



Lung Protective Ventilation

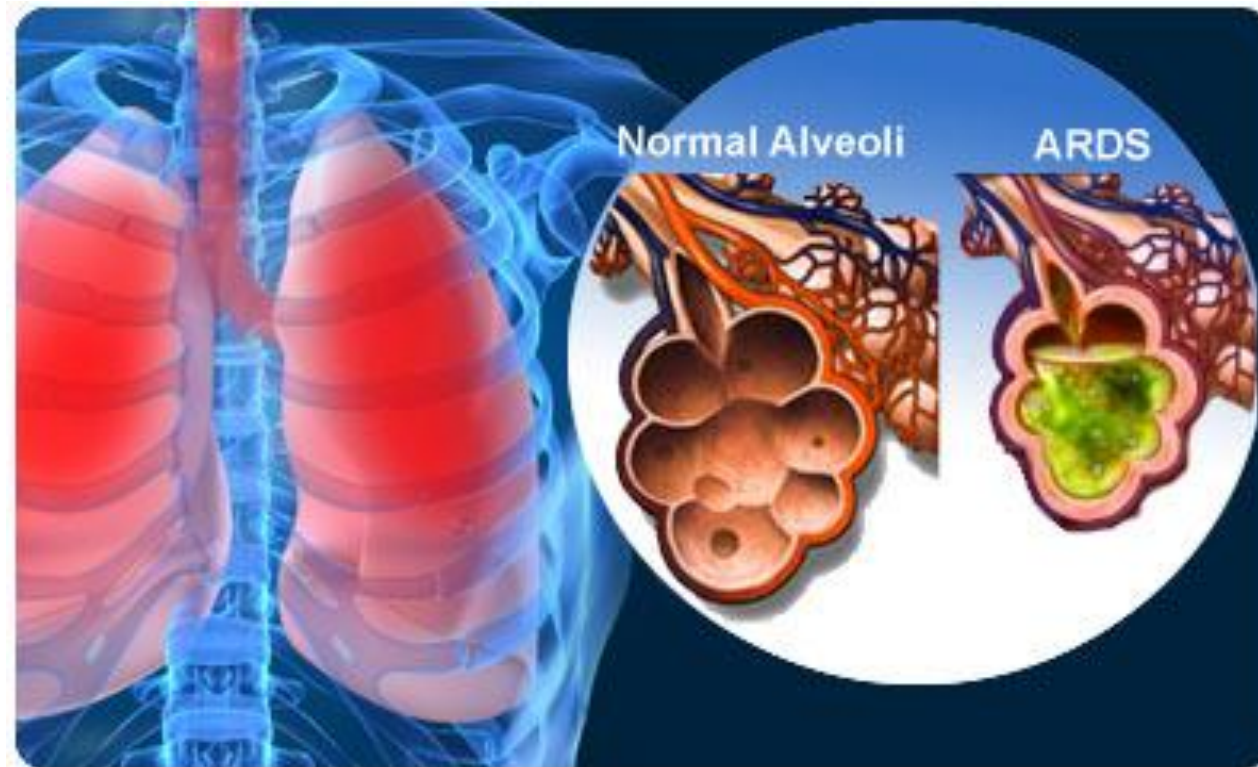
Thomas Bice, M.D.

