

MTQIP Data and VTE Outcomes

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Outcomes for low molecular weight
heparin vs heparin use in MTQIP

Our goals

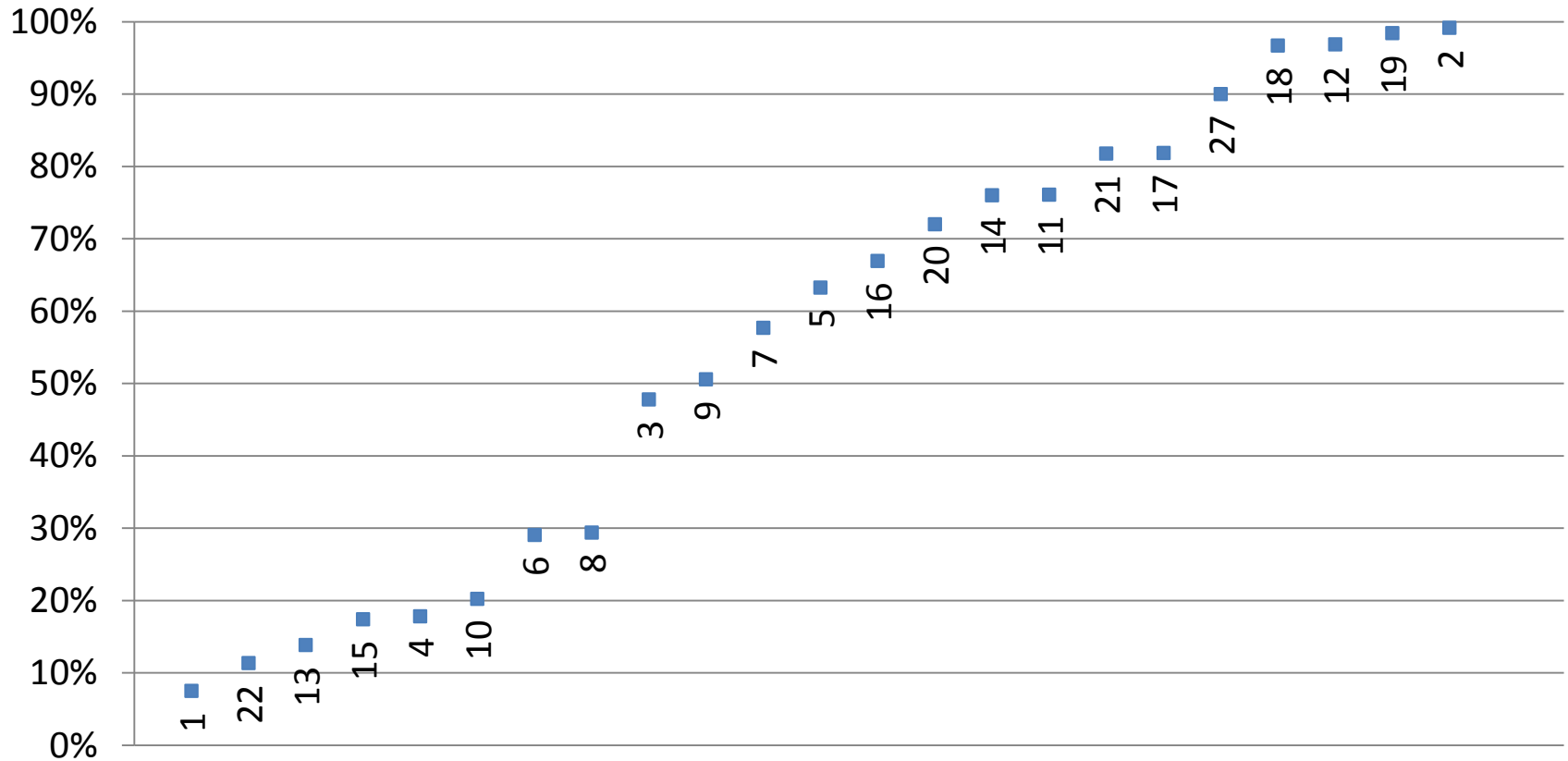
- Compare outcomes for patients who received LMWH v heparin
 - Conflicting evidence
 - Geerts: LMWH better
 - Sise: Heparin non-inferior to LMWH
- Use regression models to figure out ‘head-to-head’ real world comparison
 - For similar patients who differ only by drug type, what do their VTE and mortality outcomes look like?
- We have the data to do this!

