



# Using Specific COVID-19 Targets and Patient Care Settings as a Springboard for Driving Global Improvements in the Learning Health System Cycle for COVID-19 and Beyond

Session S60

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# ACTS and University of Minnesota

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# Disclosure

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No conflicts of interest

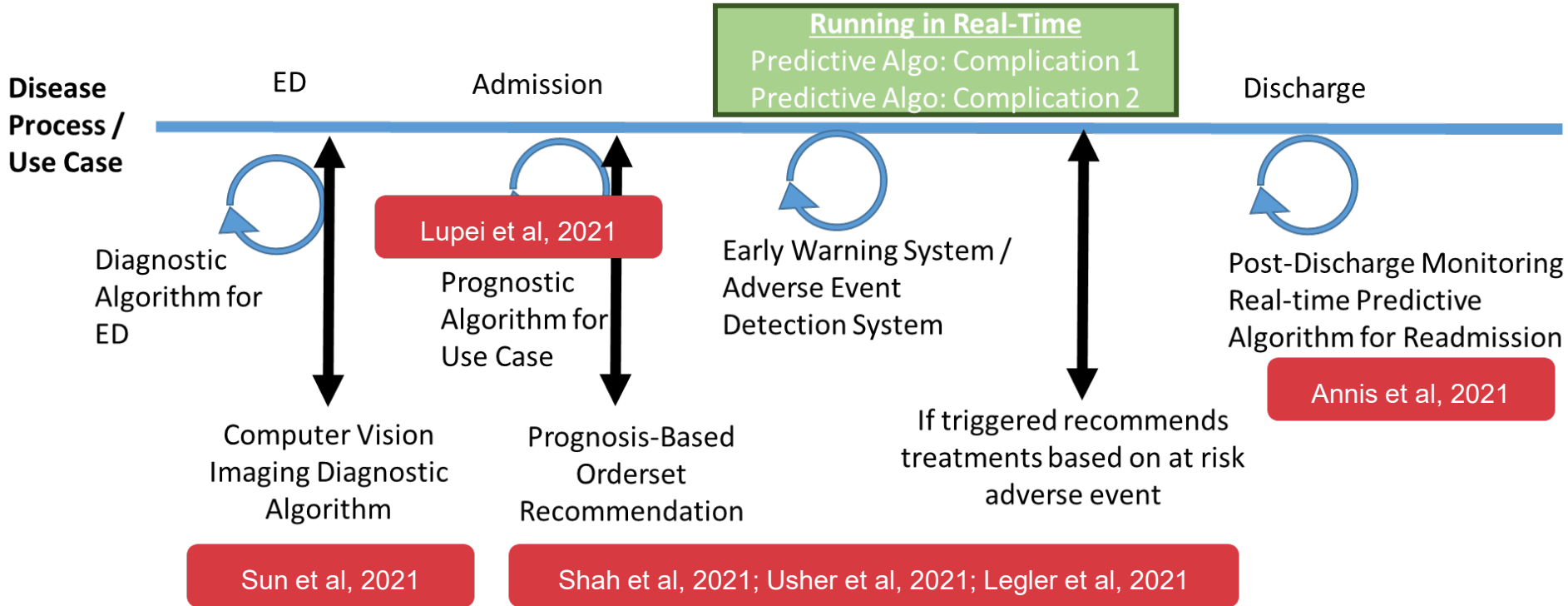
## How did I become involved:

- CDC's Adapting Clinical Guidelines for the Digital Age Initiative made the connection for us and ACTS in March 2020
- Internally working to develop infrastructure and protocols to support COVID-19 evidence synthesis, treatment guidelines, patient triage, decision support, database and infrastructure, and research

## ACTS:

- Cross-fertilize and accelerate institution, industry and federal efforts in COVID-19
- Made and strengthen the connection between UMN's clinical quality improvement CDS efforts and UMN's AHRQ-funded Evidence-Based Practice Center

