VETN Quantitative Evaluation Study

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VETN Quantitative Evaluation Study

The quantitative evaluation study of the Vermont Emergency Telepsychiatry Network (VETN) demonstration project aimed to document the patients' characteristics and experience at the demonstration hospitals' emergency department (ED), the cost of the VETN demonstration projects, and the cost of ED utilization. In the following sections, we describe the patient and cost data collected, the methods and assumptions used in the analysis, and our results and discuss our findings.

Data

Patient and ED Experience Data

We used aggregate data from Rutland Regional Medical Center (RRMC) and Northeastern Vermont Regional Hospital (NVRH); both sites provided baseline data before the pilot programs and data during the pilot programs. Data elements included patient counts and average length of stay (LoS) in hours by sex at birth, age, discharge disposition, behavioral restraint, emergency evaluation, and insurance status.

Start-up and Ongoing Implementation Costs

To collect start-up costs, we used a semi-structured interview guide and interviewed the demonstration project leaders and other key staff at RRMC and NVRH. Each interview guide identified key start-up activities such as planning meetings with hospital staff and with telepsychiatry providers, staff trainings, and the process of credentialing providers. For each activity, we identified the staff type(s) involved and the labor hours used by each staff type. Staff type wages were specific to Vermont and obtained from the Bureau of Labor Statistics,[i] Occupational Information Network (O*NET),[ii] and local job listings, which included salary information. The key informants also provided the dollar costs of any telepsychiatry provider fees and equipment costs. Finally, average fringe benefit rates were obtained from the Bureau of Labor Statistics,[iii] and hospital administrative costs were obtained from the literature.[iv]

A similar process was used to collect ongoing implementation costs at RRMC and NVRH. We used the hospital's VETN workflow information to identify key activities that would likely create cost beyond usual care and asked the key informant(s) to estimate the labor time and staff types typically used for that activity. The same staff wages, fringe, and administrative rates used for start-up costs were also used for ongoing implementation costs. From RRMC, we also had additional invoice data: the cost of telepsychiatry consults and insurance reimbursements for the consults.

Methods and Assumptions

ED Costs and LoS

Table 1 shows ED costs using a visit cost plus an ED hourly boarding cost. The visit cost is estimated from Healthcare Cost and Utilization Project and is calculated from the average cost from ED visits caused by mental health and substance use disorders by age.[v] Nicks et al. calculated the hourly boarding cost by dividing facility payments received per admitted ED patient by the average total LoS.[vi]

Table 1. ED visit and ED hourly boarding unit costs

Unit	RRMC Unit Costs 2022 USD	NVRH Unit Costs 2022 USD
Visit Cost (RRMC: 18 years old and under) (NVRH: All ages)	$505	$621
ED Boarding, costs per hour in the ED	$126	$126

Table 2 calculates ED costs using level five (highest complexity visit) total charges reported to the Vermont Department of Health by RRMC and NVRH.[vii] We assume that the total charge re-occurs every 24 hours on a prorated basis (e.g., the estimated charge for a 35-hour ED stay equals (35/24) * $1,983). Charges do not include the costs of any tests or procedures, so the cost estimates in Table 2 are likely to underestimate potential charges.

Table 2. Vermont community hospital pricing, ED charges

Unit	Unit Costs USD 2022
Total charges every 24 hours in the ED for Current Procedural Terminology (CPT) 99285 Level 5 at RRMC	$1,983
Total charges every 24 hours in the ED for CPT 99285 Level 5 at NVRH	$1,637

Start-up and Ongoing Costs

Start-up and ongoing costs were calculated using the same approach: labor time was multiplied by staff type wages to calculate the economic or opportunity cost of labor. Fringe benefits[viii] were applied to total labor costs, and administrative costs[ix] were applied to both labor and non-labor costs. Total costs were calculated by summing labor and non-labor costs over the start-up or ongoing implementation period.

Results

Patient Characteristics

RRMC had 28 patients complete consults and only included pediatric patients recommended for inpatient admission to Brattleboro Retreat. Fifty-four percent of patients were female, more than 90% were on Medicaid, 10% were 10 and younger, 32% were 11 to 14 years of age, and 57% were 15 to 17 years of age. NVRH had 10 patients complete consults and included all mental health patients with physicians deciding when to request a telepsychiatry consult. Eighty percent of patients were male, about 40% were on Medicaid, 30% were 15 to 25 years of age, 40% were 26 to 64 years of age, and 30% were 65 or older. Figures A1 and A2 in the Appendix present these results as infographics.

