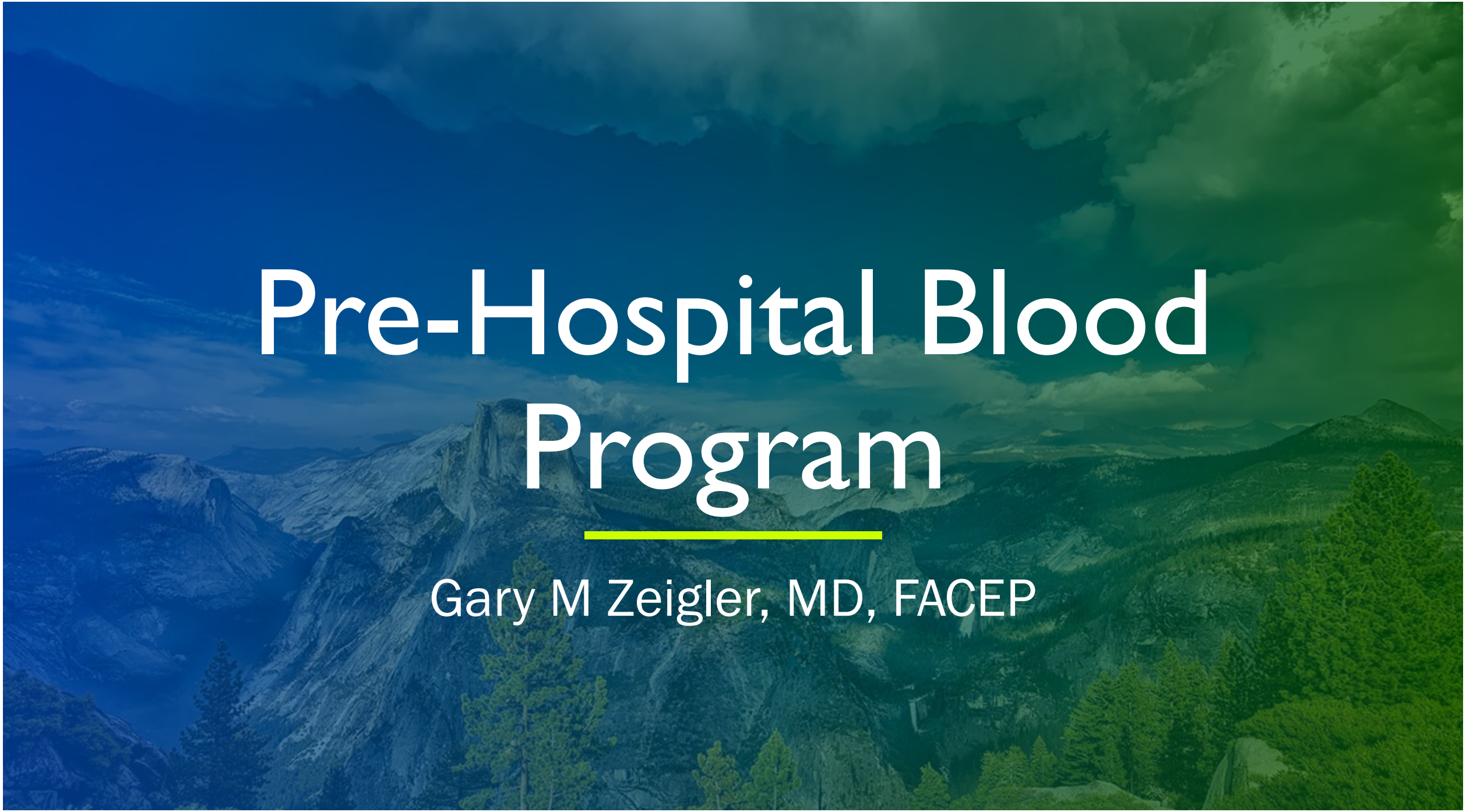
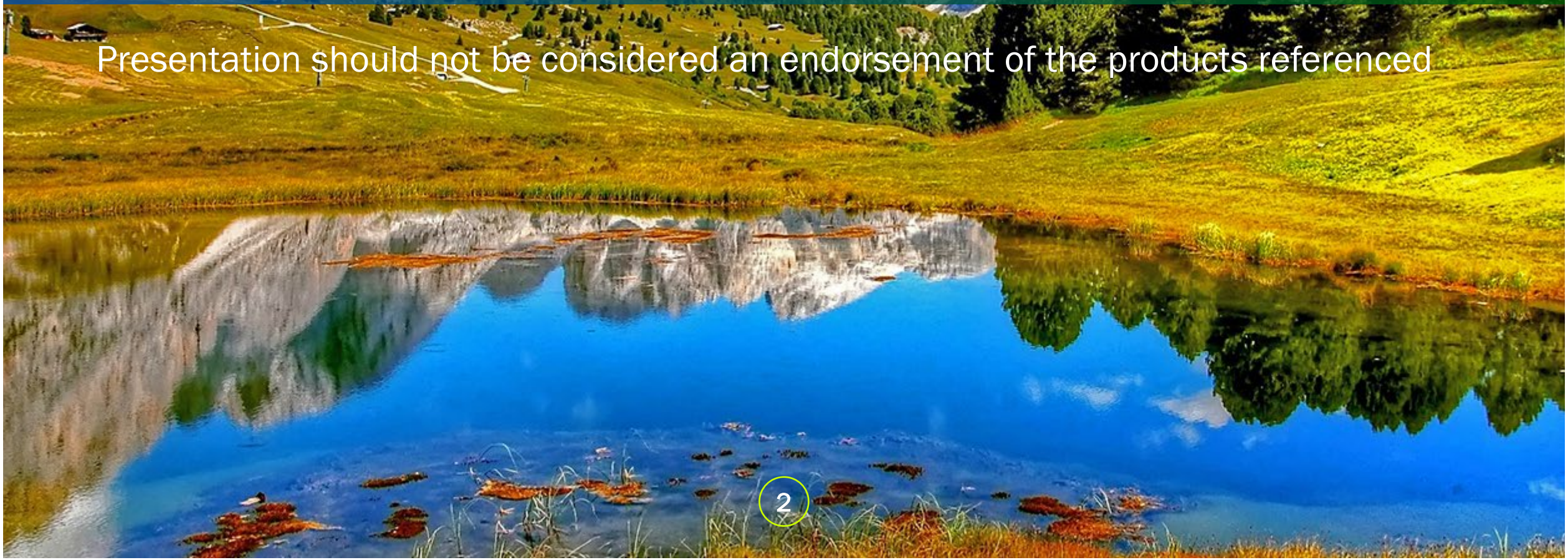

