TAKE ME HOME, COUNTRY ROADS

Trauma Care Beyond the Interstate

Alison Wilson, MD, FACS

Professor of Surgery

Skewes' Family Chair in Trauma

Executive Director, WVU Critical Care and Trauma Institute

WVU Critical Care & Trauma Institute

DISCLOSURES

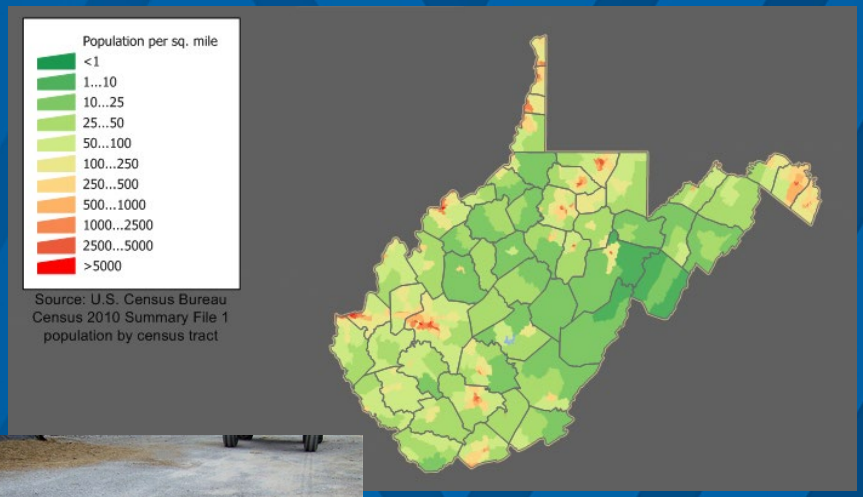
- No Financial Disclosures
- Conflict of Interests
  - Serve as National Chair for RTTDC

OBJECTIVES

- Outline **Facts** Common to **Rural** Trauma **Systems**
- **Contrast** Resources Between **Rural** and **Urban** Systems
- Discuss **Disparities** in Care that Result from These Differences
- Provide **Examples** of **Challenges** with Current Trauma **Standards**
- Provide 2 **Examples** that Have **Improved** Rural Trauma Care

RURAL TRAUMA REALITIES

- ↓ Population Density, ↑ Mortality
- Populations
- Injury Patterns
- Availability/Types EMS
- Initial Stabilizing Care
- Access to Trauma Centers
- Local Resources



POPULATIONS

- ↑ Elderly in general population
- Greater proportion in rural
- Culture\Values → Independence, functional
- Family relations, dependence
- WV – 1/3 of Children are Raised by Grandparents

POPULATIONS

- Poverty Living In Isolation
- Transportation
- Caretakers
- Supplies
- Heating/AC
- Water Source

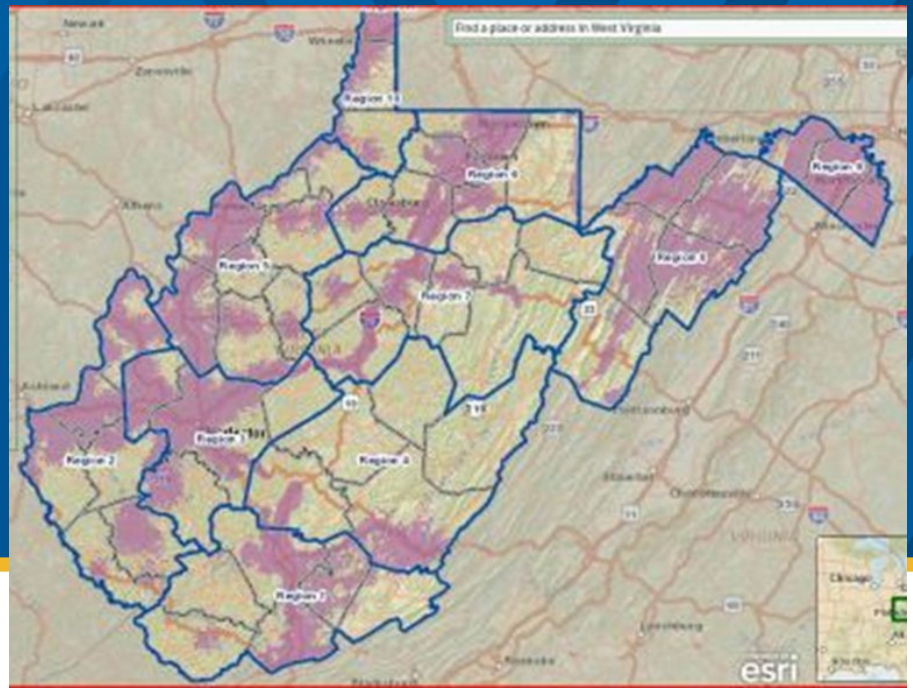
INJURIES – MVC, MCC

- More narrow roadways
- Lack of central dividers
- Lack of divided traffic streams
- Geography
- Weather
- Physical aspect of road surface

WVU Medicine

PRE-HOSPITAL FACTORS

- Knowing it Happened
- Discovering Pt
- Access to Pt
- Summoning Help
- Local EMS Resources
- Access to Trauma Centers

