

2008 Pediatric Telehealth Colloquium

## Update on Rural Pediatric Critical Care Telemedicine

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# Introduction

**A disparity in access to health care exists between rural and urban areas**

- **21% of children in the United States live in rural areas**
- **3% of board certified pediatric intensivists practice in rural areas**

## Introduction

- **Outcomes for critically ill pediatric patients are better when they are cared for by pediatric intensivists, in tertiary care pediatric intensive care units, and Level 1 trauma centers**

## Introduction

- Vermont Children's Hospital is the tertiary referral center for Vermont and northern up-state New York
- Level 1 trauma center
- The referral area includes 19 rural counties with a population of ~1,000,000
- Pediatric Intensivists n=3
- Pediatric Emergency Medicine specialists n=0



Cambridge VT

Cambridge MA

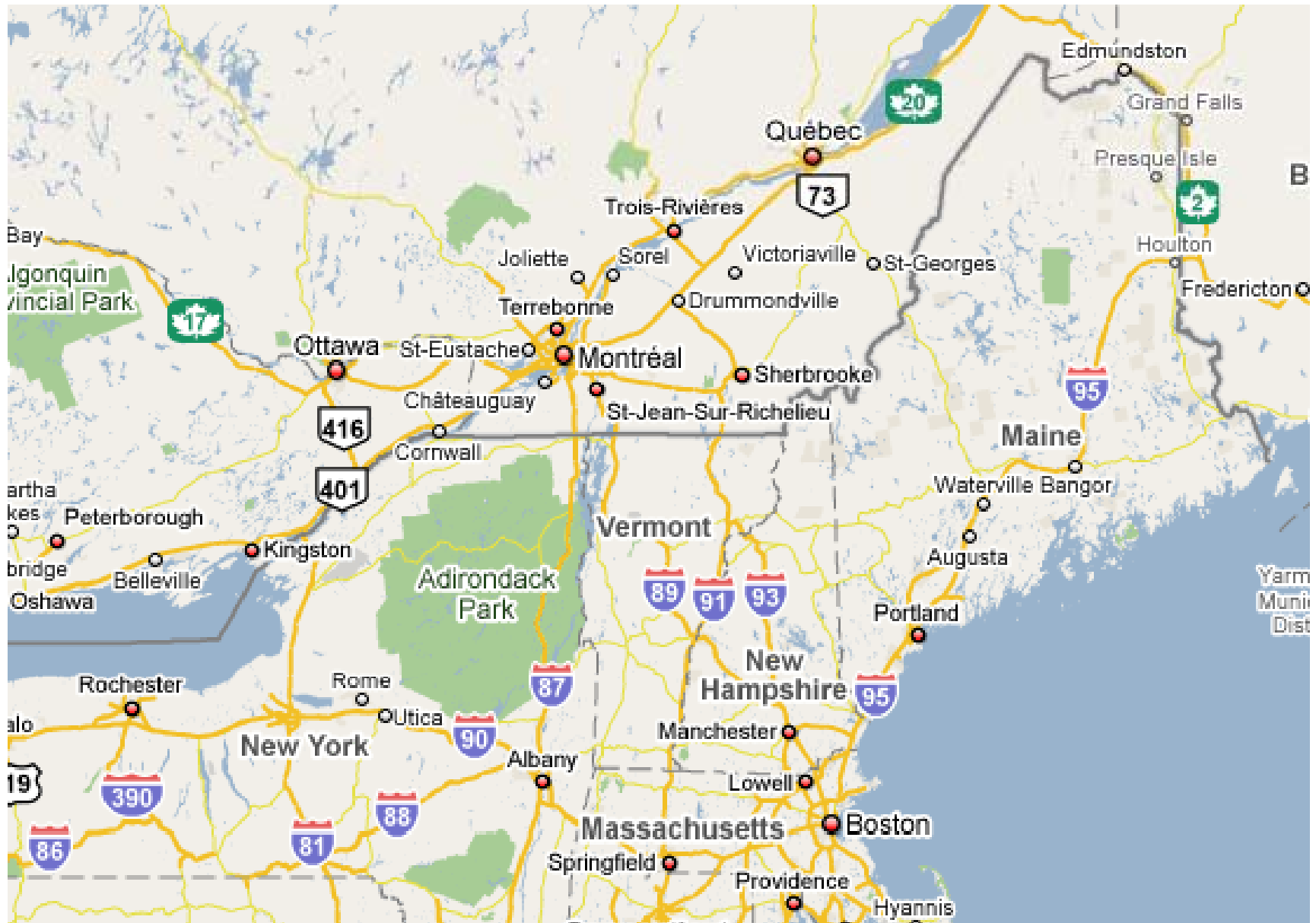


## Introduction

- In an attempt to address the issue of local rural access to sub-specialty pediatric critical care, we implemented a program to perform and evaluate pediatric critical care telemedicine consultations in rural emergency departments

