pharmaceuticals per student per month
- Pharmaceuticals per patient
  - 4 months pre-telehealth implementation - $135.22
  - 4 months post-telehealth implementation - $119.96
- Change in medications to those more appropriate to typical adolescent psychiatric diagnoses.
- Reduction in poly-pharmacy
  - Average of 1.94 meds per student pre-implementation
  - Average of 1.43 meds per student post-implementation