# LHS Case Study – UMN COVID-19



**CCA-ACC 新冠肺炎交流会议** 18 MARCH  
**CCA-ACC COMMUNICATION CONFERENCE OF COVID-19** 2020

## Abnormal coagulation is common in severe COVID-19

**D-Dimer > 1ug/ml was independent risk factor of in-hospital death**

Day	Survivors (µg/L)	Non-survivors (µg/L)
4	0.3	1.5
7	0.5	2.6
10	0.6	14.4
13	0.6	16.7
16	0.7	23.8
19	1.0	35.6
22	0.5	42.2



- Significantly increased D-dimer and FDP were associated with poor prognosis
- Vascular endothelium inflammation Extensive intravascular microthrombosis on autopsy
- Vascular endothelial cells express high levels of ACE2

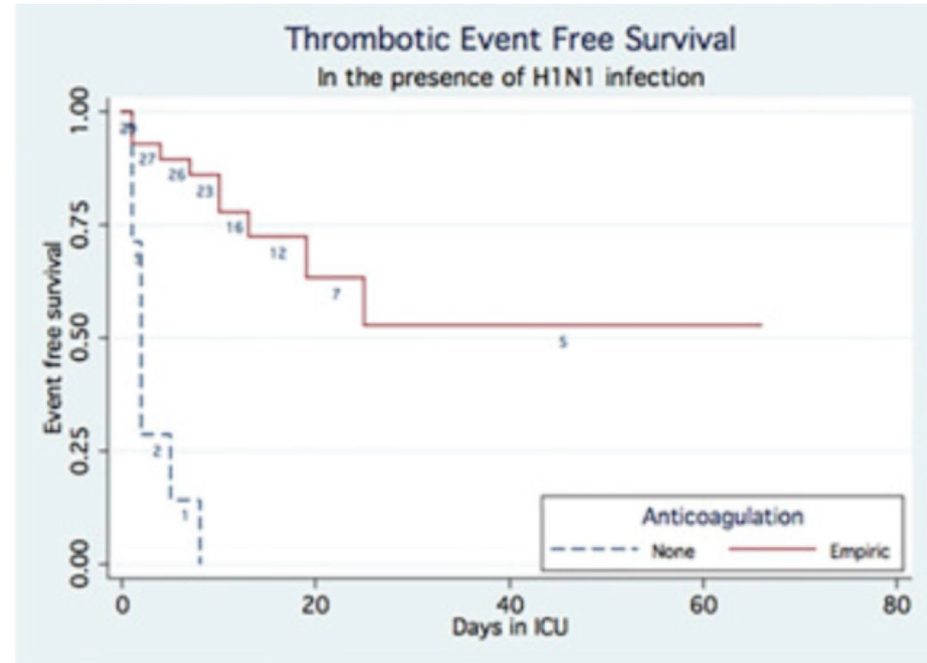
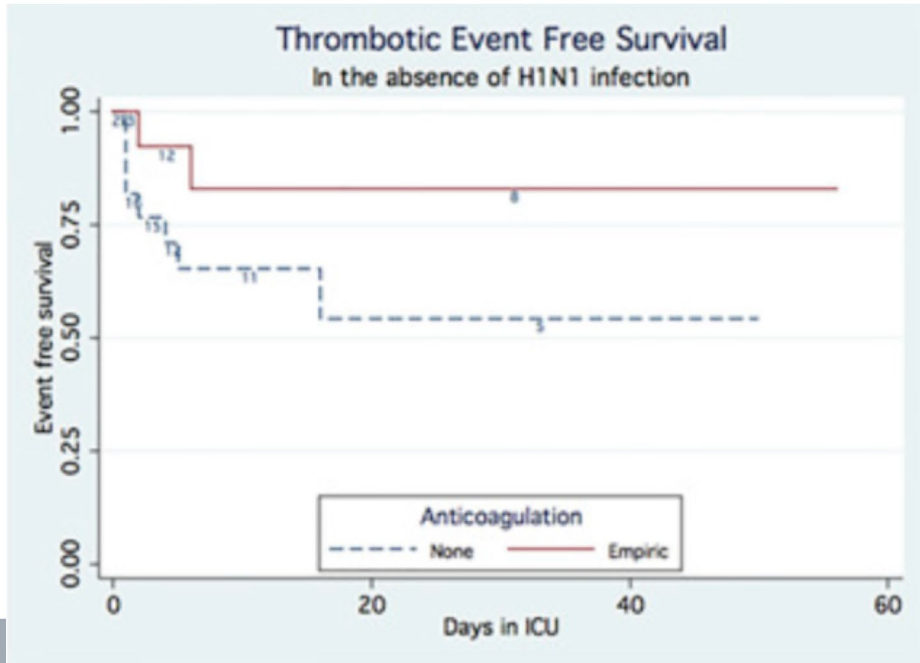
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**Anticoagulation therapy should be initiated for severe COVID-19 patients if otherwise contraindicated.**