## Methods

- **10 rural emergency departments in a referral area with a population of 1,000,000 in 19 rural counties in VT and upstate NY**
- **Ground distance to the PICU averages 62 miles (range 30-117 miles)**
- **One-way ground transport averages 104 minutes (range 35-195 minutes)**







Massena

Malone

St. Albans

Plattsburgh

Morrisville

Canton-Potsdam

Burlington

Saranac

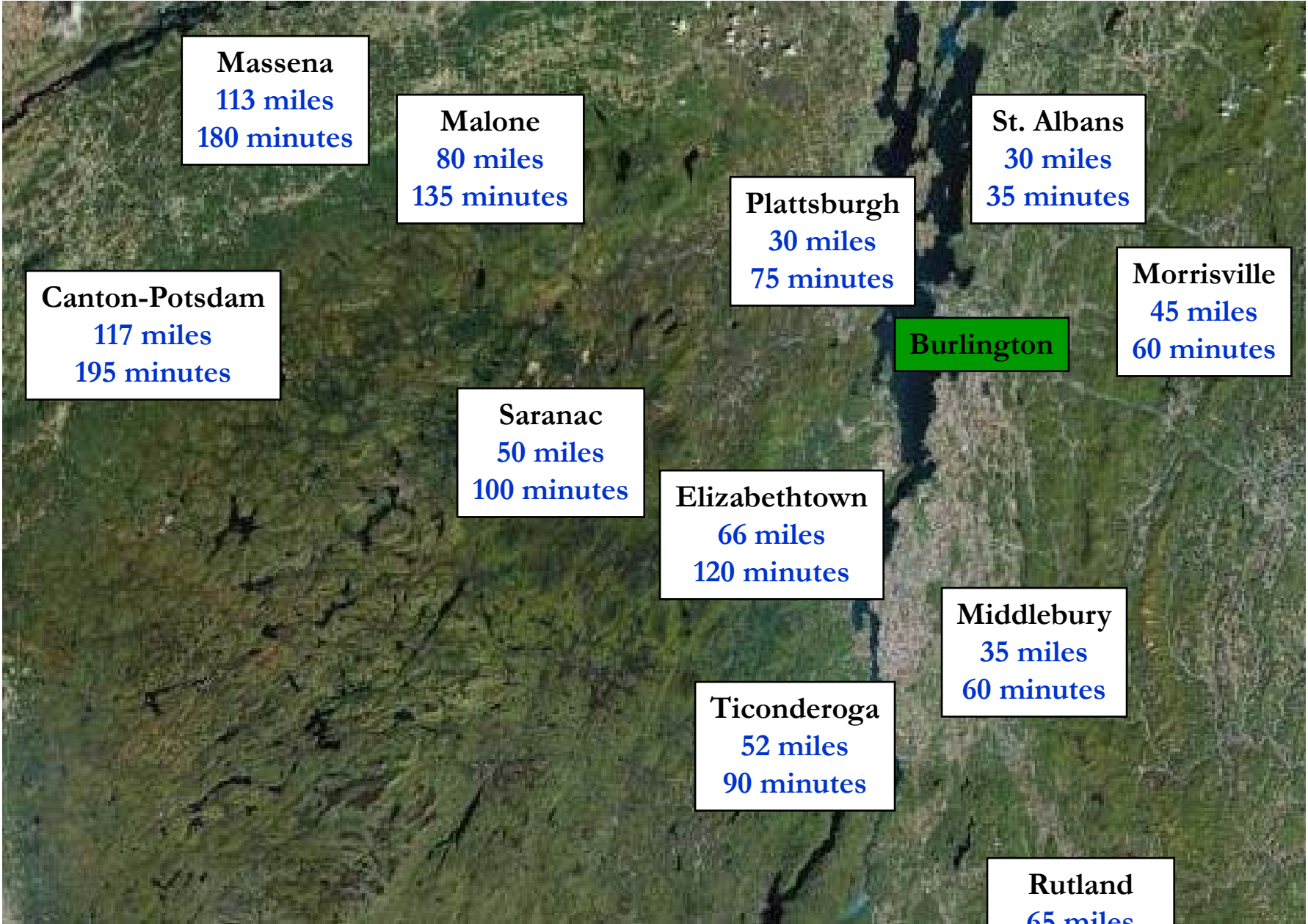
Elizabethtown