Pre-Hospital Blood Program
Gary M Zeigler, MD, FACEP

Disclosures

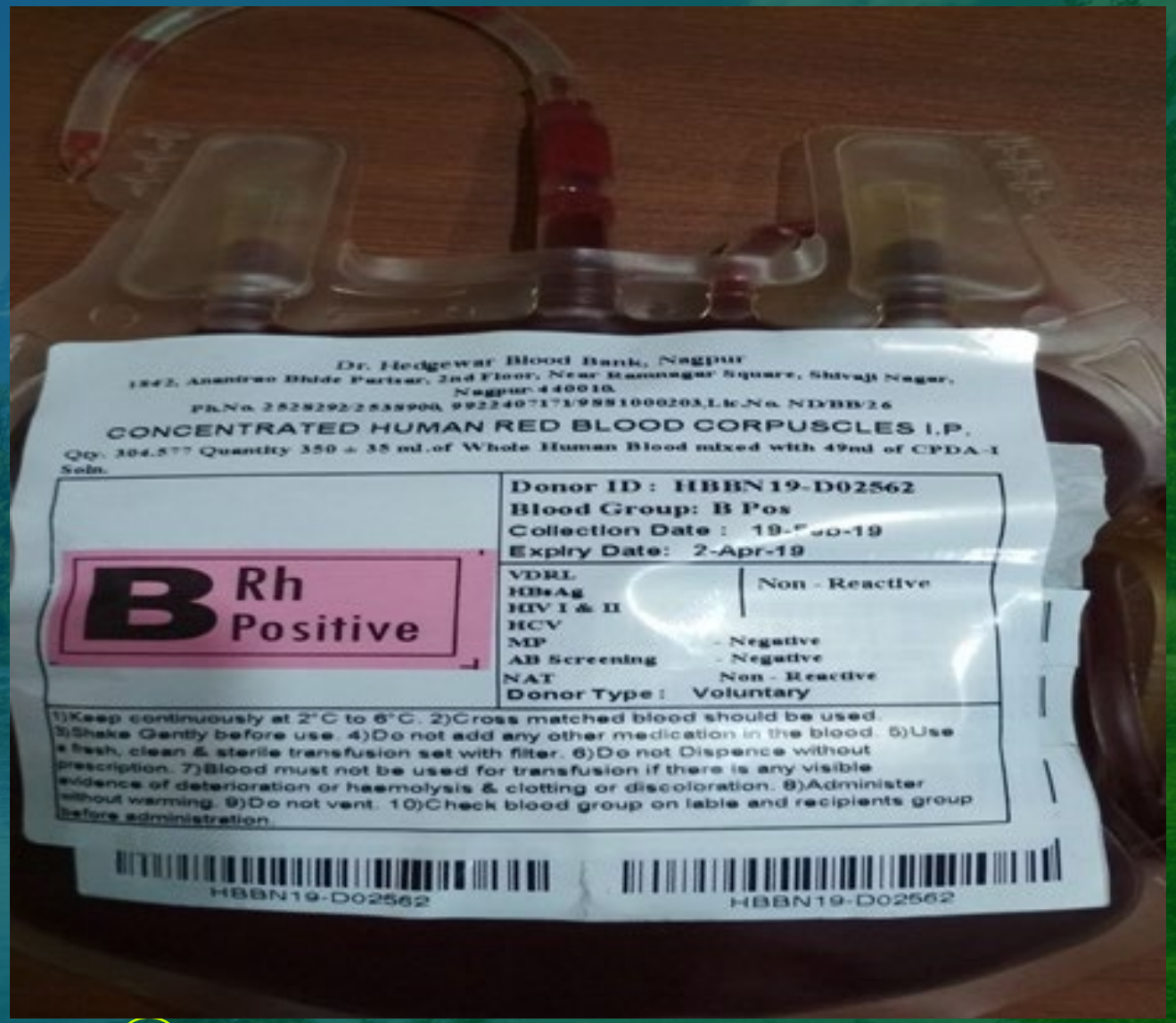
I have no financial interests in any of the products mentioned in this presentation

