EASTERN MAINE MEDICAL CENTER
EMHS MEMBER

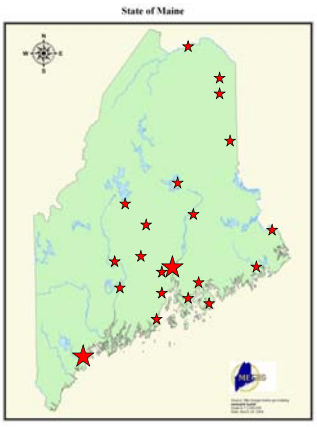
Unscheduled use of telemedicine to support rural providers
("on demand")

Jonathan P Wood, MD
Pediatric Critical Care
Senior Lead Physician for Pediatrics
Eastern Maine Medical Center
Bangor, ME

No disclosures

EMMC and Referral Area

- Tertiary referral center
  - 411 beds
  - Pediatrics: 18 general peds 6+ PICU 35 NICU
- Referral Area:
  - 18-20 hospitals - generally small communities
  - Variable pediatric capability/experience
- Large geographic area
- Long distances



Pediatric Inpatient Care at EMMC

- Full time pediatric intensivists since 2002
- Pediatric Sedation Service (2004)
- Full time pediatric hospitalists since 2007
- Transport Medical Control
  - LifeFlight of Maine
  - Meridian Star Critical Care Transport
- Phone consultation to the region

The PICU at EMMC

- 6+ beds
- 3-4 full time pediatric intensivists
- Nursing:
  - Subgroup of adult critical care nurses with pediatric ICU training
- Broad pediatric subspecialty support
- FP residents; No fellows

When the light came on…

- 2002 → 2004…
- 2 codes over the phone
- Transport decisions
  - Kids arriving sicker than expected
  - Kids arriving not as sick as expected
- Low frequency, high intensity events = !!!!!
- Sense of terror on the other end

The challenges of Maine's geography…

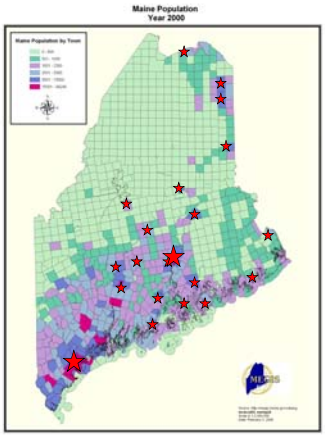
…low population density…

…uncomfortable clinicians…

…long transport times…

2015 population and density

New England States				
State	Area (sq mi)	rank	Pop'n density (people/sq mi)	rank
Mass	7,800	45th	871	3rd
Vermont	9,217	43th		
New Hampshire	8,953	44th		
Connecticut	4,842	48th	741	4th
Rhode Island	1,034	50th	1021	2nd
TOTAL	31,846			
Maine	**30,843** (20k)	**39th**	**43** (66)	**38th** (31st)
North Dakota		17th	10	47th
Alaska		1st	1	50th



And what about transport?

In the US:
- 75% of children live within 40 miles of a Peds Critical Care provider
- Population-weighted - - within 33 miles

Distances to EMMC:
- Lincoln 47 miles
- Machias 75 mi
- Calais 90 mi
- Houlton 120 mi
- Fort Kent 191 mi

Opportunity

- Pilot project – 2004/2005/2006
  - Eastern Maine Charities - EMHS - participating hospitals
- Partnered with EMMC Trauma Group
- Sites:
  - Inland Hospital (Waterville)
  - The Aroostook Medical Center (Presque Isle)
  - Pen Bay Medical Center (Rockport)

Is this legit? Does it really work?

Effectiveness of Telemedicine in Replacing In-Person Evaluation for Acute Childhood Illness in Office Settings

KENNETH M. McCONNOCHIE, M.D., M.P.H., GREGORY P. CONNERS, M.D., M.P.H., M.B.A., ANNE F. BRAYER, M.D., JULIUS GOEPP, M.D., NEIL E. HERENDEEN, M.D., NANCY E. WOOD, B.A., C.C.R.A., ANDREW THOMAS, DANIELLE S. AHN, and KLAUS J. ROGHMANN, Ph.D.