Middlebury

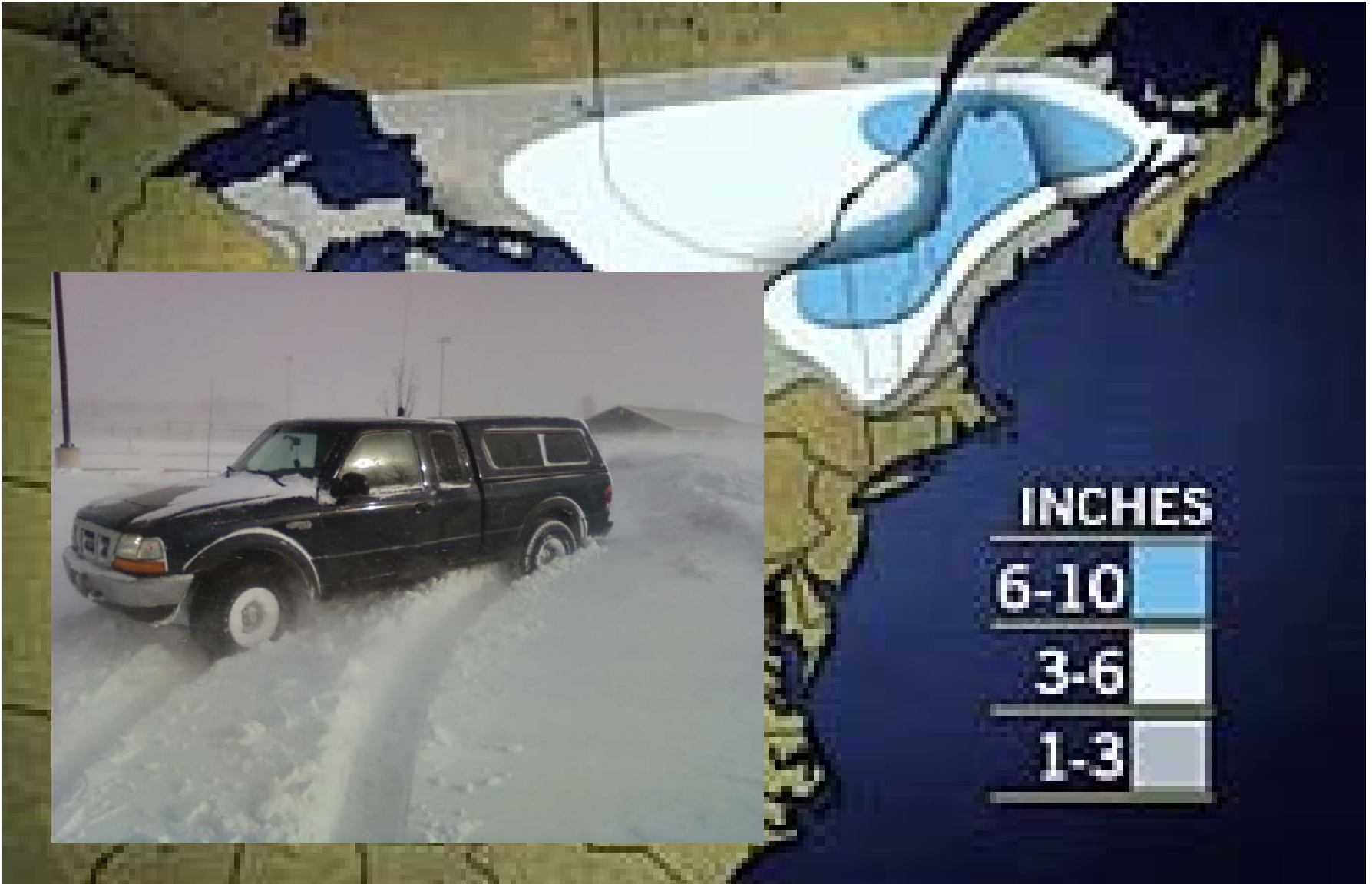
Ticonderoga

Rutland

20 miles



20 miles



**INCHES**

**6-10**



**3-6**



**1-3**



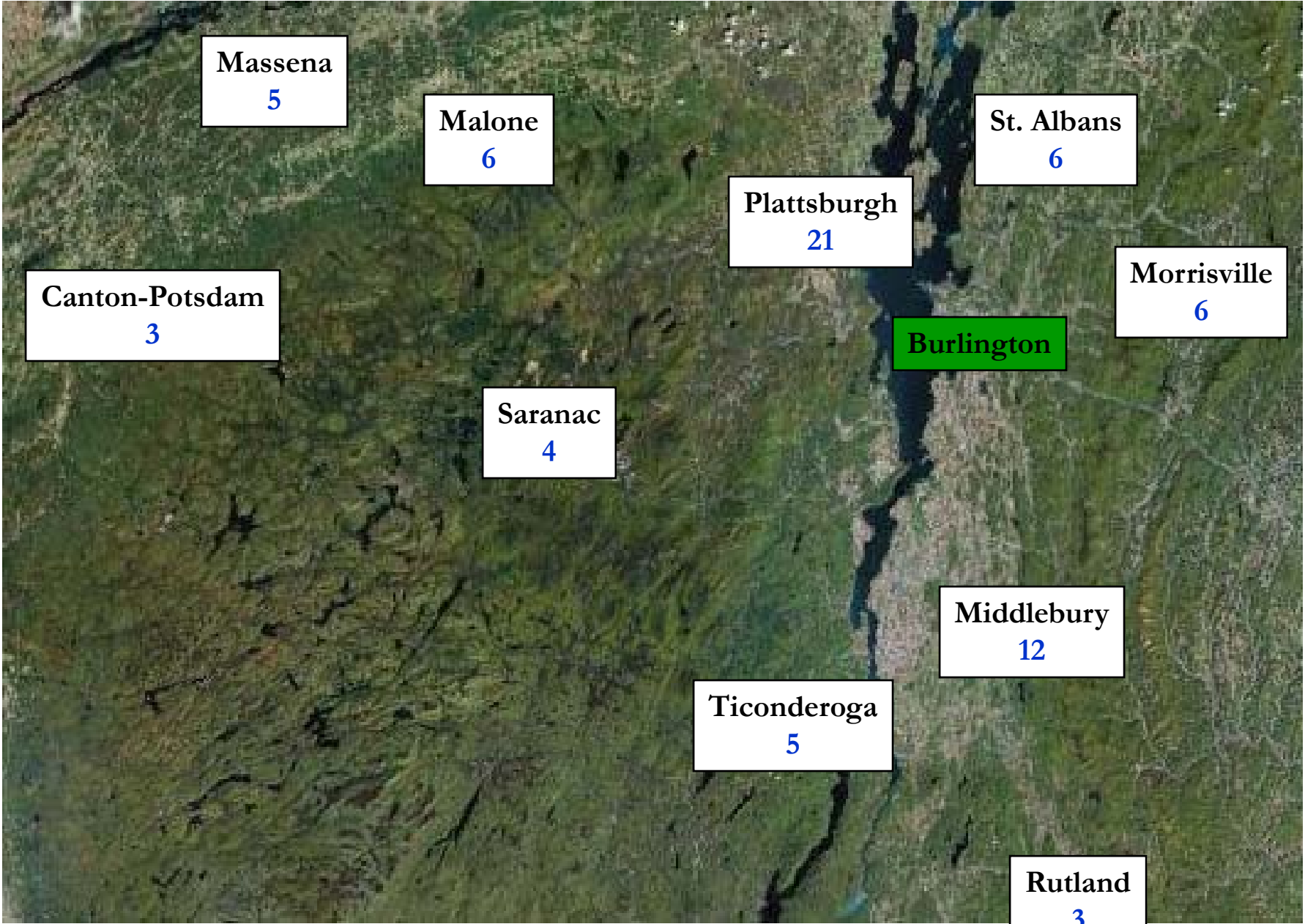
## Methods

- ISDN telephone lines and hardware-based dedicated videoconferencing systems were installed in the emergency departments, the PICU office, and the homes of the three pediatric intensivists
- Telemedicine contact was initiated by the attending pediatric intensivist following a request for consultation or transport on a 24 hour-a-day, 7-day-a-week basis
- Post-consultation questionnaires using a 5 point Likert scales and “fill in the blanks” were given to consulting intensivists and referring providers

## Results

**Total of 73 consultations were performed from 10 sites**

- **Average of 7.3 consultations per referring emergency departments**
- **Range 3 to 21 consultations**