Zhou F, et al. Lancet 2020; DOI:10.1016/S0140-6736(20)30566-3; Hamming I, et al. J Pathol 2004; 203(2): 631-7. 16

# Empirical systemic anticoagulation is associated with decreased venous thromboembolism in critically ill influenza A H1N1 acute respiratory distress syndrome patients

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## M Health Fairview COVID-19 Anticoagulation Pharmacy Guide for

NON-Pregnant ADULTS ( $\geq 18$  years old) with COVID-19

(Modified from the UNC Chapel Hill Protocol) Revision Date: 7/14/20

UMMC - Non-Malignant Hematology Section, Division of Hematology, Oncology, and Transplantation

### Highly suspected or confirmed ADULT, NON-Pregnant\*\*\* COVID-19+ patient

\*\*\*Please consult OB provider for pregnant/breastfeeding women who are COVID-19 positive ([Pregnancy OB Admission Recommendations during COVID-19](#))

**Labs on admission:** D-dimer, reticulocyte count, PT/INR, aPTT, fibrinogen, Antithrombin, ferritin, LDH, CMP and CBC with diff

Daily Labs: D-dimer, reticulocyte count, PT/INR, aPTT, fibrinogen, CBC with diff

#### VTE prophylaxis for ALL hospitalized highly-suspected or confirmed COVID-19+ patients

D-dimer  $< 10 \times$  ULN<sup>#</sup> and  
NO other Risk Factors<sup>5</sup>

eGFR\*  $\geq 30$  mL/min

- BMI  $> 40$  kg/m<sup>2</sup>: Enoxaparin 40 mg SQ BID\*\*
- BMI 18-40 kg/m<sup>2</sup>: Enoxaparin 40 mg SQ Q24 Hrs
- BMI  $< 18$  kg/m<sup>2</sup>: Enoxaparin 30 mg SQ Q24 Hrs
- Enoxaparin anti-Xa goal = 0.3-0.5. Testing only recommended if concern for under or over-treatment.

eGFR\*  $< 30$  mL/min

Heparin 5,000 units SQ q8 Hrs

If pharmacologic prophylaxis contraindicated (active bleeding, PLT  $< 30,000$ ): Apply SCDs

D-dimer  $\geq 10 \times$  ULN<sup>#</sup> AND/OR  
in the ICU, active cancer OR history of VTE

eGFR\*  $\geq 30$  mL/min

- Enoxaparin 0.5 mg/kg BID\*\* (Max dose = 90 mg)
- Check Enoxaparin anti-Xa on any dose  $> 80$  mg.
- Target Enoxaparin anti-Xa (4 hrs after 4<sup>th</sup> dose) = 0.4-0.7

eGFR\*  $< 30$  mL/min

- HealthEast: Heparin LOW Intensity Protocol  
HE Heparin-Xa goal = 0.25-0.6
- Fairview: COVID Heparin Protocol  
FV Heparin-Xa goal = 0.25-0.5

If pharmacologic prophylaxis contraindicated (active bleeding, PLT  $< 30,000$ ): Apply SCDs

#### Post-hospitalization VTE prophylaxis

Discharging provider to weigh risk vs benefits of anticoagulation at the time of discharge.

- Consider one of the following for 30 days and until the patient is mobile:
  - Apixaban (Eliquis) 2.5 mg BID
  - Rivaroxaban (Xarelto) 10 mg once daily
- All patients to be educated about the symptoms of DVT (swelling, pain, redness, warmth) and PE (SOB, CP, tachycardia, cough/hemoptysis).