ARDS and Lung Protective Ventilation

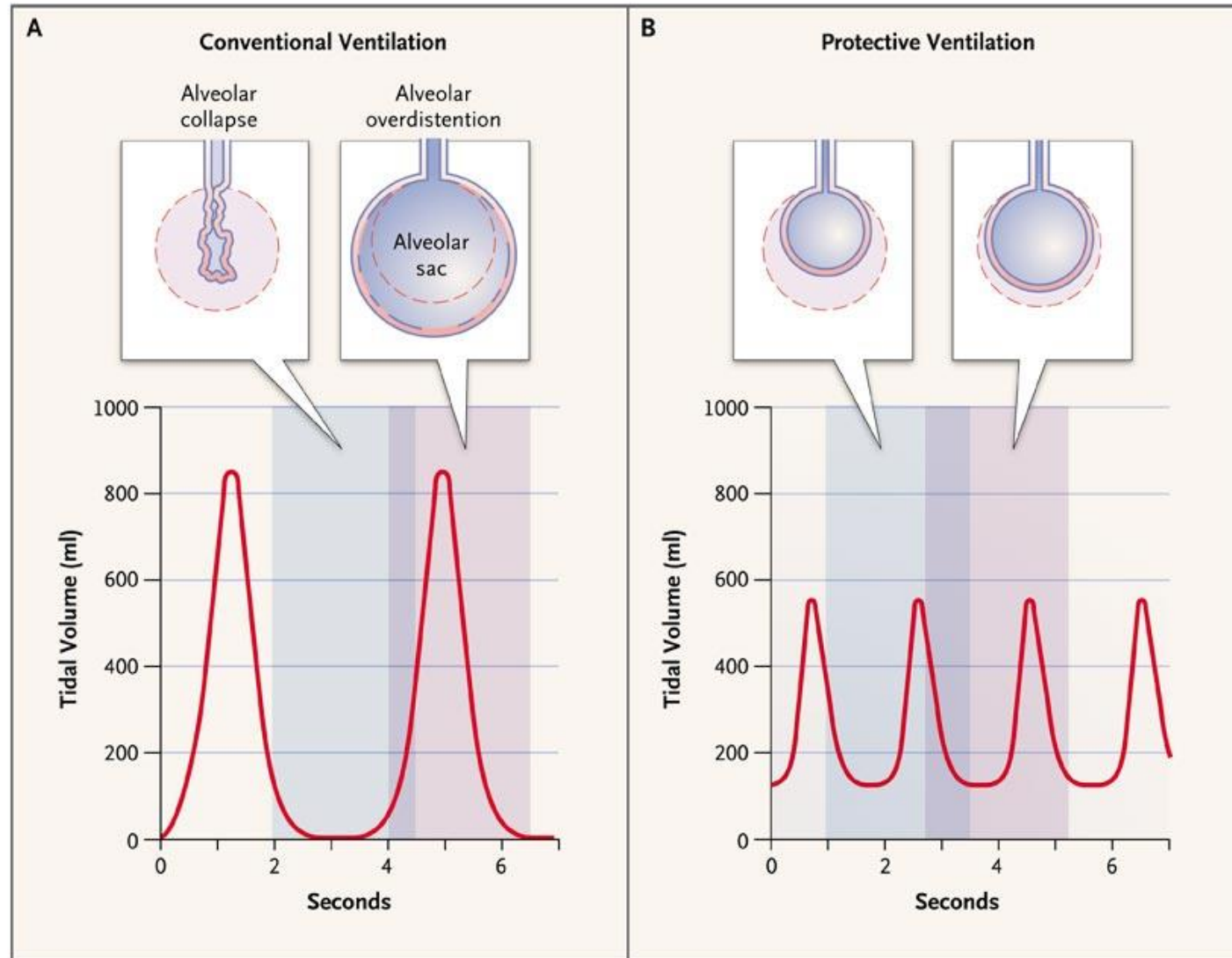
- ▶ Acute respiratory distress syndrome (ARDS) is a common complication of critical illness
- ▶ The only intervention with known benefit in mortality is the use of lung protective ventilation
- ▶ Our adherence to lung protective ventilation at UNC was poor
- ▶ Developed team to address barriers to lung protective ventilation

What is ARDS?

- ▶ Lung inflammatory response to many conditions:
 - ▶ Trauma
 - ▶ Shock
 - ▶ Sepsis
 - ▶ Surgery