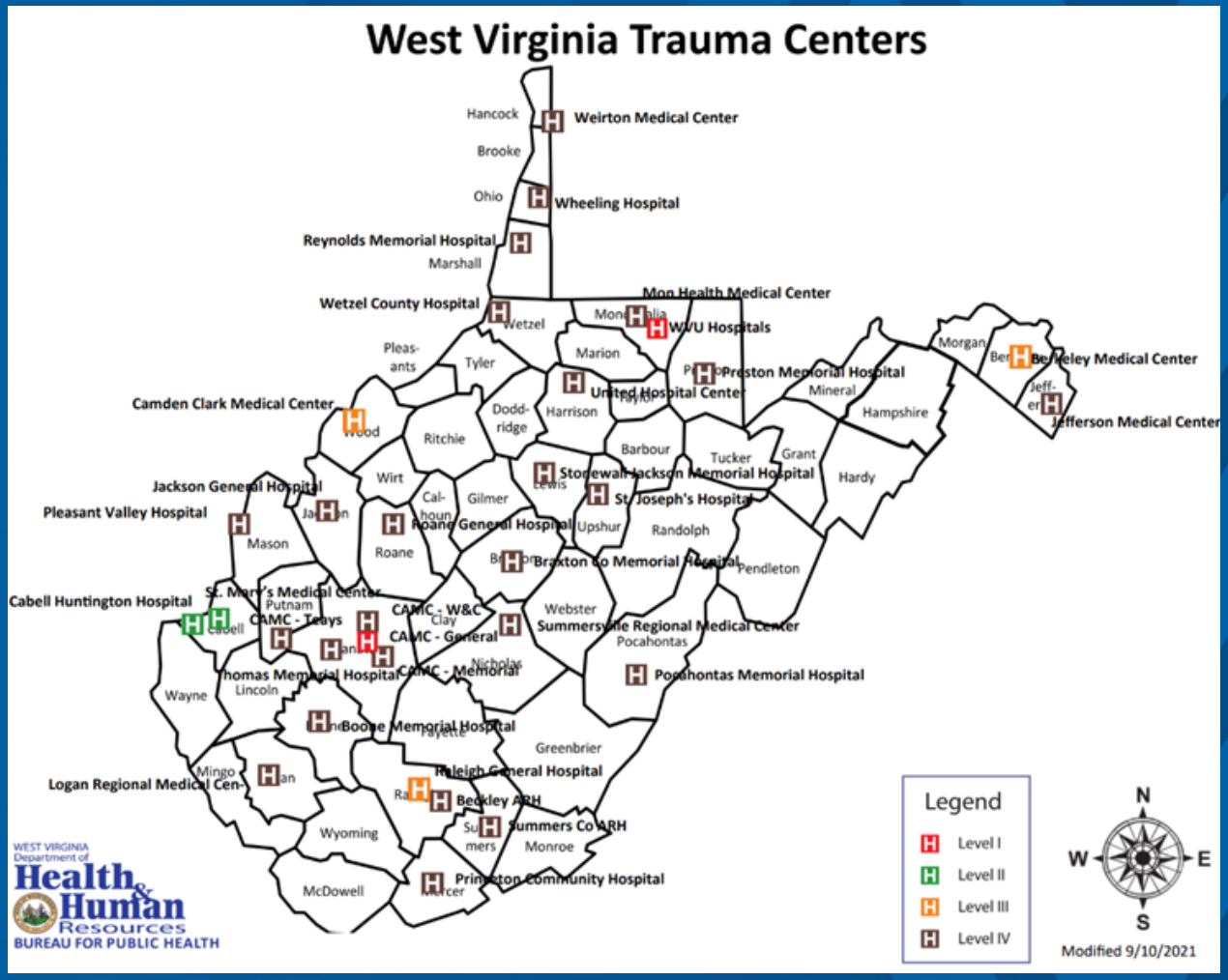


WVUMedicine

RURAL TRAUMA SYSTEMS
EMS REALITIES

- Lack of Ground Critical Care Transport → Overuse Aeromedical
- Licensed Companies – 3
  - Total Air Assets - 12
- Lack of Paramedics
  - Tucker Co. = 0
- EMT-B and Volunteer
- Common – 1 Ambulance in County
- Less than 6,000 Prehospital Providers in WV

EMS…..NOW WHERE ??



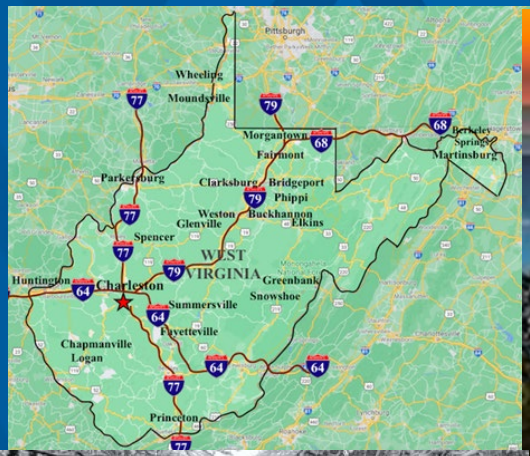
WVUMedicine

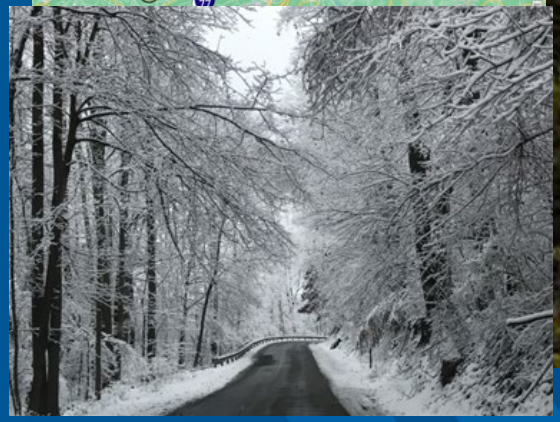
RURAL TIP of the SPEAR

- Level IV or Critical Access
  - ED Coverage: Family Med, ED, APP
  - Intermittent Gen Surg, Ortho
  - No Critical Care Docs, though "ICU"
  - cRNAs – Not in house
  - RT – Not 24/7
  - Limited OR
  - Limited Blood Bank
    - 2 – 4 U pRBC, ? FFP, 0 Plt