Telemedicine and e-Health (2006)

Differences in Diagnosis and Treatment Using Telemedicine Versus In-Person Evaluation of Acute Illness

Kenneth M. McConnochie, MD, MPH; Gregory P. Conners, MD, MPH, MBA; Anne F. Brayer, MD; Julius Goepp, MD; Neil E. Herendeen, MD; Nancy E. Wood, BA, CCRA; Andrew Thomas, BA; Danielle S. Ahn, MD; Klaus J. Roghmann, PhD

Ambulatory Pediatrics (2006)

But what about in the setting of pediatric critical illness…?

We quickly became convinced of things that didn't show up in the literature until nearly 10 years later…

Critical Care Medicine (2013)

Impact of Critical Care Telemedicine Consultations on Children in Rural Emergency Departments*

Madan Dharmar, MBBS, PhD[1-3]; Patrick S. Romano, MD, MPH[1-3]; Nathan Kuppermann, MD, MPH[1-3]; Thomas S. Nesbitt, MD, MPH[4]; Stacey L. Cole, MBA[4]; Emily R. Andrada, MD[1-3]; Cheryl Vance, MD[1-3]; Danielle J. Harvey, PhD[1]; James P. Marcin, MD, MPH[1,2]

ORIGINAL ARTICLES www.jpeds.com • The Journal of Pediatrics

Reliability of Circulatory and Neurologic Examination by Telemedicine in a Pediatric Intensive Care Unit (2014)

Phoebe H. Yager, MD[1], Maureen E. Clark, MS[2], Heda R. Dapul, MD[1], Sarah Murphy, MD[1], Hui Zheng, PhD[2], and Natan Nowicki, MD[1]

Pediatric Critical Care Medicine (2015)

Appropriateness of Disposition Following Telemedicine Consultations in Rural Emergency Departments

Nikki H. Yang, DVM, MPVM, PhD[1-3]; Madan Dharmar, MBBS, PhD[1-3]; Nathan Kuppermann, MD, MPH[1-3]; Patrick S. Romano, MD, MPH[1-3]; Thomas S. Nesbitt, MD, MPH[4]; Nayla M. Hojman, BA, BS[1-3]; James P. Marcin, MD, MPH[1,2]

EASTERN MAINE MEDICAL CENTER Together We're Stronger

Opportunity? Yes! Do it!

- Pilot project – 2004/2005/2006
- Sites:
  - Inland Hospital (Waterville)
  - The Aroostook Medical Center (Presque Isle)
  - Pen Bay Medical Center (Rockport)

But are these 3 truly the places that need us the most…?

EASTERN MAINE MEDICAL CENTER Together We're Stronger

Next steps…

- 2006 HRSA Grant
  - OAT (Office for the Advancement of Telehealth)
  - $750,000 over 3 yrs for equipment and program development (PICU, Trauma, Home health)
  - Solidify IP connectivity
  - Tandberg "Interns"
- Our Focus:
  - Transport decisions (resource allocation)
  - Provider satisfaction (both ends)
  - Parental experience

EASTERN MAINE MEDICAL CENTER Together We're Stronger

24/7 Coverage = critical

2006:

J.M. Hopwood Charitable Trust

"Rapid Access Tele PICU to improve pediatric critical care services in rural Maine"

$24,000 to equip peds intensivists' homes with high-definition telemed units

Later - - IPad and cell phone access

EASTERN MAINE MEDICAL CENTER Together We're Stronger

HRSA Grant Program Sites Year 1

- Blue Hill Memorial Hospital
- Mayo Regional Hospital (Dover-Foxcroft)
- Sebasticook Valley Hospital (Pittsfield)
- Reddington Fairview General Hospital (Skowhegan)

HRSA Grant Program Sites Year 2

- C.A. Dean Hospital (Greenville)
- Houlton Regional Hospital
- Millinocket Regional Hospital
- Mount Desert Island Hospital