Massena  
5

Malone  
6

St. Albans  
6

Plattsburgh  
21

Morrisville  
6

Canton-Potsdam  
3

Saranac  
4

Burlington

Middlebury  
12

Ticonderoga  
5

Rutland  
3

20 miles

## Results

- Patients ranged in age from 2 days to 17 years (mean 50 months, median 17 months).
- 69/73 patients were transported to the tertiary care hospital.
  - 3 patients were kept at the referring facility
  - 1 patient died in the outside ED

<b>Respiratory distress/failure</b> Bronchiolitis (7) Status asthmaticus (6)	<b>36</b>
<b>Seizures/status epilepticus</b>	<b>12</b>
<b>Infections</b> Septic shock (2)	<b>6</b>
<b>Ingestion/overdose</b>	<b>6</b>
<b>Altered mental status</b>	<b>3</b>
<b>Cardiopulmonary arrest</b>	<b>3</b>
<b>Diabetic ketoacidosis</b>	<b>2</b>
<b>Angioedema</b>	<b>1</b>
<b>GI bleed</b>	<b>1</b>
<b>Hemorrhagic shock (hepatic tumor)</b>	<b>1</b>
<b>Hemoptysis (Fontan)</b>	<b>1</b>
<b>Trauma</b>	<b>1</b>

## Results

- Consulting intensivists made a total of specific 261 recommendations (mean 3.6 per consult)
- Transport team was supervised by telemedicine in 31 cases
- In 3 cases, the patients were triaged to the pediatric ward
- In 3 cases, transport was not required after consultation

## Results

**22 Equipment issues were reported**

- 18 times the unit in the referring ED was initially off
- 3 times audio feedback was reported
- 1 time the consultant had a difficult time “zooming in”

# Results

<b>Recommendations</b>	<b>n</b>
<b>Transport</b>	<b>69</b>
<b>Medications</b>	<b>55</b>
Antibiotics	11
Nebulized respiratory treatment	12
Anticonvulsant therapy	11
Sedation/Pain	8
Intubation	5
IVF	4
Resuscitation medications	4
IV bronchodilators	4
Inotrope/vasopressor	3
<b>Administer crystalloid</b>	<b>43</b>
<b>Obtain lab or imaging data</b>	<b>28</b>

# Results

<b>Recommendations</b>	<b>n</b>
<b>Technical recommendations</b>	<b>19</b>
Bagging technique/ventilator management	12
Respiratory therapy	5
Intubation	3
Decompress the stomach	2
Foley placement	1
<b>Obtain vascular access</b>	<b>17</b>
<b>Do NOT intubate</b>	<b>14</b>
<b>Intubate</b>	<b>10</b>
<b>Transfuse PRBCs</b>	<b>2</b>
<b>Stop resuscitation</b>	<b>1</b>
<b>Do not transport</b>	<b>3</b>

# Results

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<b>Intubate</b>	<b>10</b>
<b>Transfuse PRBCs</b>	<b>2</b>
<b>Stop resuscitation</b>	<b>1</b>
<b>Do not transport</b>	<b>3</b>

## Results

### Intubate or not?

- 7 patients were already intubated
- 10 patients were intubated after the recommendation was made via telemedicine
- Recommendations **NOT** to intubate were made in 14 patients in whom intubation was considered at the referring ED
- 1 recommendation **NOT** to extubate and re-intubate for hypercarbia

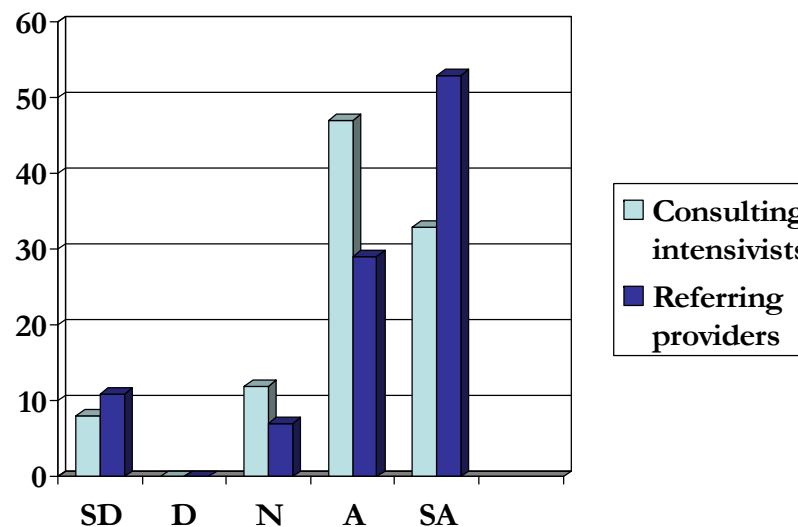
## Results

- Questionnaires were returned for 73/73 (100%) consultations by consulting intensivists
- Questionnaires returned for 46/73 (63%) consultations by referring providers