Who we studied

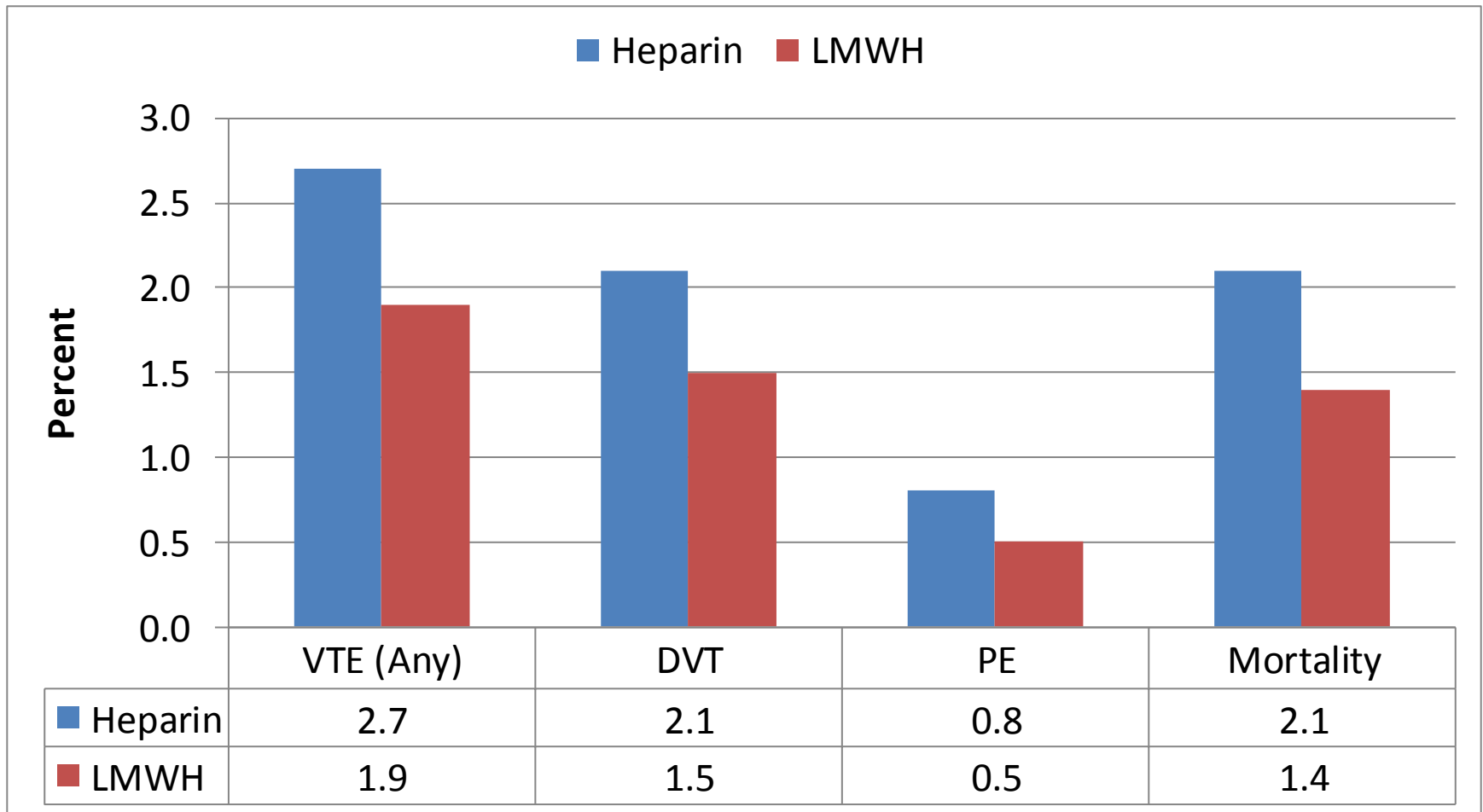
- Cohort 2 (Admit to trauma service, exclude DOAs and deaths within first 24h)
- Only patients who received LMWH or heparin during their hospital stay
 - Exclude other VTE prophylaxis, no VTE prophylaxis
- 18,010 patients from 2012-2014
 - 43% (7,786 patients) received heparin
 - 57% (10,224 patients) received LMWH

