

Timing of VTE Prophylaxis

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Association of Timing of Initiation of Pharmacologic Venous Thromboembolism Prophylaxis with Outcomes in Trauma Patients

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Background

No
Prophylaxis



~60% patients developed VTE after major trauma **without** the use of prophylaxis

Timing of
Initiation?

3x



4
DAYS

~3x ↑ risk of VTE when
initiation delayed **>4 days**

Bleed

Clot

Lack of robust studies comparing
timing of VTE prophylaxis initiation
and VTE rate

1. Geerts WH et al. NEJM. 1994
2. Nathens AB. J Trauma Acute Care Surg. 2007

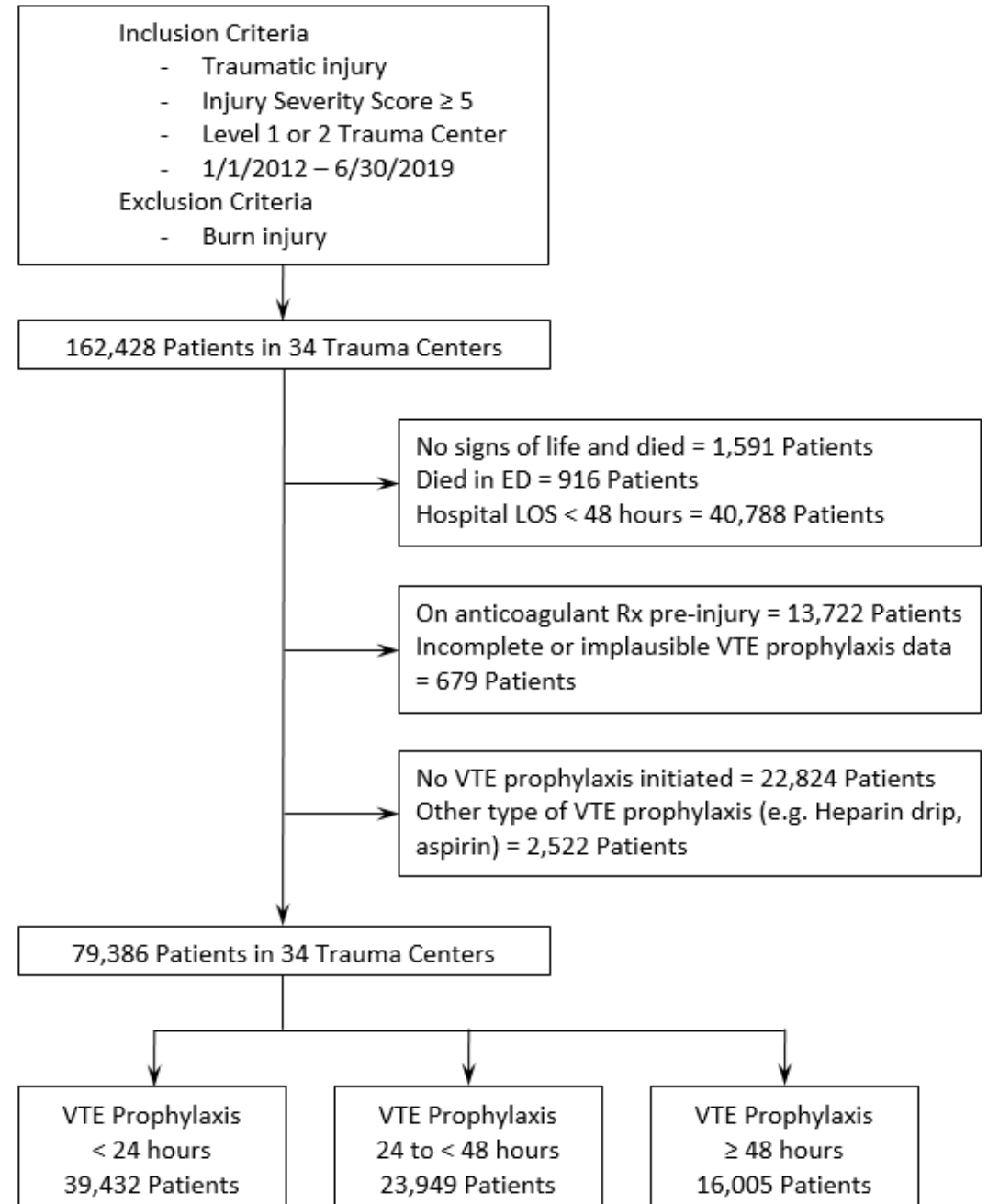
Study Cohort

◆ MTQIP Data

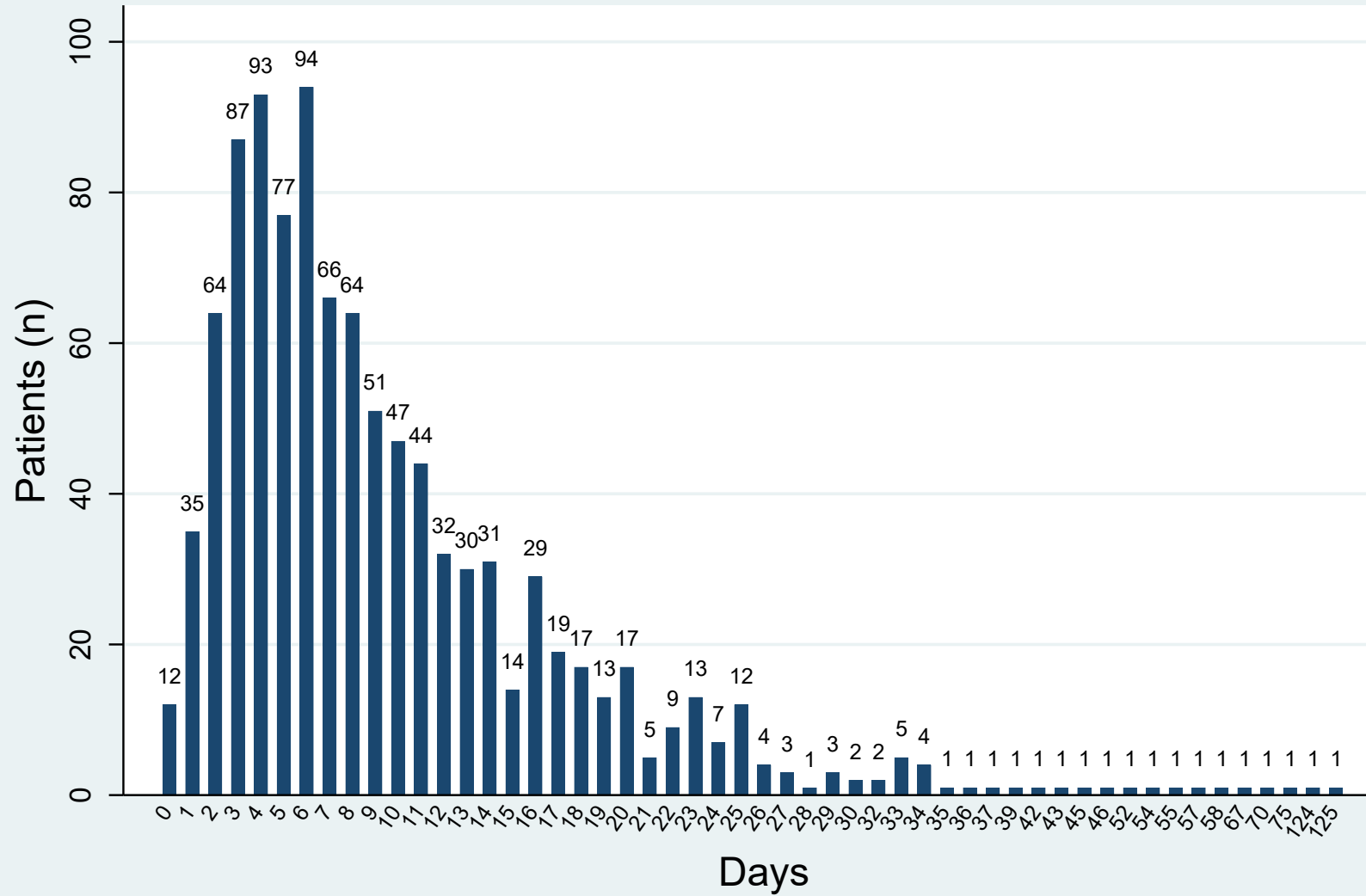
- 1/2012 to 6/30/2019
- Date of entry into MTQIP