Presentation should not be considered an endorsement of the products referenced



Disclosures

No blood products were harmed in preparation for this presentation



Wallowa County

- 7391 Population (as of 2020 census); 7008 as of 2010 census
- 3152 square miles
- Principle industries are agriculture, ranching, lumber, and tourism
- Wallowa Lake and the Wallowa Mountains are a major seasonal tourist attractors
- Median resident age 53, 3rd oldest of Oregon Counties (2020 census)
- Not a single traffic light exists in the county; although there is a single flashing caution light in downtown Enterprise

Joseph

- Recently named by Travel and Leisure Magazine as one of the 20 most beautiful small towns in the US

Bartlett
Troy
Paradise
Flora
Promise
Maxville
Rondowa
Looking Glass
Vencent
Chico
Lewis
Zumwalt
WALLOWA
Imnaha
Minam
Wallowa
Elgin
Evans
Lostine
Enterprise
Imbler
Alicel
Joseph
Island City
Cove
Hot Lake
Union
Telocaset
Medical
Cornucopia
Homestead
204
82
3
237
203
84
Wenaha R
Grande Ronde R
Wallowa R
Minam R
Lostine R
Hurricane Cr
Wallowa L
Imnaha R
Big Sheep Cr
Little Sheep Cr
Grouse Cr
Crow Cr
Lightning Cr
Deep Cr
Mill Cr
Catherine Cr