Hospital practices

Reported LMWH Use (%), 2012-2014



Unadjusted Outcomes



Without accounting for any patient factors, outcomes (any VTE, DVT, PE, mortality) are all better for patients who received LMWH v heparin.

Risk-adjustment

Unadjusted, LMWH looks better than Heparin.
Why can't we just use these results?

- Patients who receive LMWH or heparin might be systematically different: sicker, older, etc.
 - Patient differences could skew how we interpret the data
- Use regression models to risk adjust
- Try to evaluate the effect of the drug as if we were treating the same patient.

Patient Characteristic	Heparin	LMWH	p-value
Patients, N	7,786	10,224	--
Age, Mean	51.8 ± 22.0	51.3 ± 21.6	0.09
Male Gender, %	65.6	65.1	0.5
Race, %			
White	58.8	76.6	<0.001
Black	37.4	18.1	
Other	3.8	5.3	
Private Insurance, %	46.6	52.2	<0.001
Blunt Mechanism, %	85.7	90.9	<0.001
ED Pulse, %			
51 - 120, bpm	90.8	91.5	0.002
> 120	7.3	6.5	
1 - 50	1.0	0.7	
Injury Severity Score, %			
5 - 15	74.8	73.4	<0.001
16 - 24	15.7	17.7	
25 - 35	7.8	6.8	
> 35	1.7	2.1	
AIS Head/Neck > 2, %	20.8	16.3	<0.001
AIS Face > 2, %	0.6	0.6	0.9
AIS Chest > 2, %	25.8	29.0	<0.001
AIS Abdomen > 2,%	7.8	8.1	0.4
AIS Extremity > 2, %	19.0	23.7	<0.001

Patient Characteristic	Heparin	LMWH	p-value
Intubated, %	46.5	47.5	0.2
Transfer In, %	13.4	20.9	<0.001
Acquired Coagulopathy, %	4.9	6.7	<0.001
Congestive Heart Failure, %	2.3	2.8	0.02
Dialysis	1.2	0.4	<0.001
Drug Use	13.1	11.4	<0.001
Hypertension, %	33.0	29.7	<0.001
Obesity, %	13.7	12.7	0.05
Hours to VTE Prophylaxis, Mean	35.4 ± 54.9	43.7 ± 57.6	<0.001
Hours to VTE Prophylaxis, Median	13.9	26.4	<0.001
Timely VTE Prophylaxis, %	79.6	73.8	<0.001

Data analysis

- Logistic regression
- Outcome: VTE event
- Covariates (Risk Adjusters): Age/Sex/Race, ISS, AIS, Pulse, GCS-Motor, BP, Mechanism, Comorbidities