Table 3 summarizes ED utilization between all patients with mental health complaints and patients with a telepsychiatry consult. RRMC patients with a consult were less likely to be discharged home (21% vs. 71%), more likely to be initially recommended for inpatient psychiatric care (100% vs. 29%) and less likely to have a same-day discharge (7% vs. 51%). Correspondingly, patients with a consult stayed much longer in the ED, with an average stay of 139 hours compared to 18. NVRH patients with a consult were also less likely to be discharged home (20% vs. 64%), more likely to be recommended for inpatient treatment (40% vs. 15%) and less likely to have a same-day discharge (20% vs. 87%). This meant patients with a consult stayed in the ED 61 hours on average, compared with 13 hours for patients without a consult.

Table 3. Patient ED Experience at RRMC and NVRH

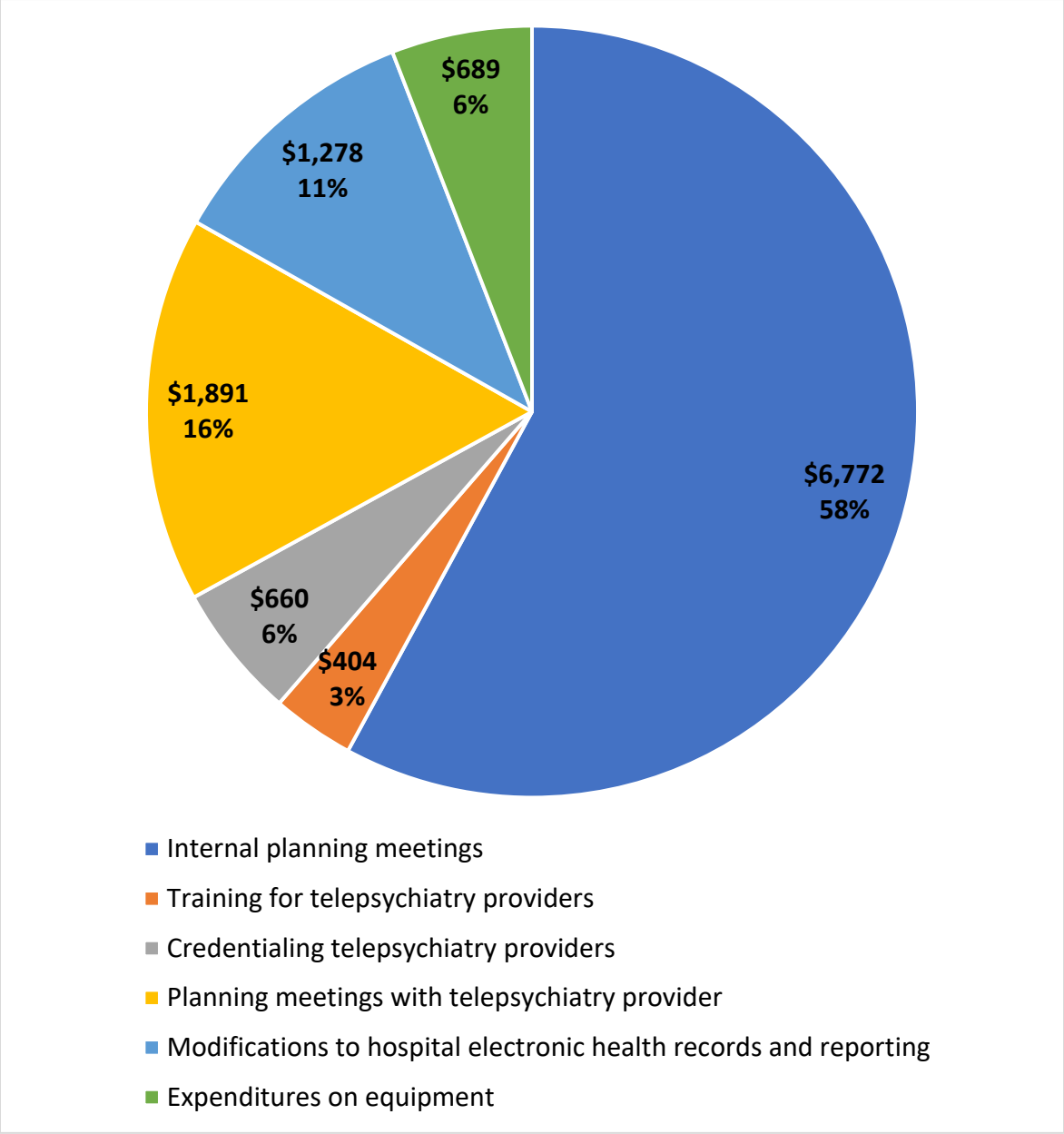
	RRMC		NVRH	
Measure	All Patients[1] (n = 237)	Patients Receiving Telepsychiatry Consults (n = 28)	All Patients[2] (n = 210)	Patients Receiving Telepsychiatry Consults (n = 10)
Discharged home	169 (71%)	6 (21%)	135 (64%)	2 (20%)
Recommended for admission to inpatient psychiatric unit	68 (29%)	28 (100%)	31 (15%)	4 (40%)
Same-day discharge	121 (51%)	2 (7%)	186 (87%)	2 (20%)
Mean LoS (hours)	18	139	13	61
Overturned involuntary commitments	0	0	0	0