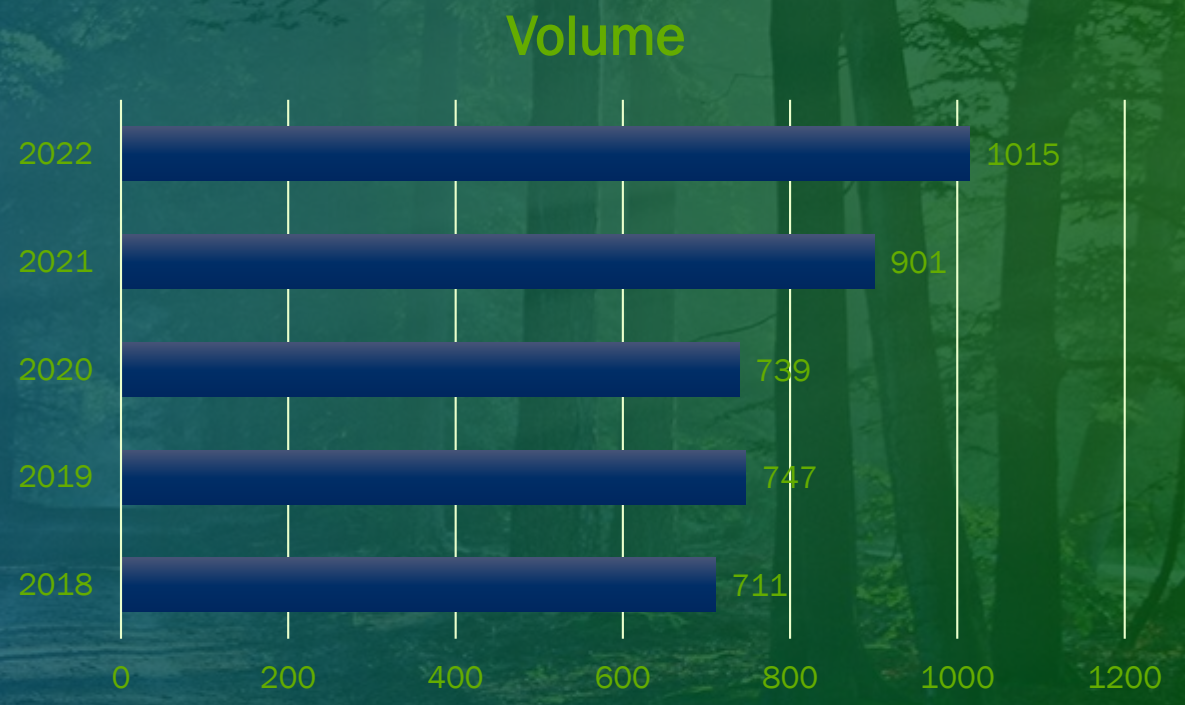
Wallowa Memorial Hospital

- 25 bed Critical Access Hospital
- Recognized by INDEX in top 100 Critical Access Hospitals in the Nation for 2023 (13th annual recognition)
- General surgery and orthopedic coverage
- Trauma Breakdown:
  - Blunt: most geriatric same level falls, remote 2nd MVA, MCA/ATV, horse accidents
  - Penetrating: very rare
- ED Volumes:
  - 2019 – 2505
  - 2020 – 2410
  - 2021 - 2472
  - 2022 - 2710