Variable	Odds Ratio (95% CI)	<i>p</i> -value
LMWH	0.7 (0.50-0.92)	0.01
Male	1.4 (1.06-1.75)	0.02
Age		
16 - 25, years	1.0	--
26 - 45	1.5 (1.06-2.21)	0.03
46 - 65	2.3 (1.56-3.24)	<0.001
66 - 75	3.3 (2.06-5.23)	<0.001
> 75	2.5 (1.48-4.19)	0.001
Race		
White	1.0	--
Black	0.9 (0.62-1.34)	0.6
Other	0.8 (0.51-1.42)	0.5
Private Insurance	1.1 (0.85-1.39)	0.5
Injury Severity Score		
5 - 15	1.0	--
16 - 24	2.0 (1.46-2.70)	<0.001
25 - 35	2.7 (1.82-4.06)	<0.001
> 35	5.3 (3.13-8.91)	<0.001
AIS Head/Neck > 2	1.1 (0.78-1.47)	0.7
AIS Face > 2	1.0 (0.44-2.09)	0.9
AIS Chest > 2	0.9 (0.70-1.17)	0.5
AIS Abdomen	1.2 (0.83-1.61)	0.4
AIS Extremity	1.6 (1.21-1.99)	<0.001

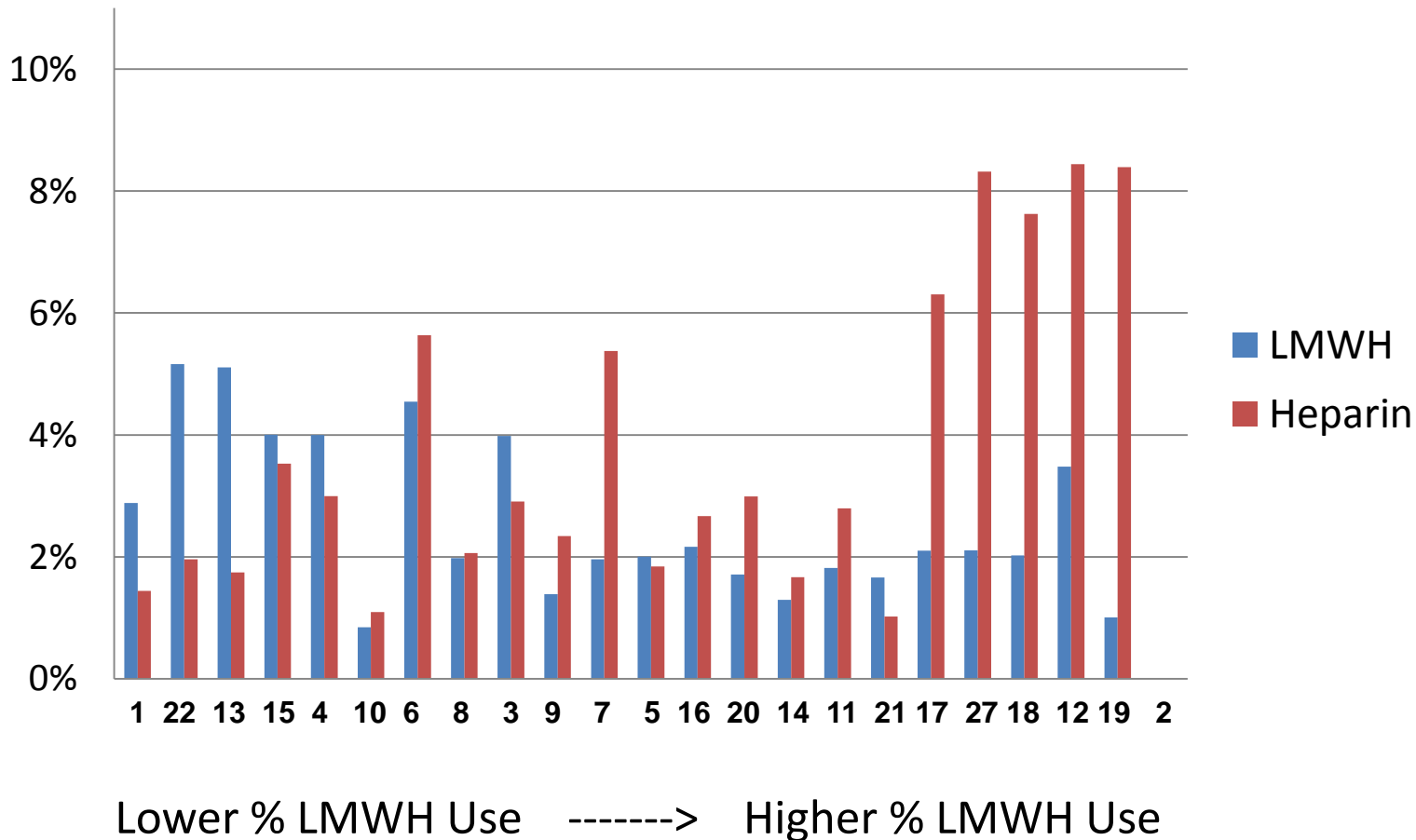
Variable	Odds Ratio (95% CI)	<i>p</i> -value
ED GCS Motor		
6	1.0	--
5 - 2	1.4 (1.04-2.02)	0.03
1	1.4 (0.95-1.95)	0.1
Blunt Mechanism	0.6 (0.44-0.90)	0.01
Fall	1.0 (0.74-1.33)	0.9
ED Systolic Blood Pressure, mmHg		
> 90	1.0	--
61 - 90	1.5 (1.00-2.17)	0.05
≤ 60	3.0 (1.41-6.49)	0.004
ED Heart Rate, bpm		
51 - 120	1.0	--
> 120	1.9 (1.38-2.48)	<0.001
1 - 50	1.0 (0.37-2.49)	0.9
Intubated	3.1 (2.16-4.33)	<0.001
Timely VTE Prophylaxis	0.4 (0.34-0.57)	<0.001
Smoking	0.8 (0.58-0.98)	0.03
Obesity	1.2 (0.94-1.64)	0.1
Acquired Coagulopathy	1.4 (0.52-3.58)	0.5
Hypertension	0.88 (0.67-1.15)	0.3
Transfer	1.1 (0.82-1.46)	0.5