1. Population was all children and adolescents under the age of 18 with a primary mental health diagnosis presenting to the ED. Data period is from January through December 2023.
2. Population was all patients with a primary mental health diagnosis presenting to the ED. Data period is from January through June 2024.

RRMC Start-up Costs

RRMC developed a telepsychiatry service delivery model that included four credentialed providers offering consults during business hours, 2 days a week. RRMC targeted a subset of pediatric patients ages 18 years and younger referred to Brattleboro Retreat for inpatient behavioral health. As shown in Figure 1, RRMC's start-up expenditures are $689 to update video conferencing equipment. RRMC staff supported start-up efforts within the capacity of their existing roles at RRMC; the estimated opportunity cost of RRMC staff labor is $11,009, including fringe benefits and administrative costs. RRMC start-up and planning activities occurred from October through December 2022. RRMC implemented VETN in January 2023, with the first patient being seen in March 2023.

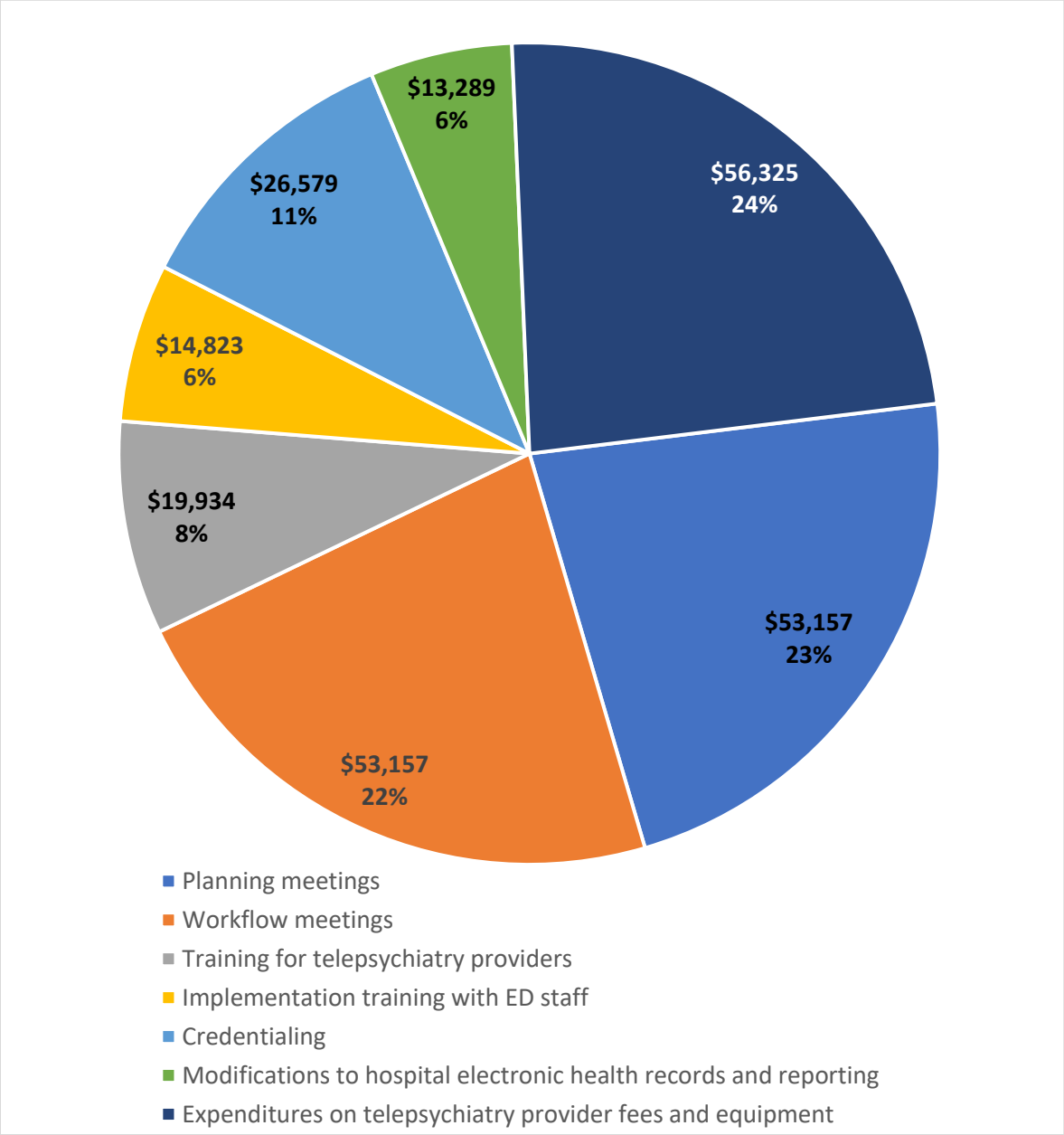
Figure 1. RRMC Start-up Costs, 2022 US Dollars