DELAYS to HIGHER LEVEL of CARE

- Recognizing “Sick”
- Initial Interventions
- Finding Transport
- Weather
- Geography
- Time to Definitive Care
  - 1.5 – 6hr
  - Weather – 12 hr





- ***Tyranny of Time and Distance***

TRANSLATING the DATA

- Most Resuscitation Studies Exclude Transfers
- Most Large Academic Programs Located Urban, Pop Dense Areas
- Long Pre-Hospital Times Not Well Represented

- Rural Level I : > 50% are Transfers
- Initial EMS Data is Challenging, accuracy treatments, physiology
- Rural Level I – Not Organized Together for Research

PERMISSIVE HYPOTENSION

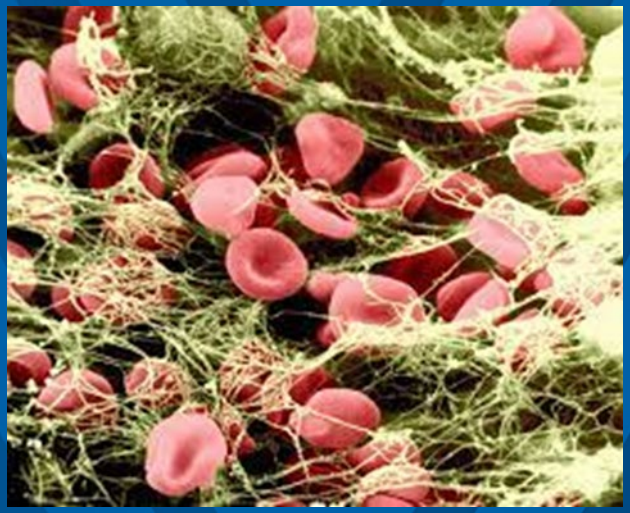
- "Don't Pop the Clot"
  - Pre-Hospital
  - During OR
  - Limiting Crystalloid
  - Blood Only Resuscitation
- How Long Can You Do It ??
  - Times, Access
- What If Concurrent TBI ??

The New England
Journal of Medicine

Volume 331 OCTOBER 27, 1994 Number 17

IMMEDIATE VERSUS DELAYED FLUID RESUSCITATION FOR HYPOTENSIVE PATIENTS WITH PENETRATING TORSO INJURIES

WILLIAM H. BICKELL, M.D., MATTHEW J. WALL, JR., M.D., PAUL E. PEPE, M.D., R. RUSSELL MARTIN, M.D., VICTORIA F. GINGER, M.S.N., MARY K. ALLEN, B.A., AND KENNETH L. MATTOX, M.D.



USE OF TXA

- Randomized, Controlled Trial
- 274 hospitals, 40 countries
- 20,211 trauma patients
- TXA vs Placebo
- Outcomes: Mortality
- Most Beneficial
  - ≤3 hours of injury
  - SBP ≤ 75 mm Hg
  - Moderate TBI
  - Penetrating injury

CRASH-2
Clinical Randomisation of an Antifibrinolytic in Significant Haemorrhage

WVUMedicine

CRASH CONTROVERSIES

- Only 2% patients had rapid access
  - Blood products
  - Damage control surgery
  - Angiography
- 50% patients received blood transfusions
- Overpowered study
  - Hemorrhagic death (4.9% vs 5.7%)
- Resource limited or poor countries