*This consult improved the quality of this patient's health care.*

Agree, Strongly Agree

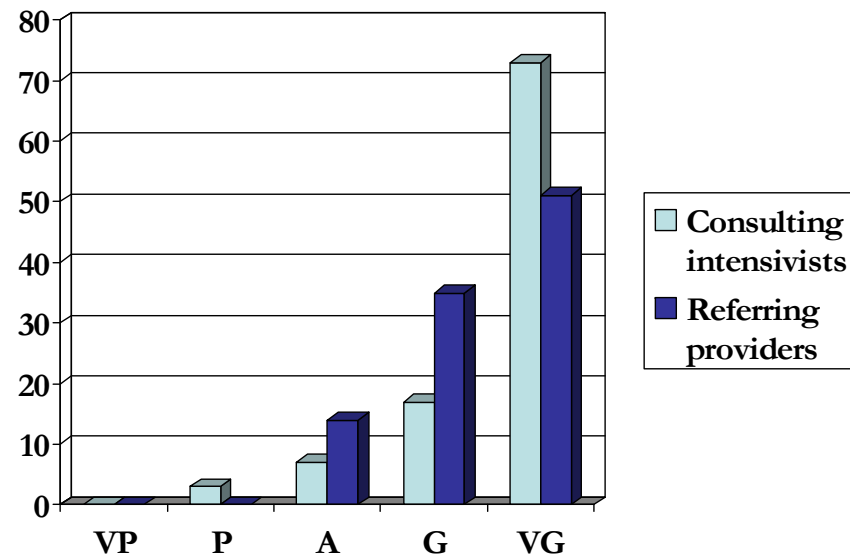
- Consulting Intensivists 80%
- Referring Providers 82%



## *The ease of use of the telemedicine equipment was*

### Good, Very Good

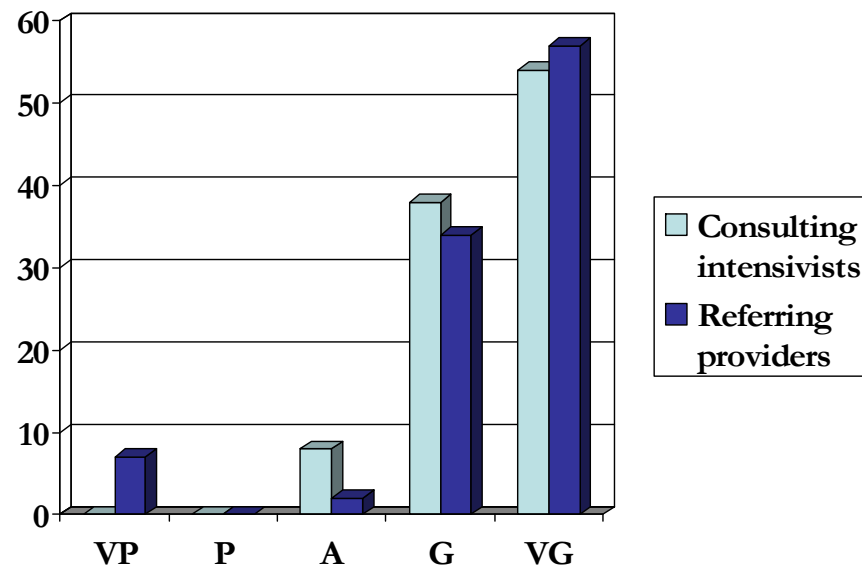
- Consulting Intensivists 89%
- Referring Providers 86%