NVRH Start-Up Costs

NVRH developed a telepsychiatry service delivery model that includes 17 credentialed providers affiliated with a national telepsychiatry vendor, ARRAY, offering off-hours telepsychiatry consults at the attending physician's request (5 p.m. to 8 a.m. and weekends, eventually expanded to 24/7 without additional costs). NVRH start-up expenditures were $56,325 which includes ARRAY's fees, equipment, and training costs (Figure 2). Over 6 months, NVRH staff supported start-up efforts within the capacity of their existing roles at NVRH; the estimated opportunity cost of NVRH staff labor is $180,939, including fringe benefits and administrative costs. NVRH start-up and planning activities occurred from May through November 2023.

Figure 2. NVRH Start-up Costs, 2022 U.S. Dollars



ED LoS Costs

For both demonstration sites, telepsychiatry patients had longer ED LoS and higher costs than patients that did not receive a consult. RRMC telepsychiatry patients had an ED LoS of 139 hours, compared with 20 hours among all non-telepsychiatry pediatric patients in Fiscal Year (FY) 2023 and 18 hours during the study period (January through December 2023). Appendix Table 1 shows average ED costs, including visit costs and estimated opportunity costs for ED boarding. Telepsychiatry patients have an average cost $18,054, compared with $3,099 for non-telepsychiatry pediatric patients in FY2023 and $2,835 during the study period. Appendix Table 2 has a similar pattern and calculated costs based on Vermont hospital pricing

schedules.[vii] Telepsychiatry patients have an average ED cost of $11,474, compared with $1,696 for non-telepsychiatry pediatric patients in FY2023 and $1,523 during the study period.

NVRH telepsychiatry patients had an ED LoS of 61 hours, compared with 16.3 hours among all non-telepsychiatry mental health patients during the study period (January through June 2024). Average ED costs, including visit costs and estimated opportunity costs for ED boarding, were $8,339 for telepsychiatry patients compared with $2,684 for non-telepsychiatry mental health patients (Appendix Table 3). Appendix Table 4 has a similar pattern and calculated costs based on Vermont hospital pricing schedules.[vii] Telepsychiatry patients have an average ED cost of $4,166, compared with $1,114 for non-telepsychiatry mental health patients during the period.