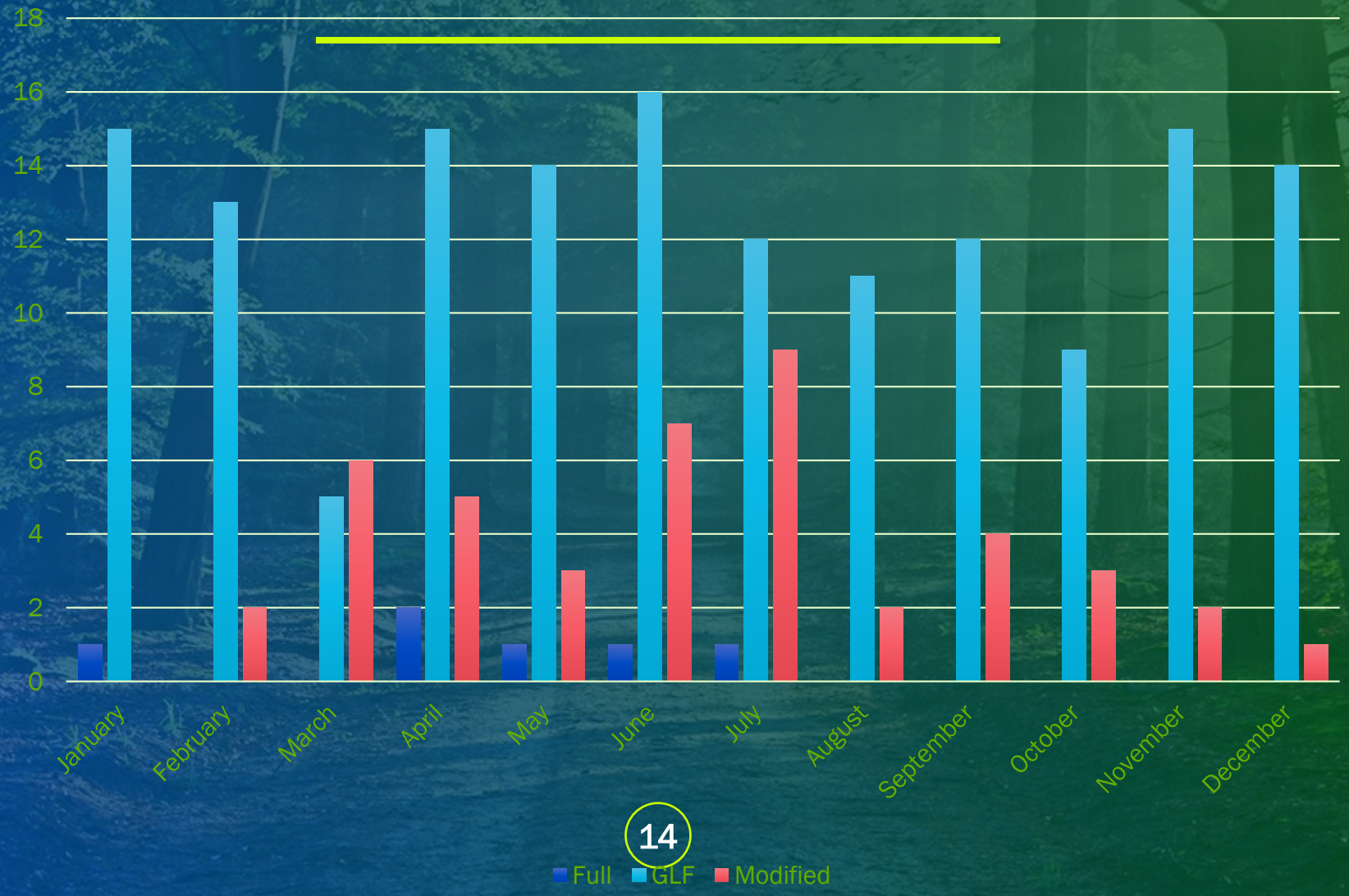
Wallowa County EMS

- Wallowa Memorial EMS
  - Hospital based system
  - Staffed by 6 paramedics, 2 intermediates, 1 advanced, 8 EMT's, and 1 EMR
- Joseph Fire Department (5 EMT's, 3 EMR's), not affiliated with Wallowa Memorial EMS
- Wallowa EMT's, Imnaha EMR's; part of Wallowa Memorial EMS

EMS Run Volumes

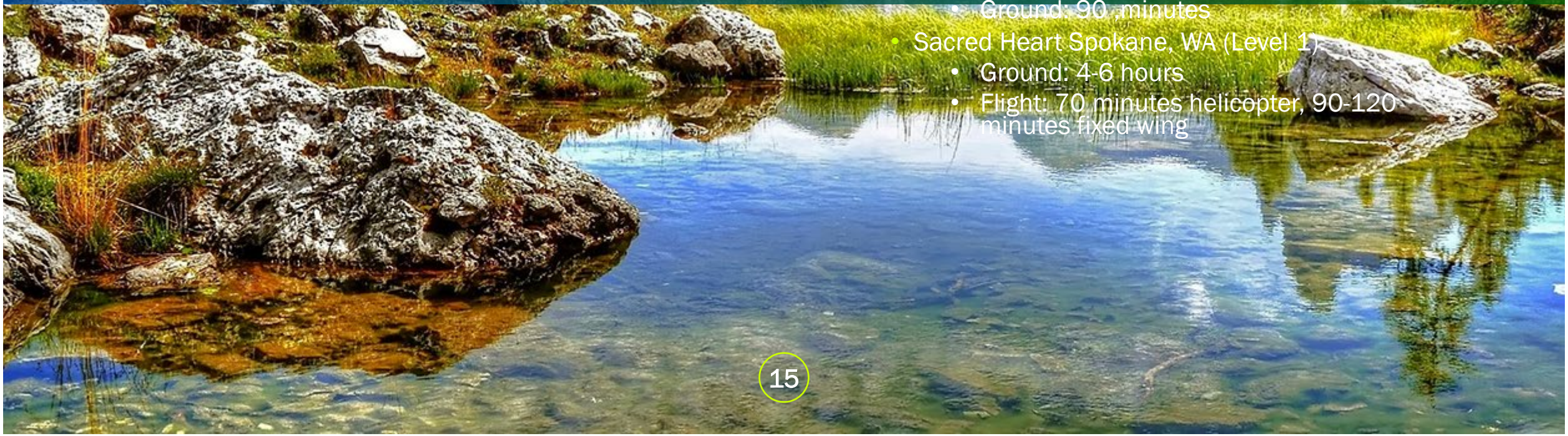


2022 ER Trauma Volumes



Trauma Transfers

- St Alphonsus Boise, ID (Level 2) :
  - Ground 4-7 hours
  - Flight: 60 minutes helicopter, 90 -120 fixed wing
- St Lukes Boise, ID (Level 3); same transfer times
- St Joseph Lewiston, ID (Level 3)
  - Ground: 2-3 hours
  - Flight: 45 minutes helicopter, 90 minutes fixed wing
- Grande Ronde Hospital La Grande, OR (Level 4);
  - Ground: 90 minutes
- Sacred Heart Spokane, WA (Level 1)
  - Ground: 4-6 hours
  - Flight: 70 minutes helicopter, 90-120 minutes fixed wing



Trauma Transfers

- Aeromedical transfers limited from November thru March
  - No Instrument Landing System (ILS) in place for Joseph State Airport for fixed wing aeromedical transfers
- Many trauma transfers are ground EMS transferring tofixed wing in La Grande to final destination,
- Ground all he way

Trauma Destinations

- St Alphonsus Boise, ID (Level 2) :
  - Ground 4-7 hours
  - Flight: 60 minutes helicopter, 90 -120 fixed wing
- St Lukes Boise, ID (Level 3); Pediatric trauma; same transfer times
- St Joseph Lewiston, ID (Level 3)
  - Ground: 2-3 hours
  - Flight: 45 minutes helicopter, 90 minutes fixed wing
- Grande Ronde Hospital La Grande, OR (Level 4); Isolated orthopedic
  - Ground: 90 ,minutes
- Sacred Heart Spokane, WA (Level 2):
  - Ground: 4-6 hours
  - Flight: 70 minutes helicopter, 90-120 minutes fixed wing