◆ Groups

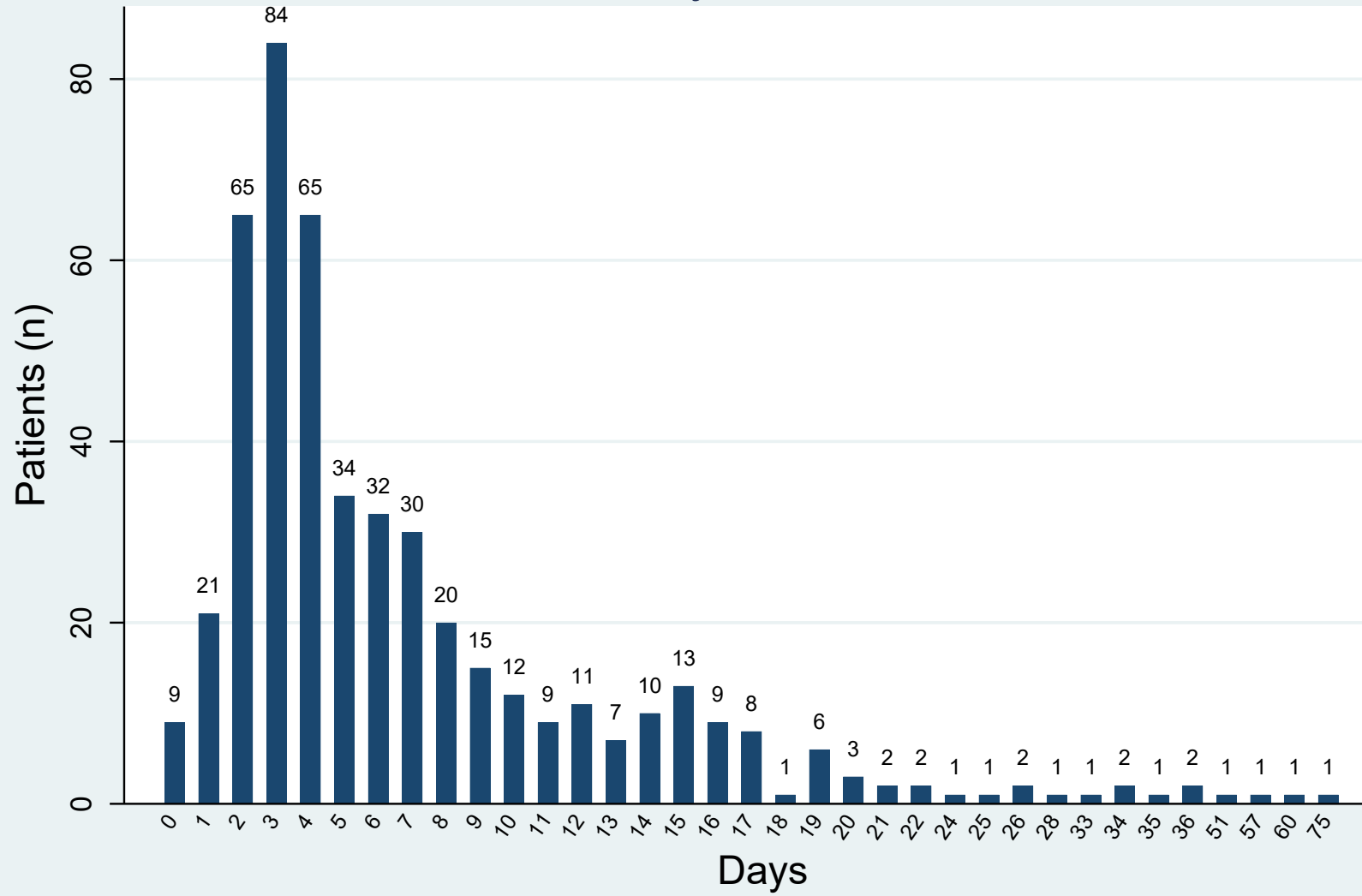
- VTE Pro < 24 hrs
- VTE Pro 24 to < 48 hrs
- VTE Pro \geq 48 hrs