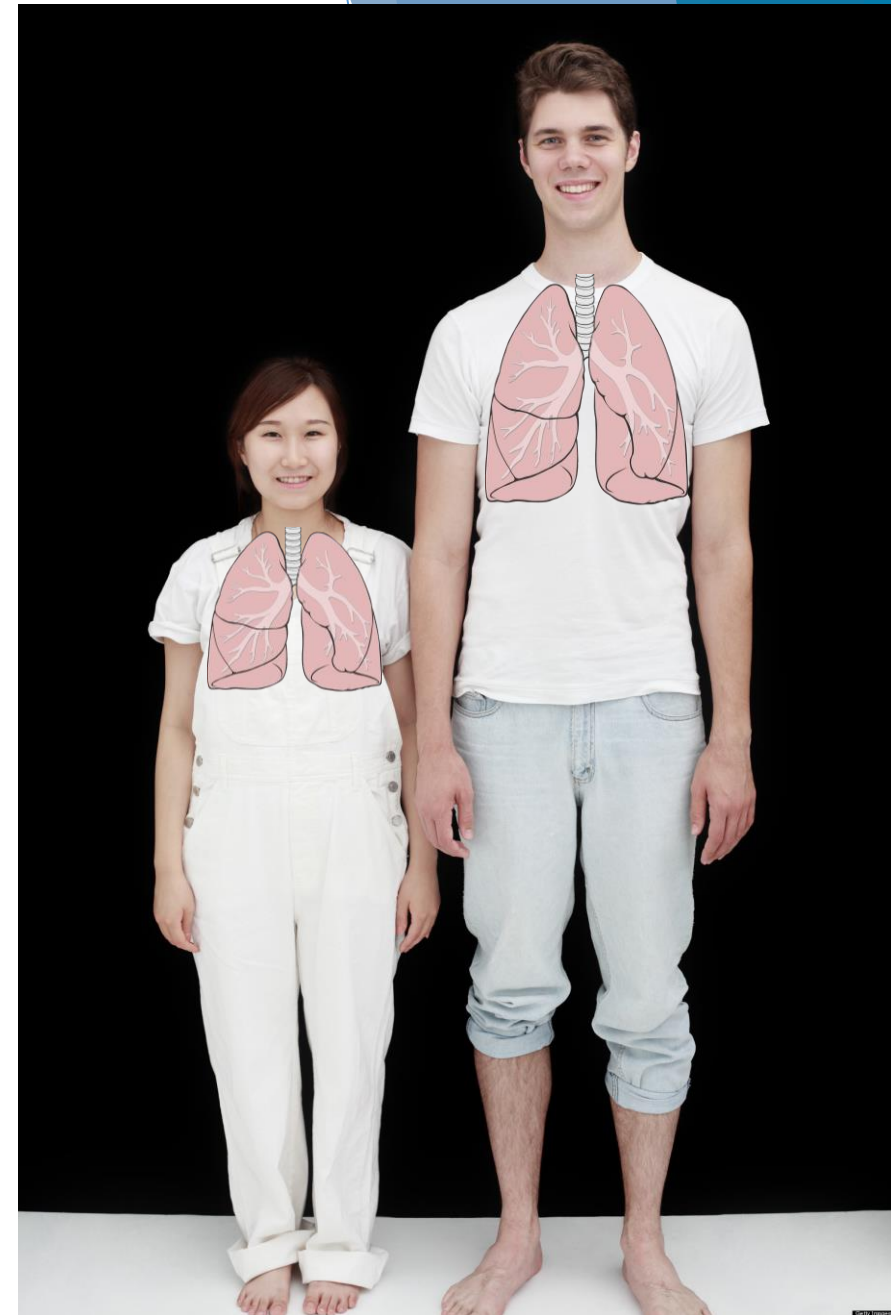


What is “Lung Protective Ventilation?”



What is a “Normal” Tidal Volume?

- ▶ Most textbooks say 500 ml - for a healthy 70 kg man at rest
 - ▶ = ~ 7 ml/kg
- ▶ 2 problems:
 1. Critically ill patients come in all sizes
 2. None of them are at rest or as healthy as these two appear to be



Known Benefits of LPV

- ▶ ARMA trial - published in 2000!!!
 - ▶ Compared 12 vs. 6 ml/kg ideal body weight
 - ▶ 39.8% vs. 31% mortality
 - ▶ Number Needed to Treat (NNT) to prevent 1 death
 - ▶ 12 per acute stay

Difficulties in Implementation

- ▶ Default ventilator settings:
 - ▶ Rate 15, Tidal Volume 500
- ▶ Perceived harm
 - ▶ Increased sedation use
 - ▶ Risk of delirium
 - ▶ Increased acidosis
- ▶ **These can all be overcome!**

Possible Harm?