#### Therapeutic anticoagulation

##### On therapeutic anticoagulation prior to admission

- Continue PTA anticoagulation if no contraindications

##### Highly-suspected or confirmed VTE

eGFR\*  $\geq 30$  mL/min

Enoxaparin 1 mg/kg SQ BID\*\* (Max dose = 190 mg)

Check Enoxaparin anti-Xa on any dose  $> 140$  mg.

Target Enoxaparin-Xa (4 hrs after 4<sup>th</sup> dose) = 0.6-1.

eGFR\*  $< 30$  mL/min

IV UFH HIGH-intensity protocol

Heparin-Xa goal = 0.3-0.7

#### Post-hospitalization VTE management:

- Follow standard for full anticoagulation treatment



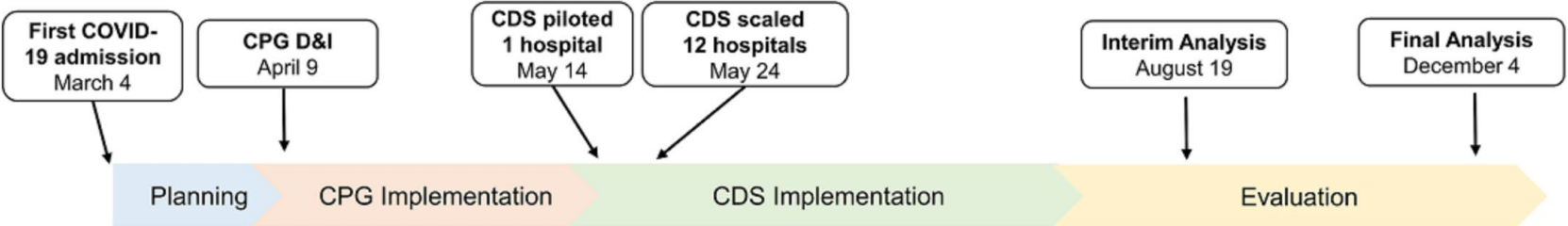
# LHS Case Study – UMN COVID-19



## Computable Publishing: Recommendations Table Viewer

(Anticoagulation for COVID-19 - Recommendations Summary Browser Demo from ACTS COVID-19 Collaborative)

For COVID Patients In:	Critical Care	Hospitalized (not critical)
<b>ASH Recommends:</b>	<a href="#">Suggests using prophylactic-intensity anticoagulation</a> Strength: conditional recommendation Last review date: 2021-04-07	<a href="#">Prophylactic-intensity over DOACs, LMWH, UFH, Fondaparinux, Argatroban, or Bivalirudin at intermediate-intensity or therapeutic-intensity</a> Strength: weak Last review date: 2020-10-26
<b>NIH Recommends:</b>	<a href="#">Provide prophylactic dose anticoagulation</a> Strength: AllI Last review date: 2021-02-11	<a href="#">Provide prophylactic dose anticoagulation</a> Strength: AllI Last review date: 2021-02-11
<b>WHO Recommends:</b>	<a href="#">Anticoagulation at prophylactic intensity</a> Strength: weak Last review date: 2021-01-25	<a href="#">Anticoagulation at prophylactic intensity</a> Strength: weak Last review date: 2021-01-25
<b>Australian Guidelines Recommends:</b>	<a href="#">Use prophylactic doses of anticoagulants, preferably low molecular weight heparin (LMWH)</a> Strength: Conditional recommendation Last review date: 2021-07-14	<a href="#">Do not routinely offer therapeutic anticoagulant dosing</a> Strength: weak



Data Infrastructure

Development of COVID-19 Datamart to facilitate rapid D2K, K2P, and P2D research

Dissemination

Dissemination of Anticoagulation CPG

Discipline-specific CDS dissemination strategy for:

- Providers
- Pharmacists

Evaluation

3 Month Interim Analysis: Effectiveness

6 Month: REAIM Evaluation

Monthly reach and CDS adherence monitoring

## Passive COVID-19 Anticoagulation Orderset

HEM Covid-19 Anticoagulation ADULT 

 Manage User Versions

Version: MAY-2020 (3040001975) Content Owner: SL Cancer Care – Benign Hematology

Intended for use ONLY with Covid-19 Positive patient greater than or equal to 18 years of age and non-pregnant females.