LET'S TALK TOURNIQUETS

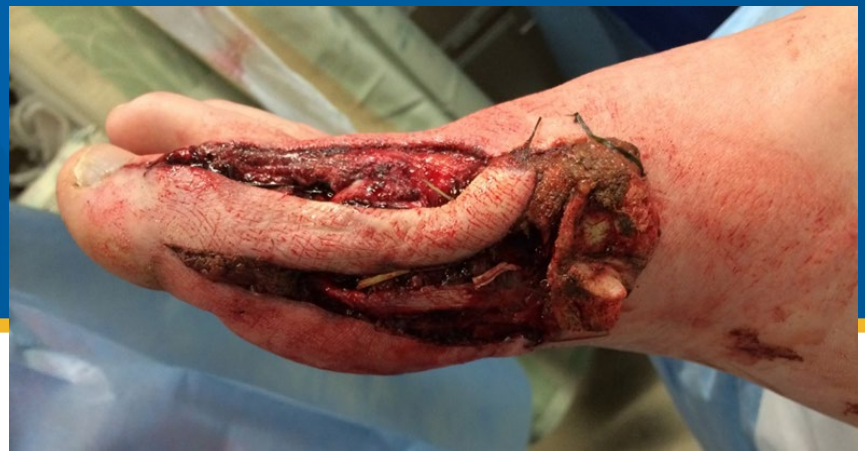
FACT: Tourniquets Have Saved Lives

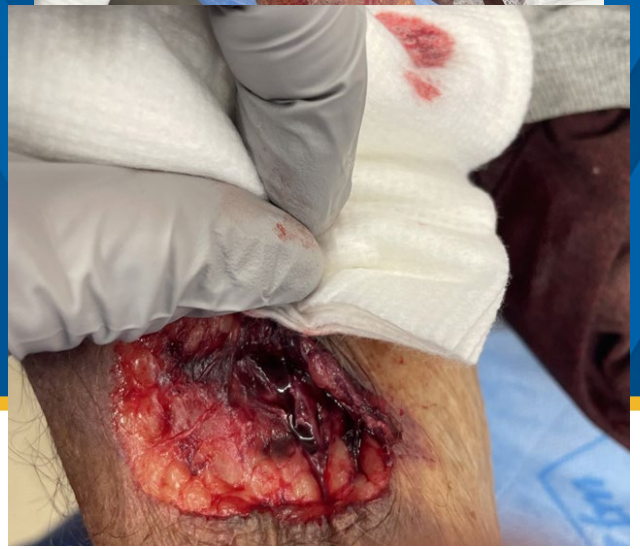
- Mangled Extremity
- Significant Vascular Injury
- Amputations/Partial Amputations
- Tactical Situations

WVUMedicine

WE MUST BE RESPONSIBLE IN TEACHING/POLICY

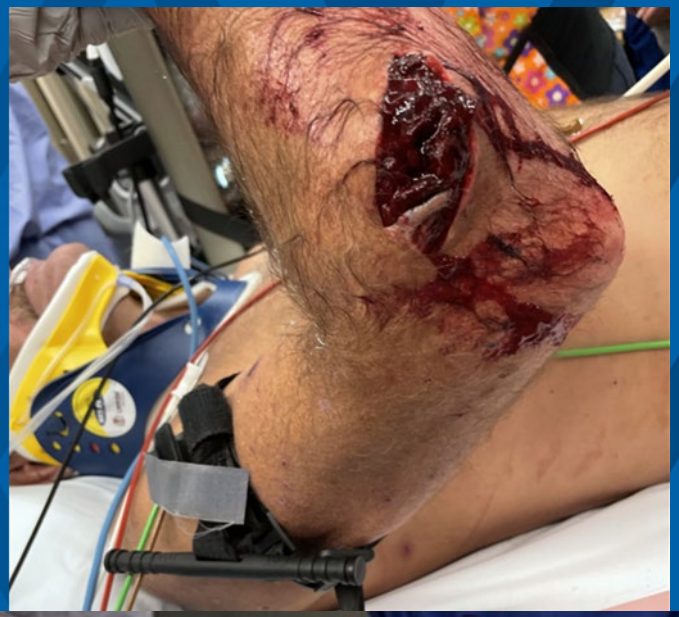
IS THIS A PROBLEM ??





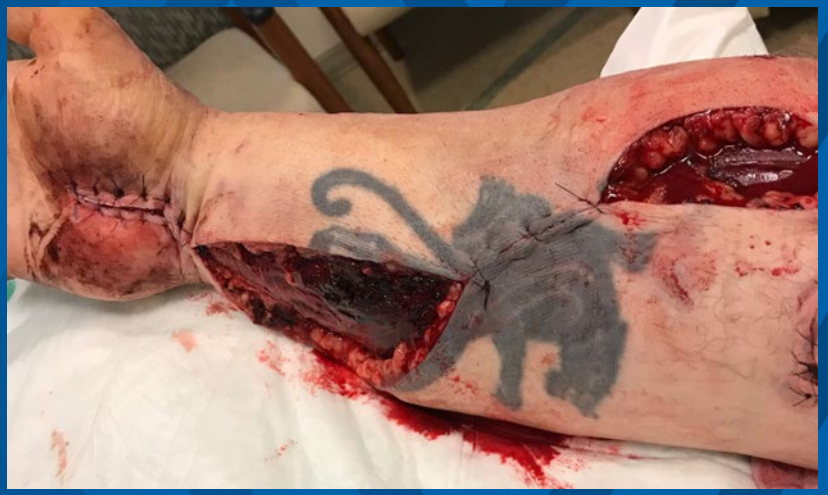
IS THIS AN ISSUE FOR EMS ??

- **State Protocols**: Once TQ on, No Removal Until Definitive Care
  - Transport Times ??
- **Use and Placement**
  - 39% Not Arterially Occlusive
  - 4% Placed On Top of Wound
  - 0.5% Actually Distal to Wound
  - 34% DC Home from ED
    - Tatebe L, J Trauma Acute Care Surg. 2021; 92(5): 890-896.



BUT WHO CARES ?
Complications are Temporary

- **Complications**
  - Neuropraxia
  - Compartment Syndrome
  - Rhabdomyolysis
  - ↑ w times > 2 hours
- Rural Study
  - Median TQ Time: 123 min
  - 21% TQ were NOT clinically indicated
    - Bedri H. Prehospital Emergency Care 2022; 26:246-254.
- DM + Prehospital TQ: OR 3.7 AKI
    - Paquette. Prehosp Disaster Med 2022;37(3): 360-364.



SOLVING THESE PROBLEMS

- We Have to Get the Accurate Data
- We Have to Ask the Questions ….or Ask the Question Again

- One Approach
  - Appalachian Research Consortium for Trauma
    - (ARC-T)
  - 9 Level I Centers
  - *ONLY PATIENTS W MORE THAN 1 HOUR PRE-HOSPITAL TIME*

WHAT ELSE CAN WE DO ?