More analyses

- Outcomes:
 - VTE event, plus split out into PE, DVT
 - Mortality
- Also included hospital-specific effects
- Also stratified by ISS category

Outcome	N	OR for LMWH	95% CI	p-value
VTE Event, w/o Hospital Effect	18,010	0.65	0.52-0.81	<0.001
VTE Event, with Hospital Effect	17,895	0.67	0.50-0.92	0.01
VTE Event by ISS categories				
5-15	13,241	0.51	0.30-0.87	0.01
16-24	2,945	0.45	0.15-0.81	0.008
≥ 25	1,570	1.12	0.66-1.89	0.7
PE, w/o Hospital Effect	18,010	0.52	0.35-0.78	0.002
PE, with Hospital Effect	17,895	0.42	0.23-0.77	0.005
PE by ISS categories				
5-15	11,749	0.24	0.09-0.62	0.003
16-24	1,999	0.46	0.14-1.54	0.2
≥ 25	1,228	0.73	0.22-2.47	0.6
DVT, w/o Hospital Effect	18,010	0.70	0.54-0.90	0.005
DVT, with Hospital Effect	17,895	0.78	0.56-1.08	0.14
DVT by ISS categories				
5-15	12,869	0.61	0.33-1.13	0.11
16-24	2,945	0.49	0.26-0.92	0.03
≥ 25	1,560	1.31	0.76-2.30	0.3
Mortality, w/o Hospital Effect	18,010	0.64	0.50-0.83	0.001
Mortality, with Hospital Effect	18,010	0.57	0.41-0.79	0.001
Mortality by ISS categories				
5-15	13,328	0.61	0.38-0.97	0.04
16-24	2,820	0.67	0.29-1.54	0.3
≥ 25	1,611	0.50	0.26-0.94	0.03

Hospital-level analysis: Risk-Adjusted VTE event rates for LMWH vs heparin patients



Conclusions

- Overall, protective effects of LMWH
 - For VTE event and mortality
 - Tends to be more noticeable in lower ISS patients
- Also seems to be ‘hospital effect’
 - In most hospitals, VTE event rates better for LMWH vs heparin – except those hospitals that use mostly heparin.