Telepsychiatry Service Delivery Costs

RRMC provided telepsychiatry consults to 28 patients from January through December 2023, at a total cost of $25,650. Table 4 shows the telepsychiatry costs per patent for both pilot programs. At RRMC, consult costs were $915 per patient and ED costs were $17,642 per patient. NVRH completed 10 telepsychiatry consults between January through June 2024 at a total cost of $36,820, including the cost of the fixed availability fee. At NVRH, telepsychiatry costs were $3,682 per patient, and ED costs were $8,339 per patient.

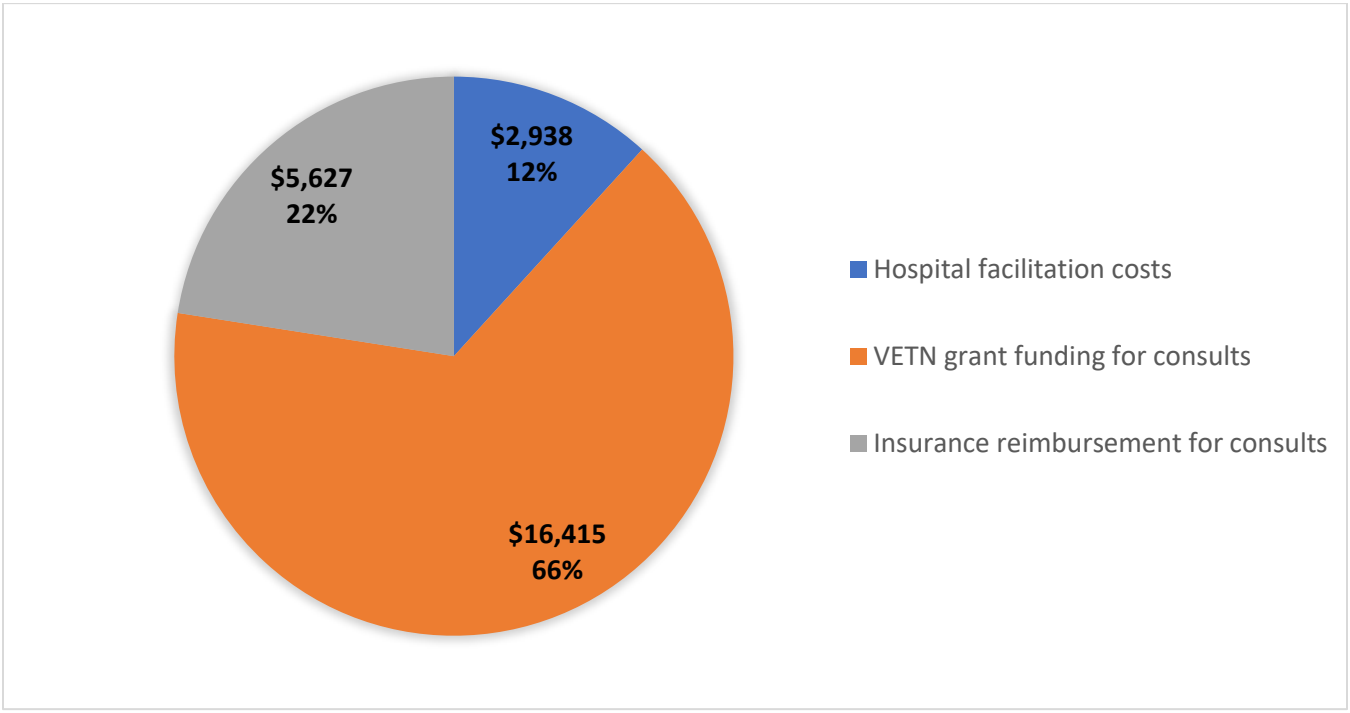
Table 4. Service Delivery Costs Per Patient, RRMC and NVRH

Cost Category	Activity or Quantity	RRMC Average Cost per Patient	NVRH Average Cost per Patient
Opportunity labor costs	Request consult, set up equipment, and follow up	$115	$130
Consult fees	Charged by consult provider	$800	$552
	NVRH: Fixed availability fee over 10 consults	NA	$3,000
Total Telepsychiatry Costs		**$915**	**$3,682**
ED Visit Costs[v]	RRMC: Youth Patients with Mental and Substance Use Disorders NVRH: All Patients with Mental and Substance Use Disorders	$505	$621
ED Boarding Costs[vi]	RRMC: Average LoS was 139 hours NVRH: Average LoS was 61 hours	$17,642	$7,718
Total ED Costs		**$17,642**	**$8,339**