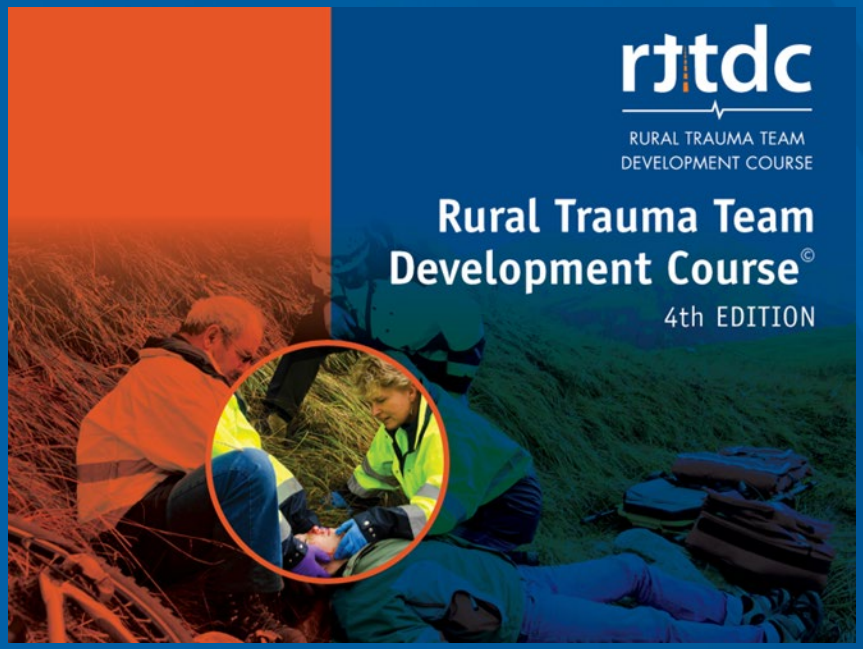
- INCLUSIVE TRAUMA SYSTEM
- STANDARDIZED STATE CRITERIA
- IMPROVE ACCESS
- EDUCATE TO IDENTIFY EARLY

KNOW THEIR REALITY

- **One size will not fit all**
  - *Personnel* - BLS, ALS, Surgeon, Anesthesia, Ortho, ICU
  - *Training* – Scope of skills
  - *Equipment* – Ultrasound, MRI, Operating Room
  - Supplies – Blood Bank, Lines
  - *Access to Trauma Center* – 3 city blocks vs 3 rural counties

THESE ARE NOT THE SAME

PARTNERING w LEVEL IV and CRITICAL ACCESS



- 3 Member team
- May not be physicians
- Trauma Teams
  - Defined members
  - Defined Roles
- Based on Local Resources
  - Team same at 2 am as 2 pm ??
  - How to get more help ?
  - Will they know what to do ?
    - Practice

HOW DOES IT WORK ?

- Taught at the referring hospital
- 1 day course/ 8 hours trauma CME
- Outreach and PI
- 3 Member Team

Cognitive

Skills

Teamwork

Communication

FACILITATE DEVELOPMENT OF A LOCAL PLAN

- TRAUMA TEAM ACTIVATION CRITERIA
- RELIABLE ACTIVATION SYSTEM
- RESUSCITATION/TRAUMA EVALUATION PROTOCOL
- TRAUMA FLOWSHEET
- TREATMENT PROTOCOLS
- TRANSFER CRITERIA AND PROTOCOLS

TRADE OFF

- *YOU LEARN*
  - Their Resources
    - ED – Physicians or APPs ?
    - OR – Do They Even Have One
    - Surgeons - ???
    - Blood Bank – pRBC?, FFP?, Factors?
      - Should We Send Stuff to Them ?

- **BUILD RELATIONSHIPS**

EFFECTIVE

Changes in rural trauma prehospital times following the Rural Trauma Team Development Course training

Mahdi Malekpour, M.D., Nina Neuhaus, M.D., David Martin, M.S., Kenneth Widom, M.D., Megan Rapp, M.D., Diane Leonard, M.D., Susan Baro, D.O., James Dove, B.A., Marie Hunsinger, R.N., Joseph Blansfield, M.D., Mohsen Shabahang, M.D., Denise Torres, M.D., Jeffrey Wild, M.D.*

↓ TRANSFER ACCEPTANCE TIMES – 30 MIN P=.003
↓ OVERALL TRANSFER TIMES – 30 MIN P= .002

MORTALITY ↓ 6.2% TO 3.4%

Does the Rural Trauma Team Development Course Shorten the Interval From Trauma Patient Arrival to Decision to Transfer?