Days to DVT



Days to PE



Analysis

- ◆ Differences in characteristics
 - ISS, AIS, Physiology, Comorbid
- ◆ Outcomes
 - VTE, PE, DVT
 - Mortality
- ◆ Adjustment
 - Logistic Regression
 - Sensitivity analysis
 - ◆ Exclude pts getting PRBC in first 4 hrs
 - ◆ Exclude PRBC and/or TBI
 - ◆ Propensity score

Patient Characteristic	Timing of VTE Prophylaxis Initiation			p-value
	0 to < 24 hrs	24 to < 48 hrs	≥ 48 hrs	
Patients, N	39,432	23,949	16,005	
Age, mean (SD)	61.7 (22.6)	63.5 (22.4)	58.2 (22.4)	<0.001
Age, %				
16-25y	8.4	7.7	10.6	<0.001
26-45y	16.7	15.1	19.1	
46-65y	26.7	24.7	28.7	
66-75y	13.7	14.5	13.6	
>75y	34.5	38.0	28.0	
Male, %	51.1	47.7	58.5	<0.001
Race, %				
White	77.0	81.6	77.9	<0.001
Black	19.6	14.7	18.0	
Other	3.4	3.7	4.1	
Mechanism, %				
Blunt	92.3	94.7	93.6	<0.001
Penetrating	7.7	5.3	6.4	
Injury Severity Score, %				
5-15	87.8	83.3	56.8	<0.001
16-24	9.3	11.4	22.7	
25-35	2.3	4.3	15.9	
>35	0.4	1.0	4.6	
AIS Head/neck>2, %	6.6	11.9	37.7	<0.001
AIS Chest>2, %	20.2	14.9	24.7	<0.001
AIS Abdomen>2, %	4.9	4.9	10.5	<0.001
AIS Extremity>2, %	41.7	55.5	33.7	<0.001
ED Heart Rate, %				
51-120, bpm	91.6	91.7	88.1	<0.001
> 120	4.3	4.0	8.0	
0-50	0.8	0.9	1.2	
Missing	3.3	3.4	2.7	
ED Systolic Blood Pressure, %				
> 90, mmHg	94.0	94.3	92.1	<0.001
61-90	2.0	1.9	4.3	
≤ 60	0.3	0.2	0.5	
Missing	3.7	3.6	3.1	
Glasgow Coma Scale Motor, %				
6	87.1	85.0	74.2	<0.001
5-2	2.8	3.4	10.5	

Unadjusted

Outcome	Timing of VTE Prophylaxis Initiation			<i>p</i> -value
	0 to < 24 hrs from Admission	24 to < 48 hrs from Admission	≥ 48 hrs from Admission	
Patients, N	39,432	23,949	16,005	--
Mortality, % (N)	1.34 (528)	1.33 (319)	3.69 (590)	<0.001
Venous Thromboembolism, % (N)	1.07 (420)	1.42 (339)	4.60 (736)	<0.001
Pulmonary Embolism, % (N)	0.42 (167)	0.57 (136)	1.37 (220)	<0.001
Deep Venous Thrombosis, % (N)	0.72 (284)	0.93 (223)	3.66 (585)	<0.001