## *The quality of the video was*

### Good, Very Good

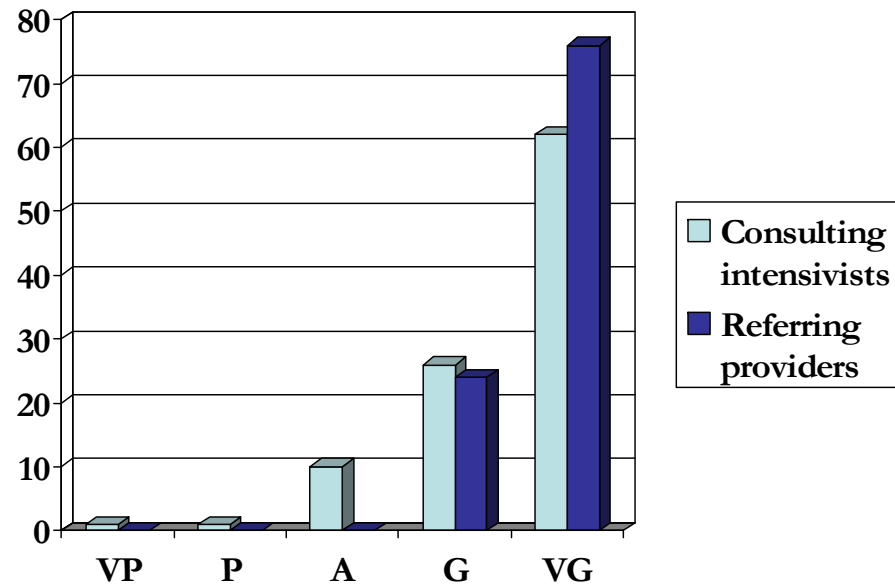
- Consulting Intensivists 92%
- Referring Providers 91%



## *The quality of the audio was*

### Good, Very Good

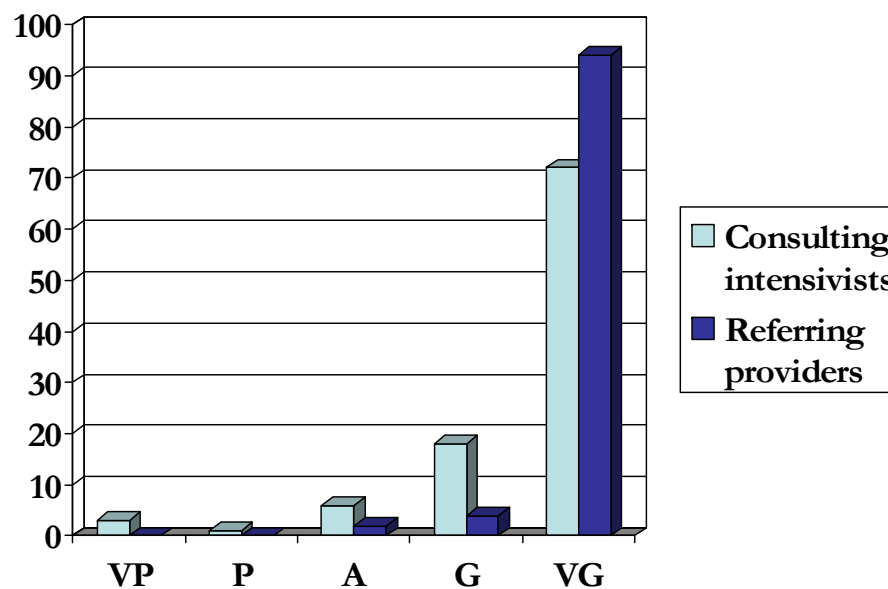
- Consulting Intensivists 88%
- Referring Providers 100%



*Provider-to-provider communications during the session was*

Good, Very Good

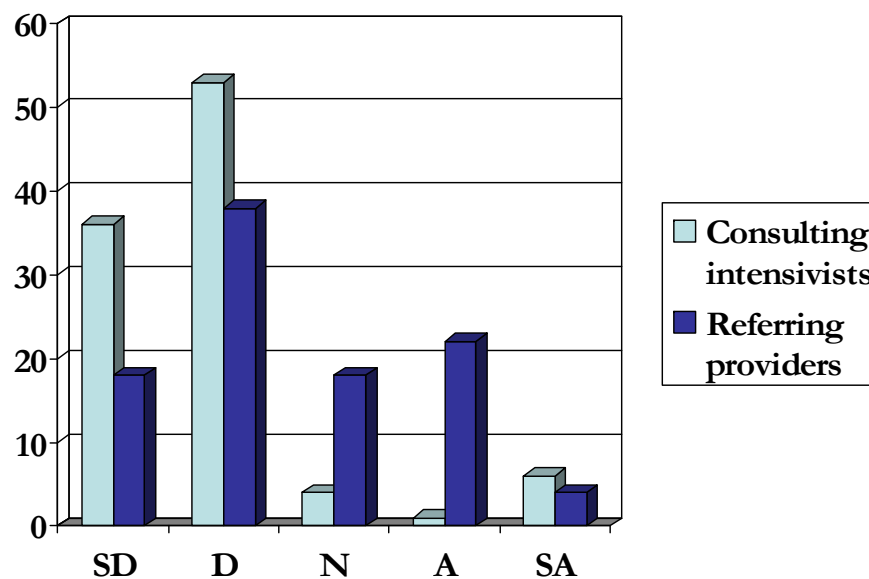
- Consulting Intensivists 90%
- Referring Providers 98%