- ▶ Secondary analysis of ARMA¹
 - ▶ No difference in sedation use
 - ▶ Reduced length of stay

¹Khan et al - Crit Care Med 2005

Should We Use LPV for All?

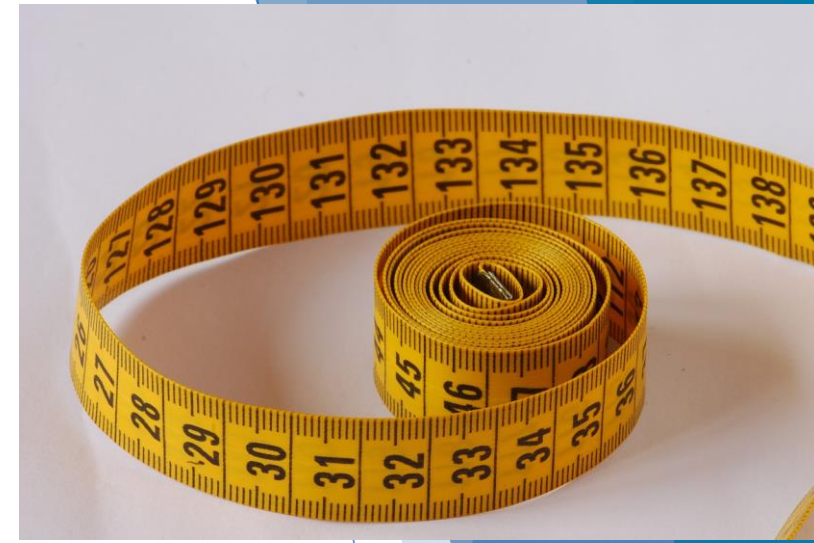
- ▶ ARDS can be a difficult syndrome to recognize early
- ▶ Many centers examining their own practice have shown that adherence is poor
- ▶ Several recent recommendations for ventilator management suggest that using LPV for all patients may improve the adherence in ARDS
- ▶ **There is NO harm involved with Lung Protective Ventilation!**

Project Goal

- ▶ 90% of patients ≤ 6.5 ml/kg IBW at 24 hours
- ▶ Average daily tidal volume ≤ 6.5 ml/kg IBW

How we did it...

- ▶ Designated Respiratory Therapy Clinical Specialists
- ▶ Changed default settings on all ventilators
 - ▶ Tidal volume = 400 ml
- ▶ Put kit together that includes all supplies necessary for initiation of mechanical ventilation, including tape measure!
- ▶ Placed chart on each ventilator with default starting points to achieve 80% goal at baseline