RRMC Reimbursement Study

Additional data from RRMC allowed costs to be analyzed from the hospital perspective, which includes reimbursement from the VETN grant and insurance. Completed reimbursement data show an average insurance reimbursement of $216 per Medicaid patient and $836 for Tricare. In Figure 4, the VETN grant funding covered $16,343 of the consult costs (66% of total costs), and insurance reimbursement covered $5,627 (22% of total costs) The opportunity cost of hospital facilitation is $2,938 (12% of total costs), which included time spent by RRMC staff to request a consult, set up and tear down equipment, monitor patients during sessions, and follow up post-consult. Based on 28 completed consults, current costs of telepsychiatry at RRMC show that observed insurance reimbursement rates would only cover only a fraction of the telepsychiatry consult costs. Without VETN grant funding, RRMC would need to spend $586 per patient consult in direct expenditures in addition to incurring the opportunity cost of RRMC staff labor used to facilitate a consult.

Figure 4. RRMC Reimbursement and Hospital Perspective Costs



Discussion

The cost of the VETN demonstration project to the hospitals and the health care system included start-up costs and service delivery costs for RRMC and NVRH. Start-up costs varied substantially between RRMC and NVRH; RRMC only incurred $689 in direct expenditures and $11,205 in labor opportunity costs, whereas NVRH incurred $56,325 in direct expenditures and $180,939 in labor opportunity costs. RRMC developed a project with a local provider and offered consults 2 days a week during business hours. Additionally, RRMC leveraged existing telehealth trainings, processes, and equipment to further reduce start-up costs. In contrast, the scope and scale of NVRH's demonstration project is much larger, which helps explains the higher cost. NVRH's project targets all mental health patients and uses a national telepsychiatry provider. NVRH's start-up costs included large, one-time, telepsychiatry provider fees and equipment costs. NVRH used staff time to credential providers, develop new workflows, and trainings for this project. For both sites, the opportunity cost of staff labor accounted for most of the economic costs. These costs were not a *new* expenditure or budget line item for the hospitals, as no new staff were hired specifically for the demonstration projects.

In some cases, the additional cost of telepsychiatry consults may be offset by reductions in ED costs because of shorter ED stays. Although neither demonstration sites observed reductions in ED during the study period, the sites added psychiatric services that were not previously available. NVRH found that ED LoS was higher for patients with telepsychiatry, albeit over only 10 consults; ED physicians likely requested consults for patients with higher acuity. RRMC found that ED LoS was often determined by wait times for beds and patient acuity, which the demonstration project was not designed to address. Patients with a telepsychiatry consult had substantially longer ED LoS and higher costs that patients without a consult, but these patients were often waiting for a bed to open at the Brattleboro Retreat or were waiting to receive a consult. Future economic evaluation could look for economic benefits at the inpatient treatment facility (e.g., are patients with an ED consult released sooner?) and at the patient level (e.g., do patients with an ED consult have better outcomes?).