Pre-Hospital Trauma Resuscitation

- TXA in use since 2018 (now using 2 gm over 20 minutes)
- Hemorrhage control thru pelvic binders, CAT tourniquets, Quickclot®
- Hospital provided crossmatch (or emergency release) blood products for ground transfers or interface with Aeromedical (Joseph State Airport, 10 miles; La Grande, 70 miles)
- Identified need for more than crystalloids for field resuscitation (or coordination with scene flights)
- Trauma case February 2018 lead to initiating our prehospital PRBC program:
  - 3 of our 5 paramedics are FPC and previously experienced with the PRBC program used by Life Flight Network
  - Our program leverages heavily from their experience


LONG LOAD

Creating a Pre-Hospital PRBC Program

- Relationship with a regional blood bank
  - PRBC's are never out of blood bank control, just part of it is held in a cooler in EMS quarters
  - Relationship with local Red Cross or regional hospital
  - *Much* easier to accomplish with a hospital-based EMS system
- Maintenance and documentation of blood temperature controls
- System developed by our critical care paramedics, all who have previously been with Life Flight Network and leveraged from their experience

Temperature Control and Monitoring

- Temperature control requirement:
  - 1-10^{o} C Transport requirement (initial delivery from ARC)
  - 1-6^{o} C Storage requirement (hospital blood bank, when held by EMS)
- Temperature monitoring requirement
  - Red Cross requires blood in transport to be monitored q4h, or automated continuous monitoring
  - Wallowa Memorial EMS records blood temperature q15min
  - Daily paper transfer log, otherwise no continuous paper

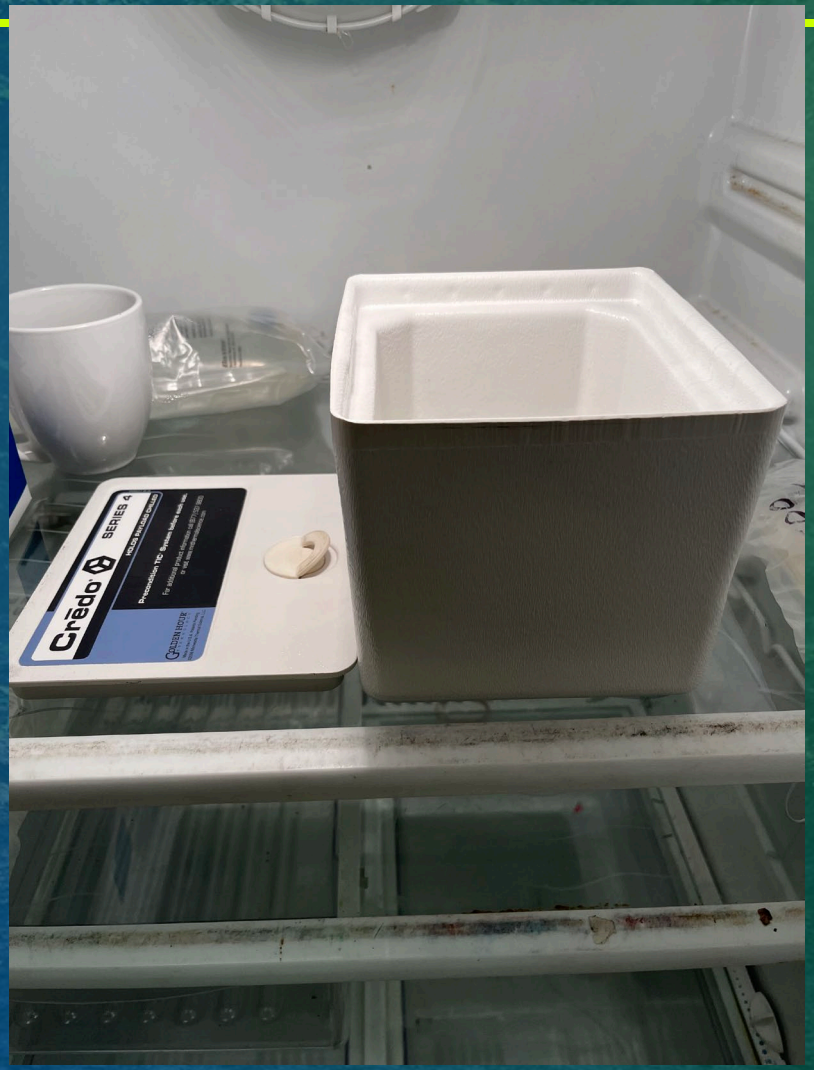
System to Monitor Temperature

- Initial monitoring was set up using OTC temperature sensors:
  - Wifi connected to internet based storage
  - SMS alerting to paramedics for *out of range* alerts
- Subsequently integrated into hospital system wide central temperature monitoring system
  - Caches q15m readings when out of WiFi service and then downloads when reconnected