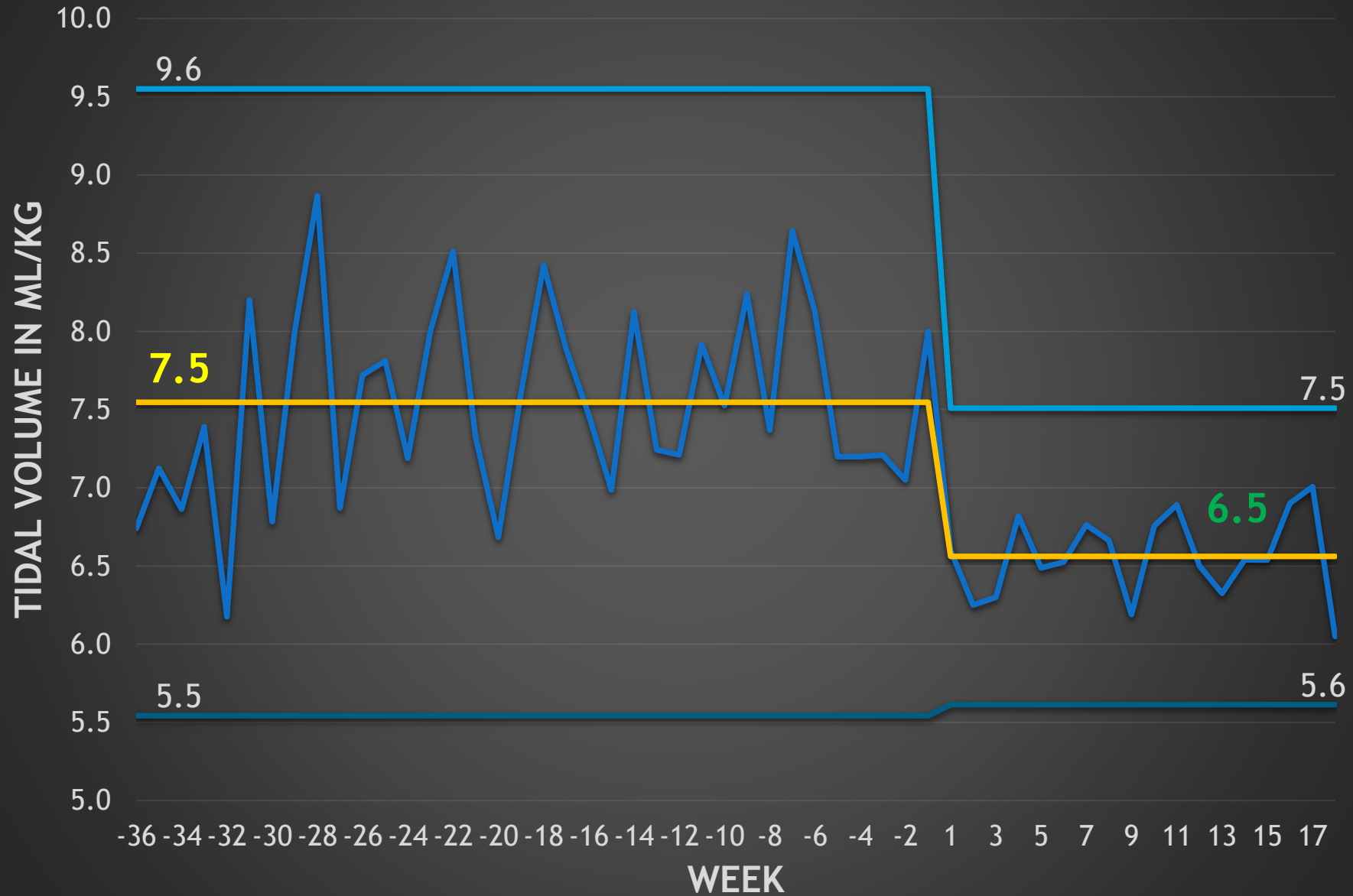
In order to achieve Lung Protective Ventilation for adult patients, please use the following initial tidal volumes until a height measurement can be obtained:

Male Patient: 450 ml

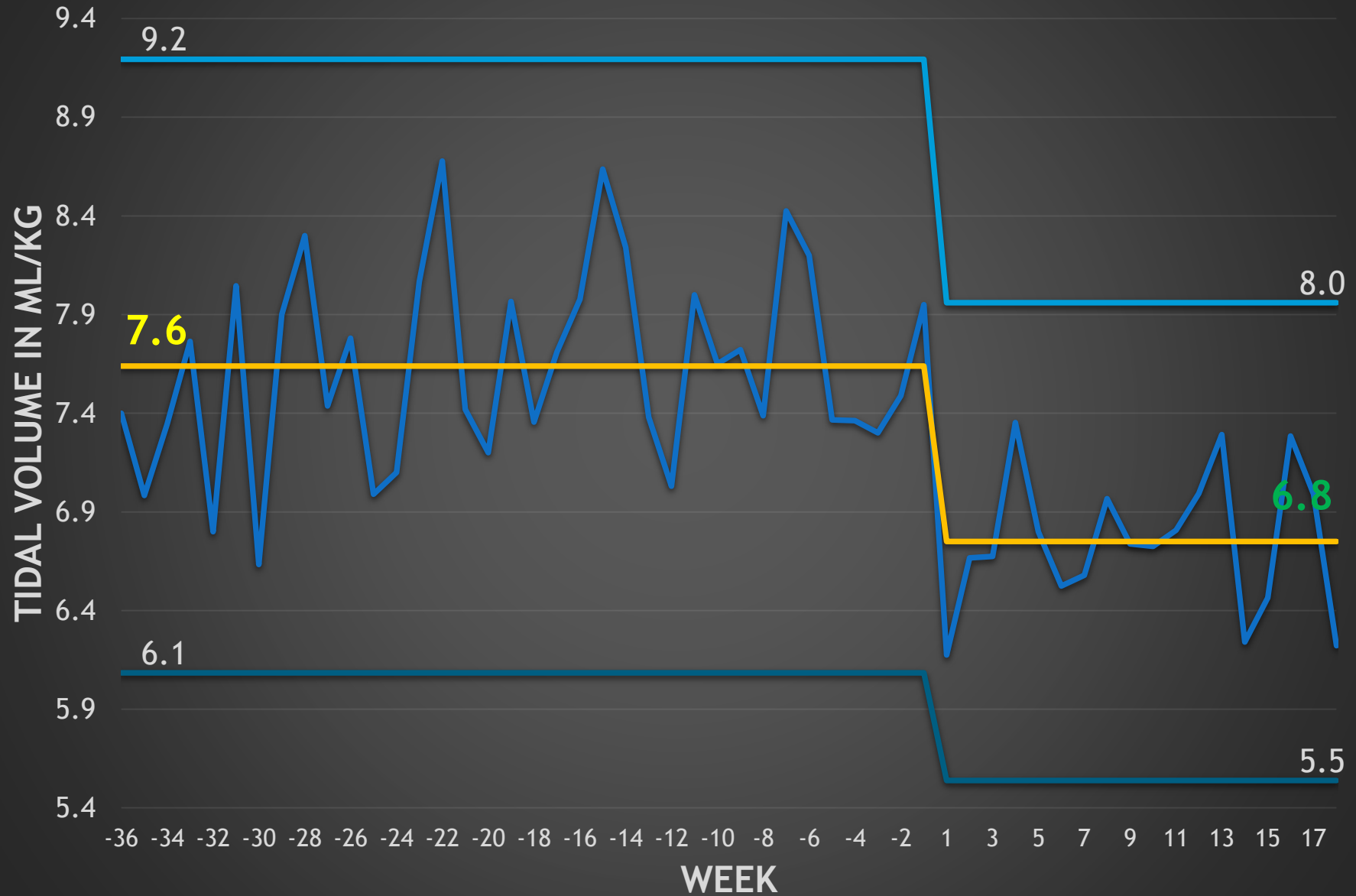
Female Patient: 350 ml

Height		6 ml/kg Tidal Volume		Height		6 ml/kg Tidal Volume	
Inches	CM	Male	Female	Inches	CM	Male	Female
48	122	130	110	64	163	360	330
49	124	150	120	65	165	370	340
50	127	160	140	66	168	380	360
51	130	180	150	67	170	400	370
52	132	190	160	68	173	410	380
53	135	200	180	69	175	420	400
54	137	220	190	70	178	440	410
55	140	230	200	71	180	450	420
56	142	240	220	72	183	470	440
57	145	260	230	73	185	480	450
58	147	270	250	74	188	490	470
59	150	290	260	75	191	510	480
60	152	300	270	76	193	520	490
61	155	310	290	77	196	530	510
62	157	330	300	78	198	550	520
63	160	340	310	79	201	560	540