Adjusted – Characteristics, Timing, Type

Outcome	Timing of VTE Prophylaxis Initiation					
	0 to < 24 hrs from Admission		24 to < 48 hrs from Admission		≥ 48 hrs from Admission	
	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value
Venous Thromboembolism	Reference	--	1.26 (1.09-1.47)	0.002	2.34 (2.04-2.70)	<0.001
Mortality	Reference	--	0.87 (0.75-1.01)	0.07	1.16 (1.00-1.35)	0.049
Incisional Surgical Site Infection	Reference	--	0.95 (0.73-1.24)	0.7	1.23 (0.95-1.61)	0.1
Organ/Space Surgical Site Infection	Reference	--	1.07 (0.73-1.57)	0.7	1.27 (0.88-1.83)	0.2
Unplanned Visit to the Operating Room	Reference	--	0.91 (0.73-1.14)	0.4	1.44 (1.17-1.77)	0.001

Complications investigated as potential proxies for bleeding

Adjusted – Exclude 6,062 pts getting PRBC

Outcome	Timing of VTE Prophylaxis Initiation					
	0 to < 24 hrs from Admission		24 to < 48 hrs from Admission		≥ 48 hrs from Admission	
	N = 37,299		N = 22,354		N = 13,671	
	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value
Venous Thromboembolism	Reference	--	1.26 (1.06-1.49)	0.008	2.54 (2.15-2.99)	<0.001
Mortality	Reference	--	0.82 (0.70-0.97)	0.018	1.13 (0.96-1.34)	0.15
Incisional Surgical Site Infection	Reference	--	0.91 (0.65-1.27)	0.56	1.12 (0.78-1.60)	0.54
Organ/Space Surgical Site Infection	Reference	--	0.90 (0.53-1.52)	0.68	0.95 (0.55-1.62)	0.84
Unplanned Visit to the Operating Room	Reference	--	0.86 (0.66-1.14)	0.30	1.35 (1.04-1.77)	0.026

Adjusted – Exclude 14,359 pts getting PRBC or with TBI

Outcome	Timing of VTE Prophylaxis Initiation					
	0 to < 24 hrs from Admission		24 to < 48 hrs from Admission		≥ 48 hrs from Admission	
	N = 36,277		N = 20,077		N = 8,673	
	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value	OR (95% CI)	<i>p</i> -value
Venous Thromboembolism	Reference	--	1.27 (1.05-1.52)	0.01	2.41 (1.99-2.92)	<0.001
Mortality	Reference	--	0.87 (0.72-1.05)	0.14	1.40 (1.15-1.70)	0.001
Incisional Surgical Site Infection	Reference	--	1.01 (0.72-1.43)	0.94	1.18 (0.79-1.76)	0.82
Organ/Space Surgical Site Infection	Reference	--	0.83 (0.48-1.44)	0.51	0.82 (0.44-1.52)	0.53
Unplanned Visit to the Operating Room	Reference	--	0.93 (0.69-1.25)	0.63	1.06 (0.75-1.48)	0.75

Propensity Score Match

- ◆ Groups
 - VTE Pro 0 to <48 hrs
 - VTE Pro \geq 48 hrs
- ◆ Patients
 - 15,510 pts in each group
 - Evenly matched
- ◆ Outcomes (early vs. late)
 - VTE, 2.0 vs. 3.9% ($p < 0.001$)
 - Mortality, 2.4 vs. 2.8% ($p = 0.037$)

Summary

- ◆ Initiation of pharmacologic VTE prophylaxis < 48 hours, and preferentially < 24 hours, after admission in trauma patients is associated with improved outcomes.
- ◆ The rates of VTE episodes were lower and mortality was not higher.
- ◆ Complications that are potential proxies for bleeding or hematoma formation were also found to not be higher among the group receiving pharmacologic VTE prophylaxis < 48 hours after admission.

Conclusion

When possible, initiation of prophylaxis within the first 24-48 hours after admission likely represents the optimal timing to maximally reduce VTE risk.