### GENERAL

#### Provider Guidance

**ALL patients admitted to hospital should get pharmacologic thromboprophylaxis unless contraindicated. Use mechanical prophylaxis in cases where contraindicated.**

Antiplatelet therapy alone is not felt to be adequate anti-thrombotic prophylaxis in COVID-19 patients.

All ICU COVID-19 Positive patients are recommended for category B or C Intensity Anticoagulation to prevent thrombosis unless contraindication.

IF patient already on therapeutic intensity anticoagulation, select that option below.

Hospitalized patients should be categorized into 3 risk categories

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## Interruptive BPA within Admission Orderset Navigator

ALL ICU COVID-19 Positive patients are recommended for category B Anticoagulation to prevent thrombosis unless contraindication. Go to the anticoagulation orderset and place anticoagulation orders as appropriate. A D-Dimer is recommended to assist with anticoagulation decisions. If the patient has NOT had a recent D-Dimer, order a D-Dimer from the Anticoagulation set. (BPA # )

Last DDIMER, collected/resulted: DD/MM/YYYY = Result value  
 Last CIRCLEARANCE, collected/resulted: DD/MM/YYYY = Result value  
 Last PLT, collected/resulted: DD/MM/YYYY = Result value  
 Last INR, collected/resulted: DD/MM/YYYY = Result value

Open Order Set

Do Not Open

COVID-19 Anticoagulation ADULT [Preview](#)

Acknowledge Reason

Already on appropriate anticoagulation

Anticoagulation Contraindicated

Not provider managing anticoagulation

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Accept

Dismiss

## Interruptive Alert Logic

### Criteria

Linked Criteria

1	CL PLATELETS < 30 [6208]	
2	CL PATIENT HAS BEEN ADMITTED MORE THAN 8 HOURS [6212]	
3	CL ADT STATUS IS ICU [6213]	
4	CL PATIENT IS NOT ON HEPARIN / ARGATROBAN INFUSIONS [6214]	
5	CL COVID INFECTION PRESENT [6355]	
6	IP RX PATIENT ON ENOXAPARIN DOSE GREATER THAN 40 MG CRITERIA [6518]	
7	CL PATIENT HAS COVID-19 RECOVERED STATUS [6628]	

Logic

(5 AND NOT 7) AND NOT 1 AND 2 AND 3 AND 4 AND NOT 6

 Logic Helper

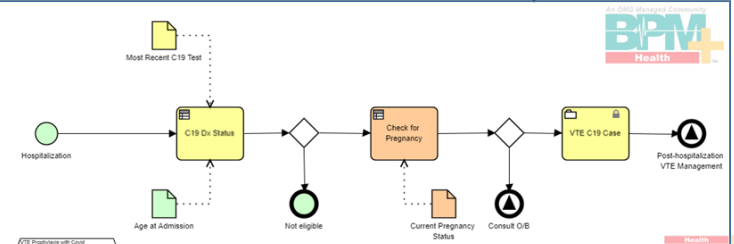
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ACTS facilitated collaborations  
With us and C19 Digital Guidelines  
Workgroup

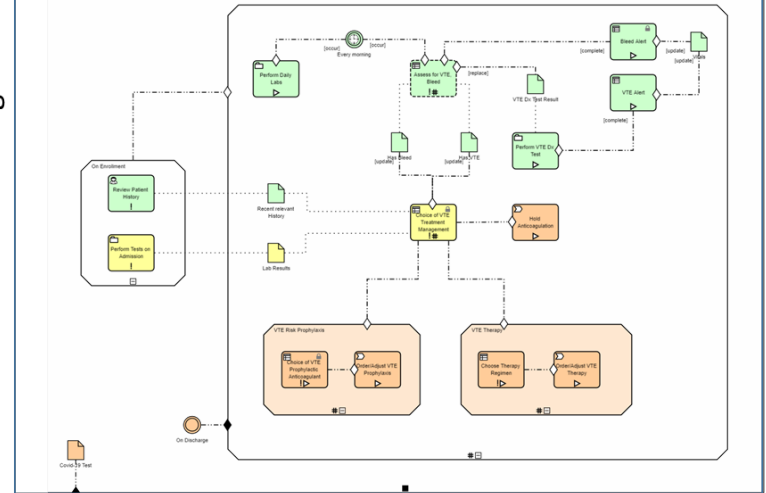
Together we have retooled the  
original native EHR CDS into the  
CPG-on-FHIR standard