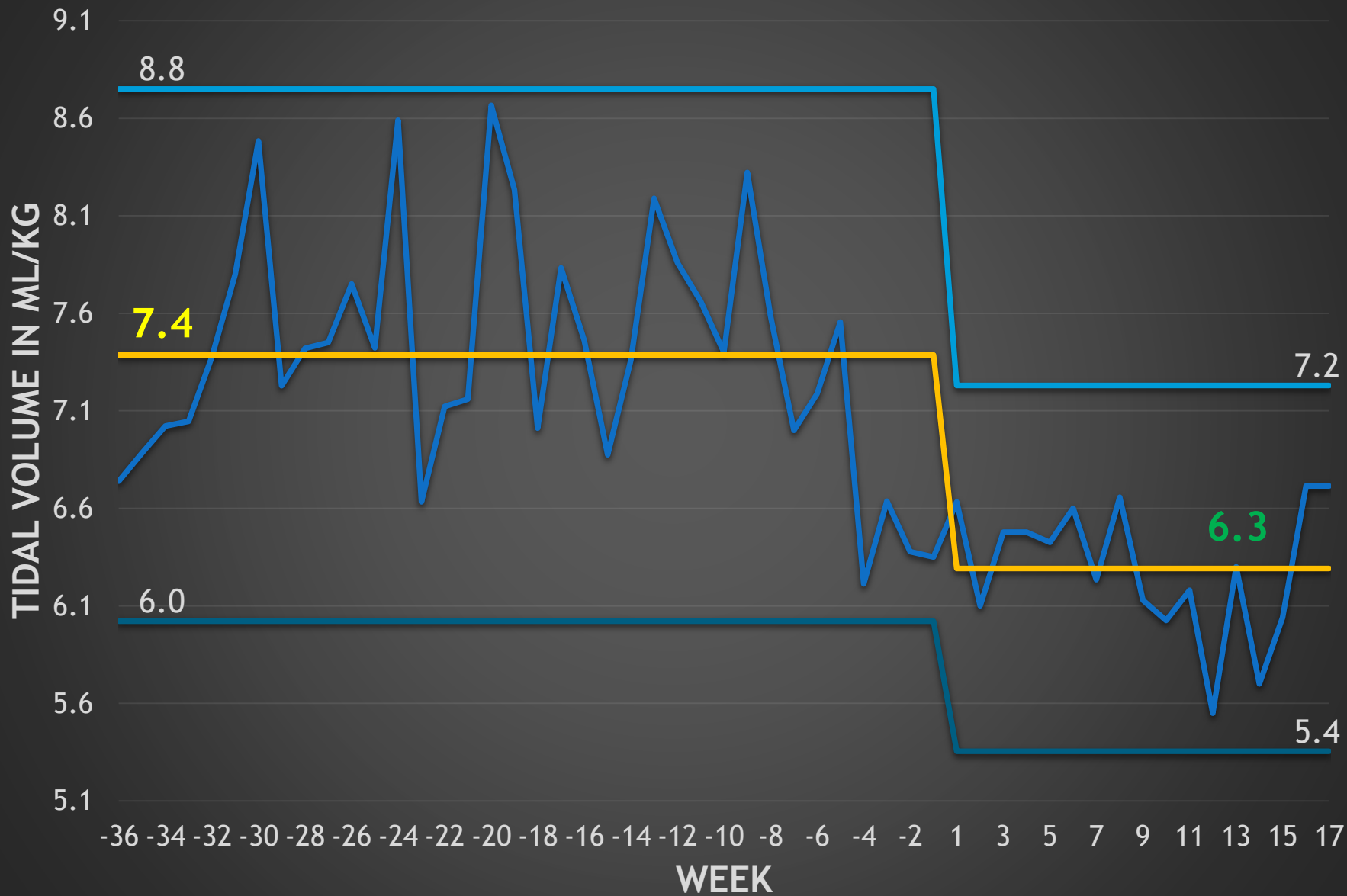
Average Tidal Volume at 24 hr



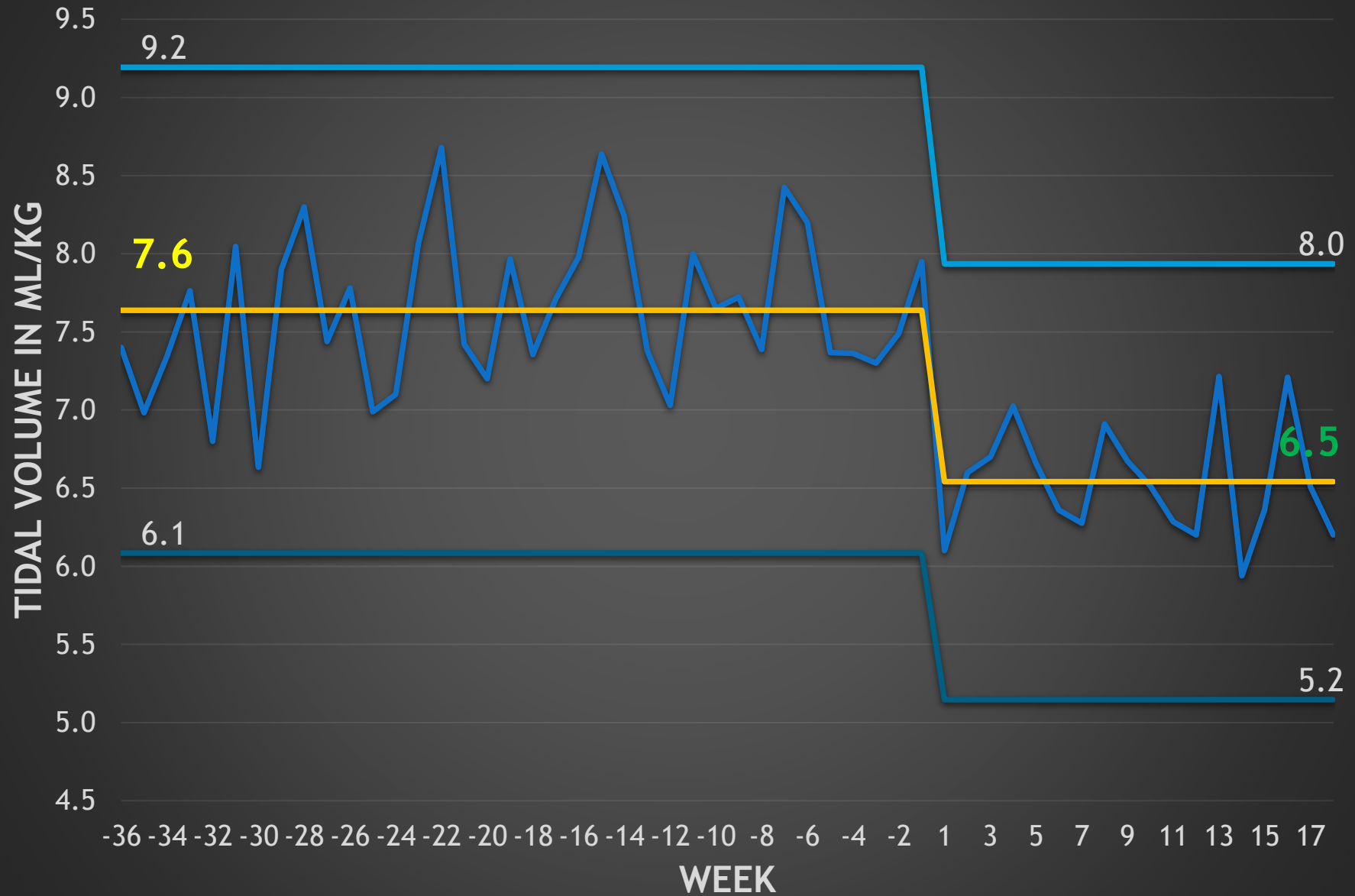
Average Initial Tidal Volume



MICU Average Tidal Volume at 24 hr



MICU Average Initial Tidal Volume



Main Results

- ▶ Initial tidal volumes: 49% are ≤ 6.5 ml/kg
- ▶ 24 hr tidal volumes: 59%
- ▶ MICU Initial: 55%
- ▶ MICU 24 hr: 70% → Up from 26%!
- ▶ Still work to do, but tremendous improvement!

Potential Effects

- ▶ 36% of MICU patients have ARDS
- ▶ 147 MICU patients since intervention
- ▶ ~50 likely had ARDS
- ▶ Before study only 16 would have received LPV
- ▶ Now, at least 35 were on LPV
- ▶ NNT = 12 to prevent 1 death
- ▶ Therefore, potentially saved 3 lives in one ICU in 4 months

Struggles Along the Way

- ▶ Delays in education of staff, both RT and MD
- ▶ Continued resistance, before, during, and after education
- ▶ Opportunities for continued education and dialogue

Sustainment Plan

- ▶ Expanding Respiratory Therapy Clinical Specialists to all ICUs
- ▶ MVP QI Team = Mechanical Ventilation Process Quality Improvement Team

Thanks!

- ▶ Michael Garrett, RTCS - MICU
- ▶ Chris Biancaniello, RTCS - SICU
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- ▶ Kathy Short, RT
- ▶ Shannon Carson, MD
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Questions?