APPENDIX

Figure A1. Infographic of Telepsychiatry Patient Characteristics at RRMC

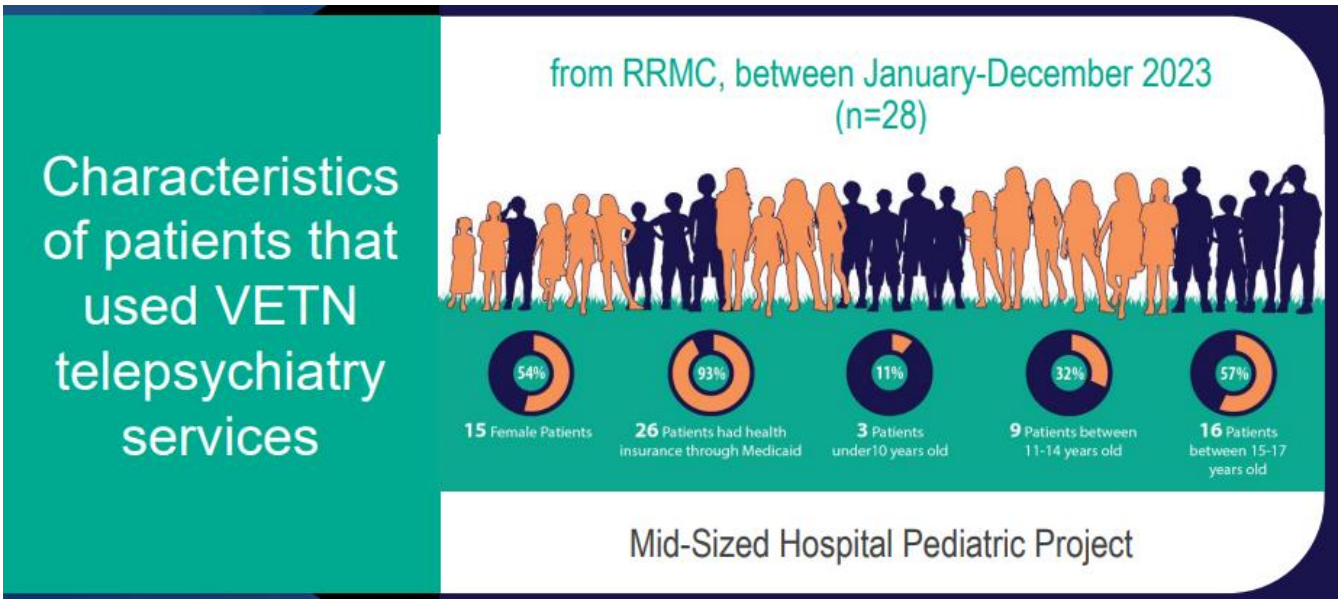
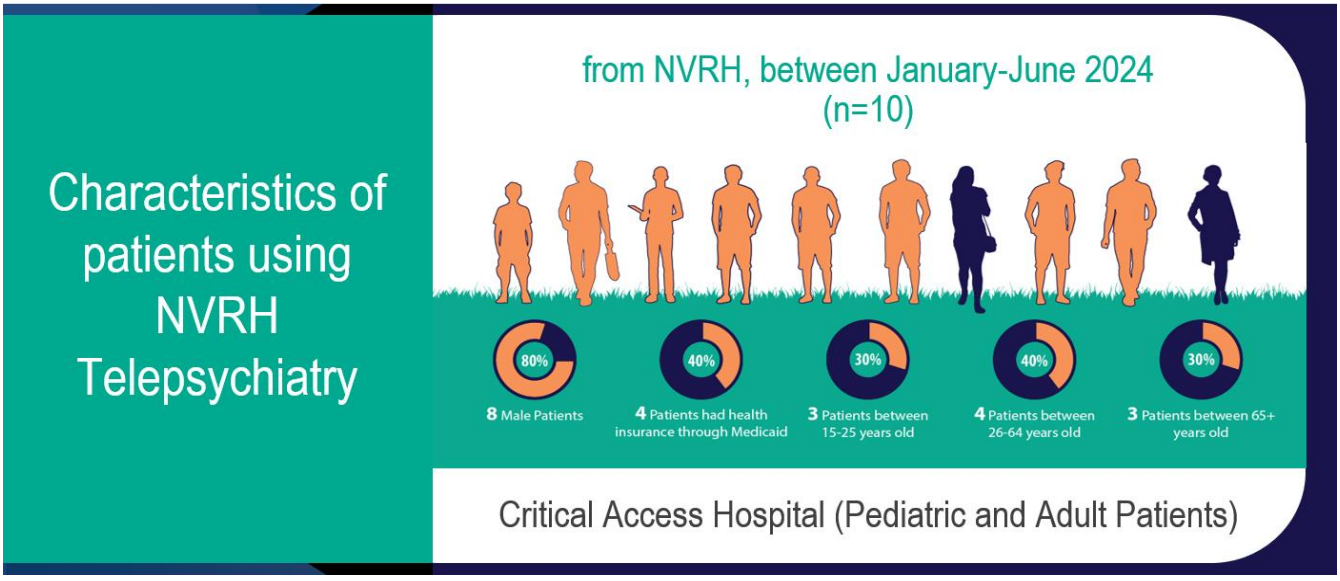


Figure A2. Infographic of Telepsychiatry Patient Characteristics at NVRH



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