*This consult could have been performed as well by telephone*

**Disagree, Strongly Disagree**

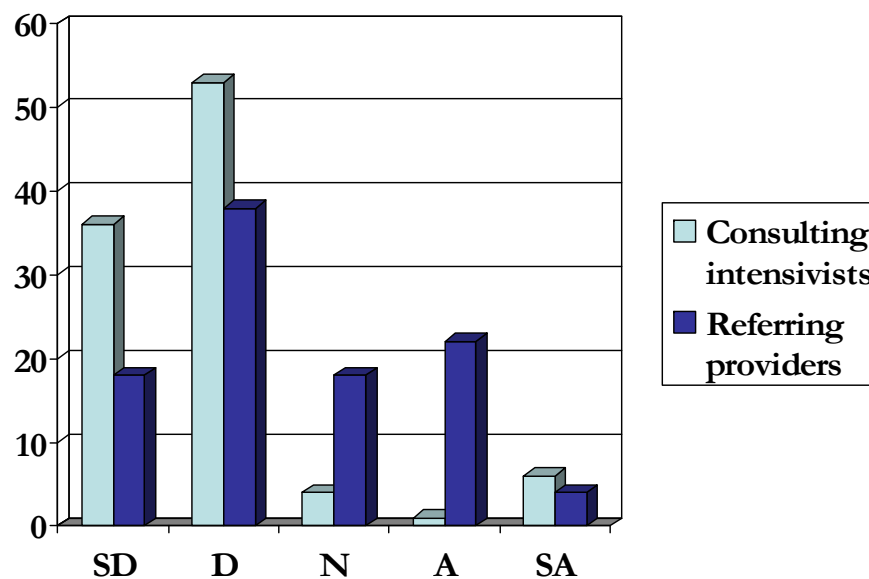
- Consulting Intensivists 89%
- Referring Providers 56%



*This consult could have been performed as well by telephone*

Agree, Strongly Agree

- Consulting Intensivists 7%
- Referring Providers 26%



# Discussion

## Telephone versus telemedicine

Were the consultants wrong?

- Bias
- Caught up in cool new technology

## Discussion

**What does the intensivist want from telemedicine?**

- **To make the best recommendations possible**
- **To triage appropriately**
- **To improve outcome providing the earliest definitive critical care management**
- **To supervise the transport team**

## Discussion

**What does the referring physician want from telemedicine?**

- **Recommendations**
- **Transport facilitated**

## Discussion

- The audiovisual information (vs telephone consultation) made available by telemedicine may not be clearly appreciated by referring providers
- Value of early examination and management may also be underappreciated by the referring provider
- The benefit of triage and planning benefits the consultant more than the referring physician

# Telephone v. Telemedicine

- **Poor chest rise - bag-mask technique**
- **Desaturation and bradycardia not noticed – stop laryngoscopy**
- **Asymmetrical chest rise post-intubation - check depth of the endotracheal tube and re-position it out of the right mainstem**
- **Poor chest rise and desaturation with bag-endotracheal tube - disable pressure pop-off on a self-inflating bag**
- **Abdominal distention after intubation - place a nasogastric tube**
- **Poor skin perfusion after bolus - repeat crystalloid**
- **Ventilator-patient dys-synchrony - repeat sedatives Rx**
- **Do not intubate x 14**

## Conclusions

- It is feasible to provide urgent subspecialty critical care for children in underserved rural emergency departments that improves patient care and provides a high degree of provider satisfaction.
- The application of pediatric critical care telemedicine technology may help to address the disparities in the access to medical care between rural and urban areas.
- The addition of telemedicine to the armamentarium of the pediatric intensivist may change the practice patterns of pediatric critical care in rural areas.

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**US DOT FAST STAR: Linking Telemedicine to the  
Moving Ambulance CONTINUATION/Project #2 of  
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