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Venous Thromboembolism Risk Stratification via Electronic Medical Record Classification

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Background

- Hospital acquired venous thromboembolism (HA-VTE) is associated with significant morbidity and mortality.
- VTE prevention strategies include increasing mobility, optimizing the use of sequential compression devices (SCD), and prophylactic anticoagulation.
- Appropriate application of preventive strategies requires accurate and timely risk stratification.

Objective

- To identify and stratify pediatric inpatients at risk for HA-VTE and offer recommendations for intervention.

Methods

- Operational definitions were developed to identify components for each risk factor. All components were generated from the electronic medical record (EMR) and include power plans, current and past diagnosis codes, patient locations, history, problem lists, procedures, consults, and various pieces of EMR documentation (Table 1).
- The sum of risk factors and patient mobility create a risk level for each patient:
    - Low risk = 0 risk factors
    - Moderate risk = 1+ risk factors OR altered mobility with 0 – 1 risk factors
    - High risk = altered mobility and 2+ risk factors.
- The presence of active SCD orders and/or active anticoagulation orders is also included on the risk stratification.
- Pharmacists review the risk stratification (Table 2) daily and engage in discussions with medical teams to communicate risk and make recommendations for prophylaxis for patients as appropriate.
- Multiple PDSA cycles were conducted to develop, implement, and spread the risk stratification.

Risk Stratification and Components

Table 1

Risk Factor	Components
Mobility Status	Altered or baseline per nursing documentation
Active Cancer/Malignancy	Active at the time of current visit (119 problem list codes)
Burn	One or more power plans: Burn - Difficult to Resuscitate, PICU Burn Admission EKM, General Surgery Floor Burn Admission EKM, General Surgery Post Op Burn Graft EKM, General Surgery/Burn Same Day Surgery
Critically Ill	Currently admitted to PICU or NICU
Cyanotic Heart Disease/Low Flow State	Diagnoses: Ebstein's Anomaly, HLHS, Double Inlet Ventricle, Discordant AC Connection, Pulmonary Atresia, Pulmonary Valve Stenosis, Tricuspid Stenosis, Tetrology of Fallot, Double Outlet Right Ventricle, Total Anomalous Pulmonary Venous Connection, Discordant Ventricular Connection, Common Arterial Trunk, Eisenmenger's Syndrome, Congestive Heart Failure, Cardiomyopathy Surgical Procedures: Pulmonary Artery Band, Norwood Palliation, Blalock-Taussig Shunt, Glenn, Fontan
Estrogen Therapy	Taken within the last 14 days
Family History of Thrombosis	Documented family history of thrombosis
Patient History of Thrombosis	Personal history (107 SNOMED codes)
Obesity	Patients 0-18 years: BMI > 95th percentile Patients 18+ years: BMI > 30
Patient 12 years or older	Age at time of report is ≥ 12 years
Protein losing disorder	Nephrotic Syndrome, Protein-Losing Enteropathy, Draining Chylous Effusion
Severe dehydration	Dehydration, Dehydration of Newborn, Hyperosmolality and Hypernatremia, Hyperemesis Gravidarum with Metabolic Disturbance
Surgery in the last 30 days	Presence of a surgery start time in the previous 30 days
Trauma	Presence of a Consult to Trauma or a Trauma Admission Notification
Thrombophilia	Documented history of Thrombophilia in lifetime (27 SNOMED codes)

Table 2

MRN	Nurse Unit/Room #	Med Service	Patient Name	Sum of Risk Factors	VTE Risk	Age	Mobility Status	Active SCD?	Active Anticoagulant?	Acitve Cancer/ Maligancy?	Burn Power Plan?	Currently In ICU?	Cyanotic Heart Disease Dx?	Estrogen <= 14 Days Ago?	Fam History of Thrombosis?	History of Thrombosis?	Obesity ?	Patient 12y or Older?	Protein Losing Disorder Dx?	Severe Dehydration?	Surgery in Last 30 Days?	Trauma Admission?	Thrombophilia?
		Intensive Care, Pediatrics		2		1	Altered					1								1			
		General Pediatrics - Red		1		8	Altered													1			
		Orthopedic Surgery		1		17		Yes										1					
		Neonatal - Yellow		1		0	Baseline					1											
		Neonatal - Green		2		0	Altered					1									1		
		Hem/Onc-Resident		1		13	Baseline	Yes										1					
		Neonatal - Pink		1		0	Altered					1											
		Gastroenterology, Pediatrics - Gold		1		1	Baseline													1			
		Hem/Onc-Resident		2		14	Altered	Yes										1		1			
		General Pediatrics - Silver		2		7	Altered	Yes									1					1	
		Intensive Care, Pediatrics		3		8	Altered					1				1				1			
		General Surgery, Pediatrics		3		17	Baseline	Yes										1		1	1		
		Intensive Care, Pediatrics		2		5	Altered					1								1			
		Neonatal - Green		1		0	Altered					1											
		Intensive Care, Pediatrics		3		14	Baseline	Yes				1						1		1			
		General Pediatrics - Purple				2	Altered																

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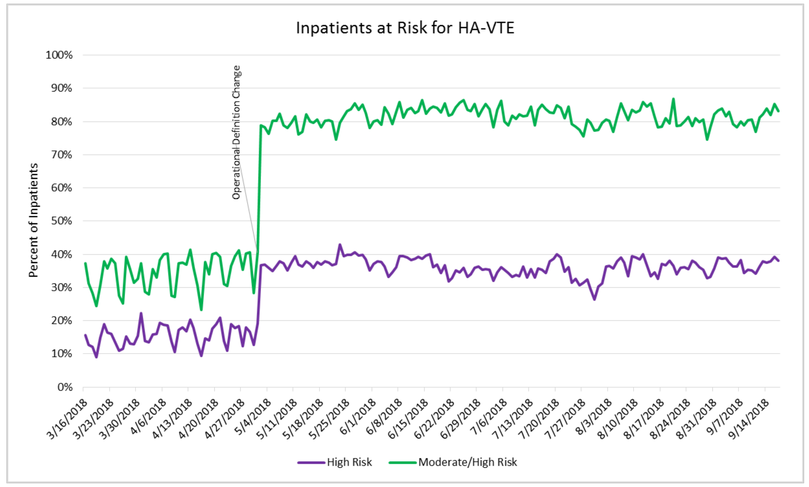
Results

- The risk stratification process has been active for six months.
- 80% of inpatients meet criteria for either moderate or high risk for VTE.
- 37% of inpatients meet criteria for high risk for VTE.
- Select Pharmacists and medical teams are involved as expansion to teams has been executed using a tiered approach.
- Pharmacists report that providers are receptive to discussions and recommendations.
- Evaluation of the process had identified additional data collection and process expansion opportunities.



Conclusions

- Pediatric providers may be unaware of the risk of HA-VTE.
- An electronic medical record based tool identifies at-risk patients and provides opportunity to recommend appropriate preventive measures.
- A multi-disciplinary approach leverages expertise of all team members.
- A multi-faceted approach is beneficial to increase awareness of HA-VTE in pediatrics.

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