It starts to become really clear…

- 2007 Boston Telemed conference
  - MGH (Natan Noviski)
  - UVM (Barry Heath)
  - EMMC
- 2009:

Clinical Investigation

Pediatric critical care telemedicine in rural underserved emergency departments*

Barry Heath, MD, FCCM; Richard Salerno, MD, MS; Amelia Hopkins, MD; Jeremy Hertzig, MD; Michael Caputo, MS

Clinical Investigation

Pediatric critical care telemedicine in rural underserved emergency departments*

Barry Heath, MD, FCCM; Richard Salerno, MD, MS; Amelia Hopkins, MD; Jeremy Hertzig, MD; Michael Caputo, MS

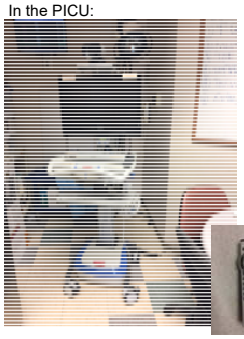
- 63 calls / 10 ED's 2006-2008. 61 transfers, ave. distance 75 miles
- Technical problems 29% of calls
- 49% respiratory disease, 16% seizures, 10% infection, 8% tox/OD
- 12 averted intubations, 7 recommended intubations, 6 prior placement
- Provider surveys: 65% return by referring providers
  - Improved quality of patient's care: Intensivists: 89%, Referrers 88%
  - Quality of video: 92% for both
  - Quality of audio: 91% vs. 100%
  - Superior to telephone: 91% vs. 55%
  - Favorable inter-provider communication: 94% vs. 98%

The Next Wave
USDA Continuation Grant (2009)

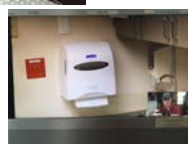
- Penobscot Valley Hospital (Lincoln)
- Calais Regional Hospital
- DownEast Community Hospital (Machias)
- Northern Maine Medical Center (Fort Kent)

What does the machinery look like?

In the PICU:



At home:



So - - what exactly happens when someone requests TelePICU?

- Page
- Call back and preview (if practical)
  - What am I dropping into?
- Connect
  - Evolution of EMMC's system
  - One-way call ("we call you")
  - Machines must be always charged, always on

What happens after the connection?

- Fly on the wall ?
- "In control" ?
- Truly consultative ?
- Usually:
  - Combination of all the above!

What does everyone have to do?

- ED staff places the machine in the room
  - Positioning is key
- Un-mute
- Consultant controls everything thereafter
  - Pan
  - Zoom
- Discussions with doc and/or parents
- Sensitive discussions (abuse, lethality, etc)

What must be in place for this to work?

- Administrative support
  - High level on both ends
  - On the ground support at tertiary site
- Physician champion(s)
- Nursing champion(s)/support/coordination
- IT support
  - high level commitment on both ends
  - 24/7 staff (the stuff has to work NOW)
- Culture shift

Challenges

- Lack of clear leadership and commitment
  - Innovators are not always good leaders
- Lack of IT appreciation of clinical realities
- Culture change on the near end (consultant)
  - "I'm too busy for this"
  - "What's wrong with the telephone?"
  - "I'll deal with it when they get here"
- Culture change on the far end (referrer)
  - "frontier medicine"
  - Big Brother +/- criticism or judgment

Challenges (cont)

- Billable model
  - e.g. ICU consults: if transferred and admitted on the same day as the consult, can only bill one
    (for pediatrics in Northern Maine, this is the overwhelming majority)
- Not-traditional ROI
  - If done well, very good for "relationship building"
  - How to measure? How to validate? How to gain support for further development?

Call-to-call barriers

- Technical:
  - ~~Lack of local broadband access~~
  - ~~High traffic times with insufficient data transfer rates~~
  - Server directory is dysfunctional, can't find address
  - ~~Poor outgoing picture quality (home units)~~
  - Audio is not working/volume off or muted
- Systemic:
  - ~~Patient is in the "wrong room"~~
  - Transport sent prior to consult, lack of communication with historical avenues for consultation or transfer
  - "Too busy" or lack of familiarity
- Human:
  - Machine not on, not connected to internet
  - Machine is locked in a safe place
  - Lost the remote

What sorts of cases do we see?