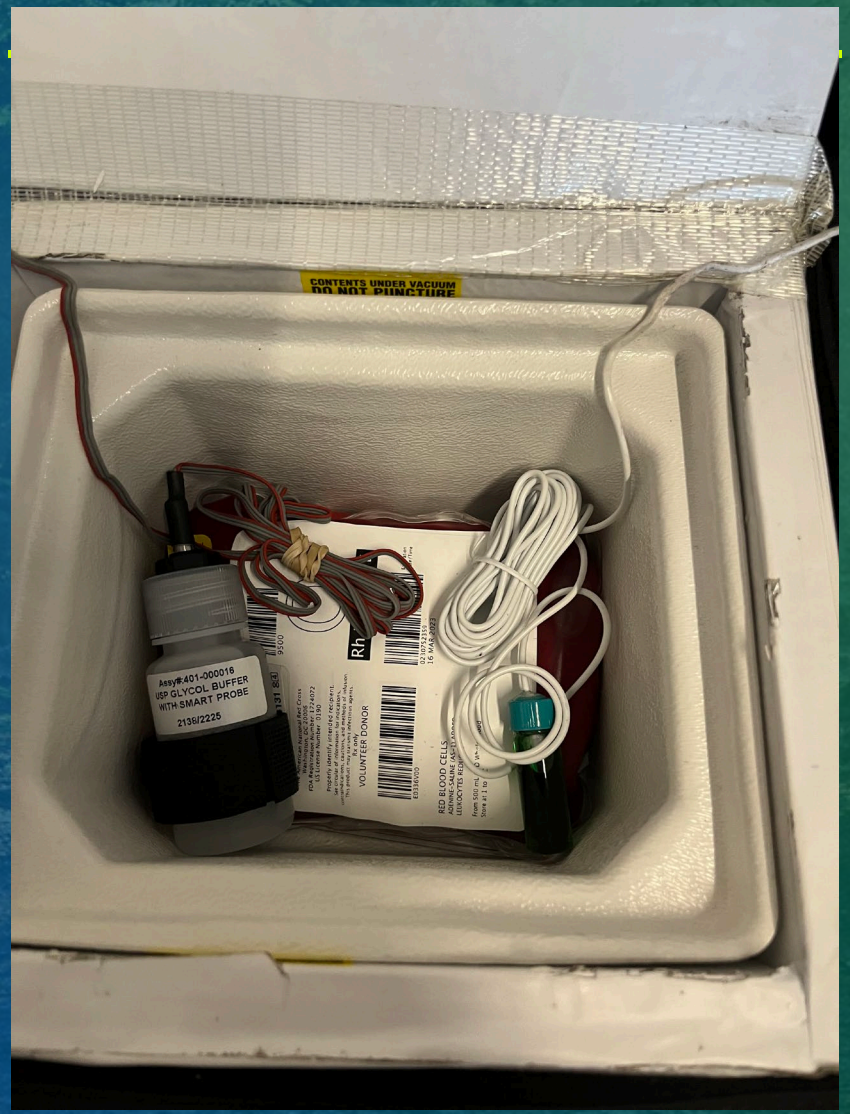
System to Control Temperature Temperature

- Credo ProMed™ Series Four Container
- Capacities for 2, 4, 8 Units
- $400 (for 2 Units PRBC Capacity)
- Rated to regulate 2º C to 8º C for up to 48 hours