Kappel, David A. MD, FACS; Rossi, Daniel C. DO, PGY-V; Polack, Edward P. MD, MA, FACS; Avtgis, Theodore A. PhD; Martin, Matthew M. PhD

Author Information

The Journal of Trauma: Injury, Infection, and Critical Care 70(2):p 315-319, February 2011. | **DOI:** 10.1097/TA.0b013e318209589e

AAST PLENARY PAPERS

Rural Trauma Team Development Course decreases time to transfer for trauma patients

Dennis, Bradley M. MD; Vella, Michael A. MD, MBA; Gunter, Oliver L. MD, MPH; Smith, Melissa D. MSN, RN; Wilson, Catherine S. MSN, RN; Patel, Mayur B. MD, MPH; Nunez, Timothy C. MD; Guillamondegui, Oscar D. MD, MPH

Author Information

Journal of Trauma and Acute Care Surgery 81(4):p 632-637, October 2016. | **DOI:** 10.1097/TA.0000000000001188

↓ 1 HOUR IN RURAL ED LOS

↓ 40 MIN – DECISION TO TRANSFER

LEARNING FROM OTHERS…
By, With, and Through

WVUMedicine

WVUMedicine

BY, WITH, and THROUGH

VIRTUAL ICU

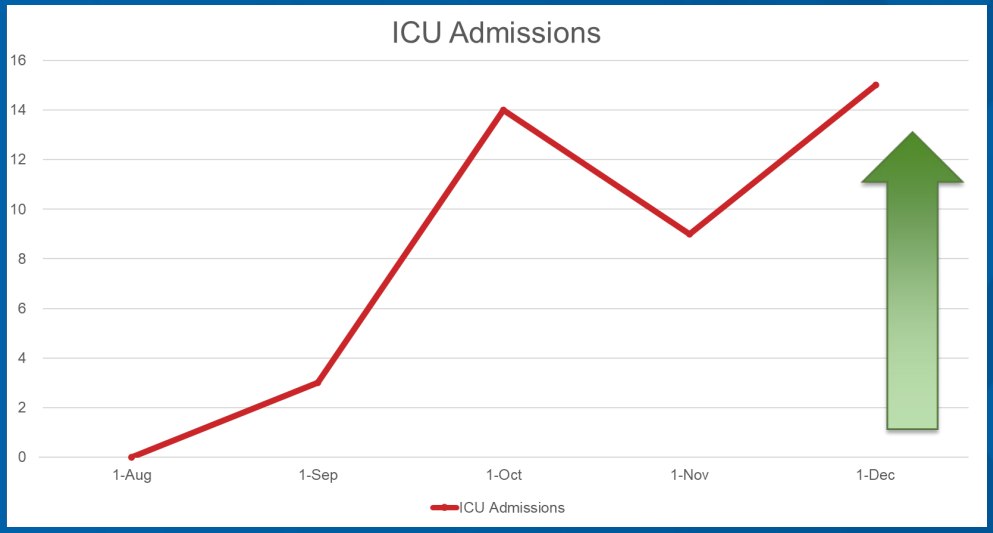
- 1 Intensivist Daily Rounds with Local Physician + Multi-Disciplinary Team: Input, Education
- Continuity – Attending of the Week
- Intensivist Can Cover Most Needs of the Specialists: AKI, NSTEMI, Sepsis, etc
- Partner w Local Physician: Not on an Island
- Cheap: $5,164 Start Up Costs