- **The** sickest kids
- Perceived sickest kids
- Not so sick kids, but provider or parental discomfort (very few of these)
- Many we feel we should see (or we *wish* we could see), but who don't call…
- 25-35 consults/year at the peak

What medical advice do we offer?

- Much like the UVM experience
- Able to do many things that we would *never* be able to do without TelePICU. (i.e. over the phone)

e.g.

- Advise against intubation
- Stress for intubation
- Complex hemodynamic or neurologic decisions
- Start terbutaline on a severe asthmatic

What else do we offer?

- Peace of mind
- Confidence
- Reassurance
- "Misery loves company"
- Congratulations and praise
- Education
- Debriefing

Early TelePICU Experience

Critical Illness Consults

- 5 y.o. in septic shock, hypoxic respiratory failure
- 18 mo. Hanging by drapery cord, prolonged CPR, (unsuccessful). Debriefing with referring staff by PICU physician
- 5 mo. Status epilepticus, intubated

Code, Resuscitation, and its Aftermath

- 8 Codes involving telemedicine consultation in the first 5 years
- 6 Deceased in ER, 2 critical transport out
- Aged 5 weeks to 7 years
- Role of the "Impassionate Observer"
  - Tracking of Time, technical details
  - Context of likely cause or presenting history
  - Provision of "consensus" to a solo clinician
  - Debriefing/support/review to local ER staff

TelePICU examples

- 10 mo. Ex-premie, critical airway, attempted tracheostomy for respiratory failure
- 3 mo. Cyanosis, shock: allowed transfer by EMS
- 3 y.o. drowning, low-temp, CPR (terminated)
- 16 y.o. ARDS, ETT, 90 minutes ICU direction awaiting transport
- 15 y.o. SMA, scoliosis, ETT for hypoxic RF
- 2 y.o. MVA roll-over trauma, CPR (terminated)

TelePICU examples (cont)

- 7 mo. with hypoxic respiratory failure, ETT, difficult to ventilate: H1N1 positive
- 1 mo. Shock syndrome, global hypoxic injury with MODS, pressors, ETT, 2+ hour ER management awaiting CCT
- 3 wk old with bronchiolitis, impending respiratory failure
- 7 y.o. ATV traumatic brain injury, ETT

A really bad night…

- 11 PM: 10 week old, co-sleeping with parent, found pulseless, 25 min EMS transport to ER, livedo, unable to intubate, BVM, CPR 50 min. efforts discontinued.
- 0345 AM: 9 week old, co-sleeping with parent, found pulseless, 10 min for EMS, intubated, fluids, atropine, epi x 3, CPR additional 50 min. efforts discontinued.
- Events occurred at the same hospital

Transfers to Other Facilities

- 4 y.o. with TGA, s/p arterial switch operation, presented after a fall, to ER in Cardiac arrest > cardioversion > asystole. CPR, trans-venous pacer wire placed, coordination of CCT directly to MMC for interventional cardiology.
- 2 mo. CNS injury, full arrest. Consult requested by CCT, report to accepting MD
- 3 mo. NICU-grad: apnea, lethargy, difficult airway, CCT consult, assistance with ventilation
- 8 yr old burn victim direct to Shriners (after 3 hrs management due to bed unavailability)

Why a program like this is difficult to maintain

- Maintain the energy
- Maintain the administrative support
- Maintain (and upgrade) the equipment
- Maintain the credentialing
- The need to bring new people up to speed with a low frequency service
- And more…

Conclusion

- It works
- It benefits those who use it
- It has very high provider satisfaction
- It has very high parental satisfaction
- Children who need pediatric critical care can often start to get it sooner…!

EASTERN MAINE MEDICAL CENTER
EMHS MEMBER

Unscheduled use of telemedicine to support rural providers
("on demand")

Jonathan P Wood, MD
Pediatric Critical Care
Senior Lead Physician for Pediatrics
Eastern Maine Medical Center
Bangor, ME