Daily Procedure – Step 1

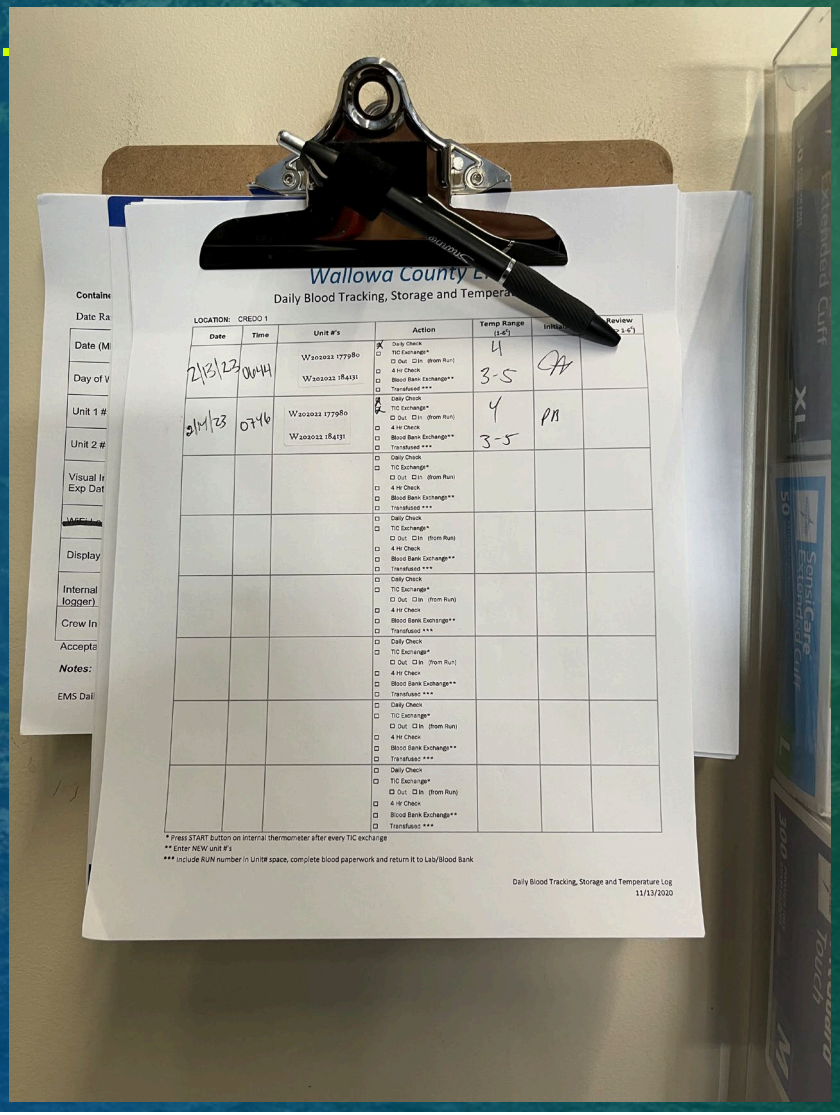


Daily Procedure – Step 2



Daily Procedure – Step 3

Daily Procedure – Step 4



Development of Protocols

- On Line Medical Control (OLMC) limitations
  - Cellular coverage intact along Oregon-82 +/- 5 miles
  - Cellular coverage lost 10 miles North of Joseph, Enterprise, Lostine, or Wallowa
  - Radio contact, even with six mountain top repeaters still limited to ~50% of the county
  - Satellite phone limitations
- No recognized guidelines, protocols for Emergency Blood Transfusion (EBT)
  - So we looked at guidelines for massive transfusion

Massive Transfusion Decision Protocols

- Shock Index
- ABC: Penetrating Mechanism, SBP, HR, FAST
- TASH: Sex, Hgb, Base Excess, SBP, Heart Rate, FAST, unstable pelvic, open femur fracture)
- Prince of Wales Hospital: Pulse, SBP, GCS, Displaced Pelvic Fracture, CT or FAST, Hgb, Base deficit
- Vandromme: Hgb, SBP, Pulse, INR, lactate
- Schreiber score
- Larson score
- Provider gestalt

Requirements

- Any protocol has to recognize the reality of the situation, there may be only one medic and one EMT on scene
- Should not require laboratory testing (although Hgb, Lactate, and Base Excess can be determined via iStat cartridges: Chem8+ and CG4+)
- Preferably a scoring system that has been validated in the prehospital environment
- Recognize diversity of population:
  - Local: > 60, agricultural, MVA, horse
  - Tourist: < 40, MVA, recreational (horse, ATV)

Assessment of Blood Consumpton (ABC)

- Four dichotomous, equally weighted variables
  - Penetrating mechanism of injury
  - SBP <= 90 mm Hg
  - HR >= 120
  - Positive FAST for free fluid
- 1 point per variable, 2 or more considered positive to initiate massive transfusion
- ED Validation studies sensitivity 75-90%

Wallowa Memorial EMS EBT Protocol

- Field exclusion of other sources of hypotension (e.g., tension PTX, AMI)
- Assessment for Blood Consumption (ABC) Score for Massive Transfusion
    - Penetrating trauma to torso
    - Systolic BP <= 90 mm Hg
    - HR >= 120
    - Positive eFAST (crews have Butterfly IQ device)
        - Free fluid present
    - Two or more factors positive
- Shock index > 1 in adult
- Provider gestalt
- OLMC

Wallowa Memorial EMS EBT Protocol

- Preferentially carry O negative PRBC (but not guaranteed)
- Consent implied, written consent form also available
- All blood products administered thru in line warmer - Belmont Buddy Light®


Buddy Lite
Fluid Warmer
Belmont

Resuscitation Goals

- May do initial trial of 500 mL LR
- Reassess after 1U PRBC infused (< 5 minutes)
- Goal: MAP 65 mm Hg, head injury 80 mm Hg

Directions

- Ongoing training/competency in eFAST examinations
- Prehospital anticoagulation reversal
- Prehospital plasma
- Population specific (e.g., geriatric) scoring systems

THANK YOU!

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