WHAT VICU IS NOT

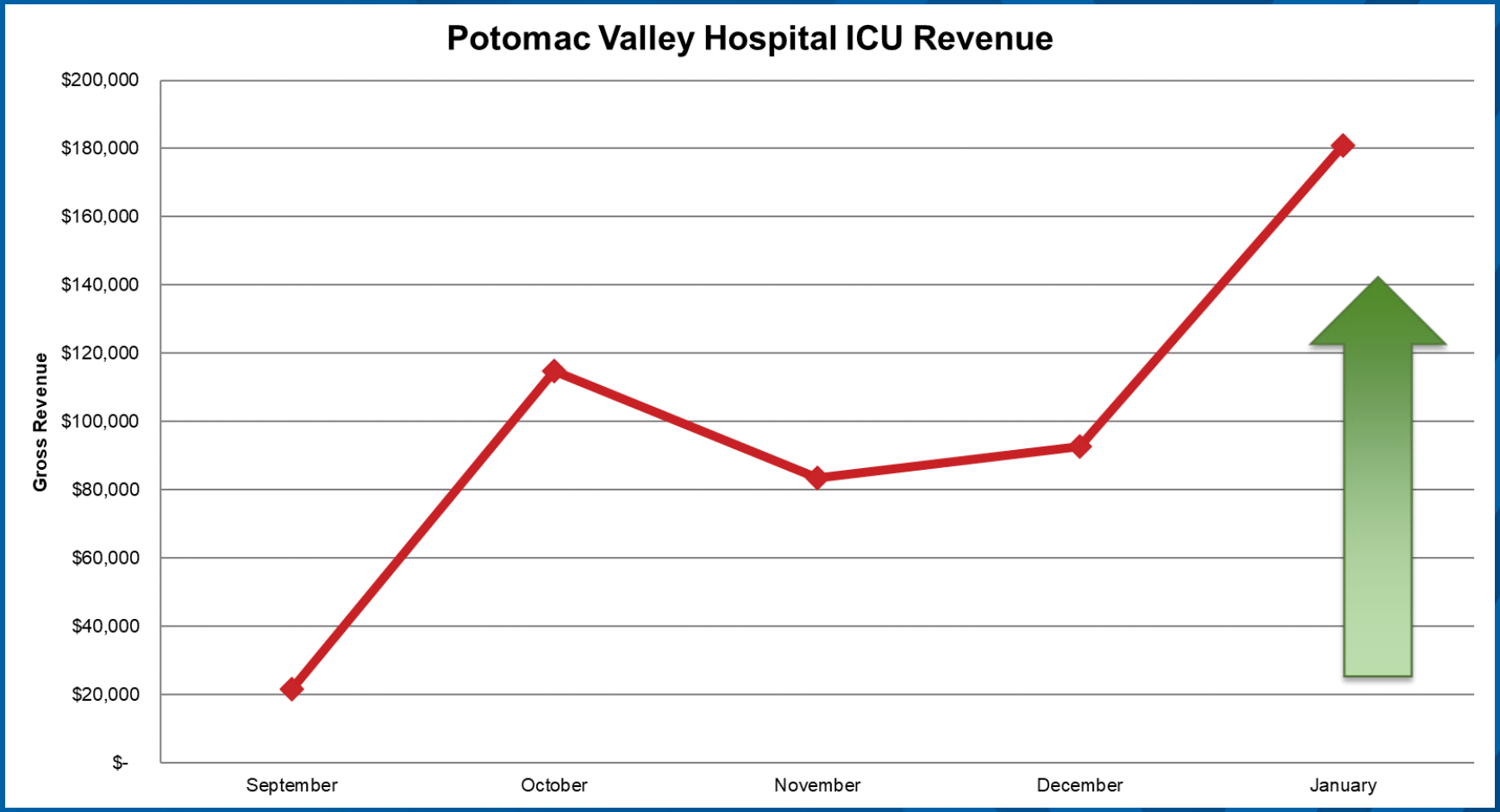
TELE-MED CONSULT

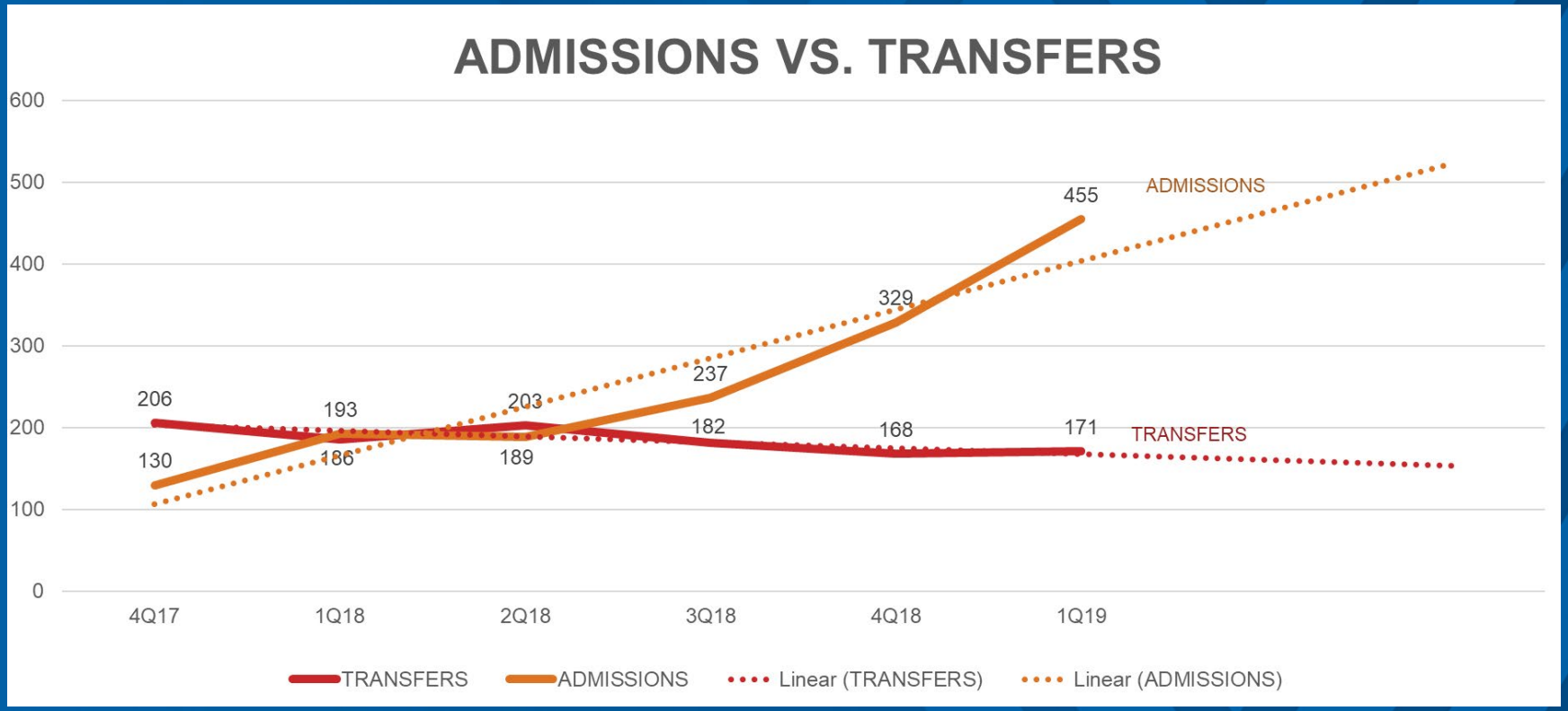
E-ICU

VICU

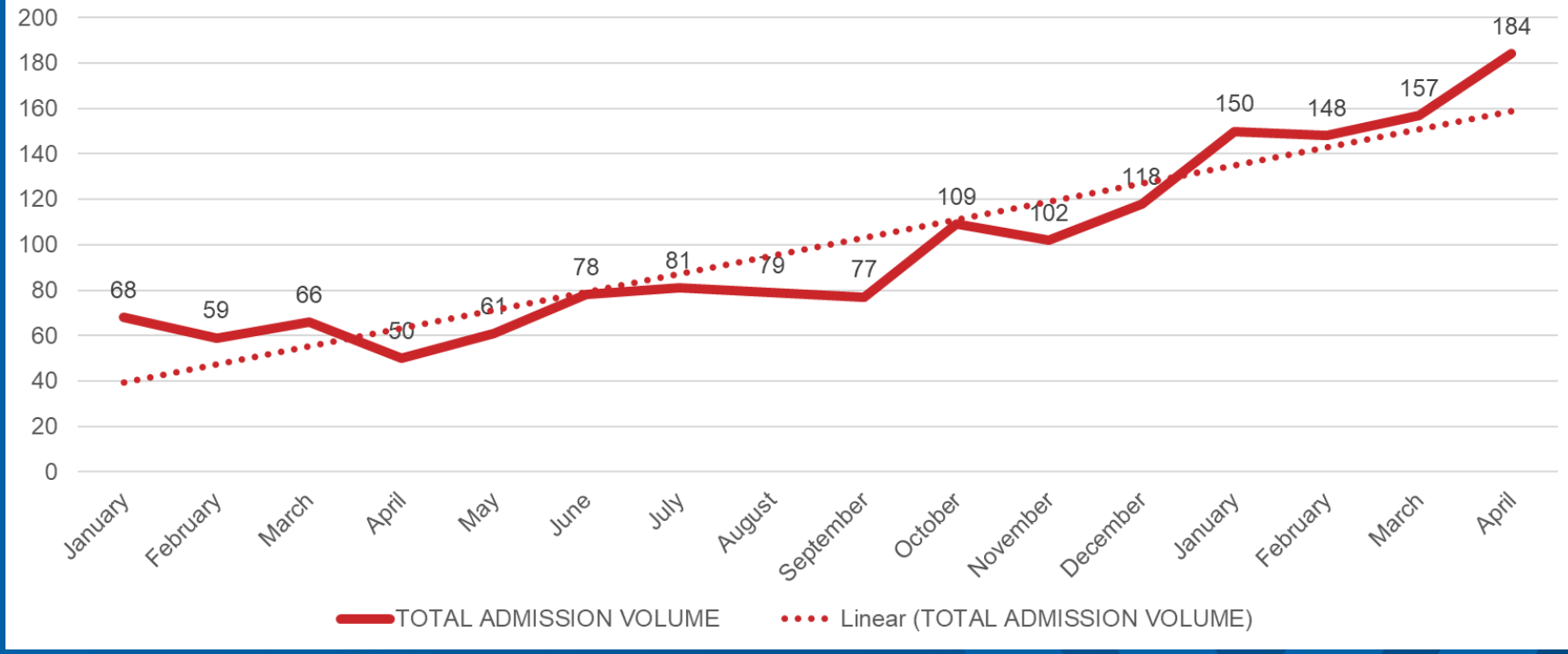


Charles Bess, MD and Faith Rodeheaver, CRNP


Potomac Valley Hospital ICU Revenue
Gross Revenue
$200,000
$180,000
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$-
September
October
November
December
January


ADMISSIONS VS. TRANSFERS
600
500
400
300
200
100
0
4Q17
1Q18
2Q18
3Q18
4Q18
1Q19
206
193
203
182
168
171
130
186
189
237
329
455
ADMISSIONS
TRANSFERS
TRANSFERS
ADMISSIONS
Linear (TRANSFERS)
Linear (ADMISSIONS)

2018-2019 TOTAL ADMISSION (INPT/OBS/SWING) VOLUME



WVUMedicine

Metric	2018	2019	2020	2021	2022
Total Patient Days	2718	4850	4620	5275	5757
Critical Care Days	155	629	751	1056	1123
Average Daily Census	5.59	8.57	12.62	14.45	15.77
Adjusted Patient Days	13852	16634	17979	19162	28803
Nursing Staffing Increase	37.35	38.5	31.83	37.96	39.63
APP Increase	4.14	7.28	9.35	14.62	16.1
RT Increase	6.02	6.1	6.93	9.75	10.88
Overall FTE Growth	199	214	220	249	284
Overall Gross Revenue	$47.5M	$62.7M	$68.1M	$100.3M	$143.1M
Overall Operating Margin	$588K	$622K	$3.9M	$6.3M	$10.4M
Hospital Outpatient Visits	15574	22544	22353	32800	40440

WVUMedicine

PVH CURRENT STATE

- 3 Hospitalists
- 2 Surgeons
- 1 Urology
- 1 Ortho
- Integrated Pain
- IR – 2 x wk
- Peds
- Pulmonary
- Urgent Care
- Addiction Treatment
- Psychiatry + Behavioral Health
- Podiatry
- Preventative Med

VICU CURRENT STATE

- 7 Sites
- 8 University Faculty Members
- Improved Collaboration
- Improved Transfer Process
- Decrease Burnout – Both Sides
- My Faculty are Better at Medicine !!!
- Improved Patient and Family Satisfaction

SUMMARY

- Urban and Rural Trauma Systems are Different
  - We have to meet the needs of both
- Develop Relationships…..in Everything
  - Work, Academic Societies, Communities
- Keep Working the Problems
  - Solutions Can Come from Unexpected Sources
- You Do Not Completely Understand What You Have Until the Next Phase of Your Life

THANK YOU