### COVID-19 VTE Prevention Guideline Representation

Guideline  
Enrollment



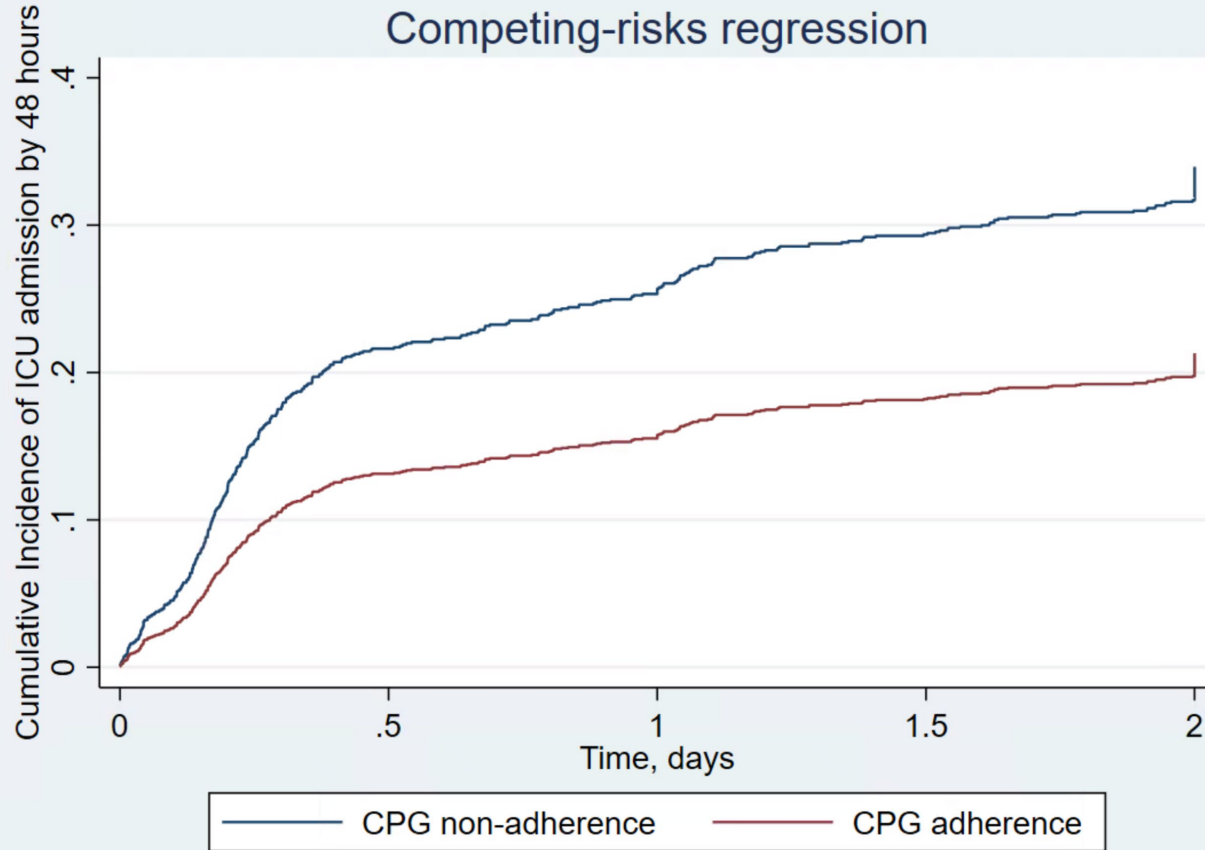
Guideline and Monitoring



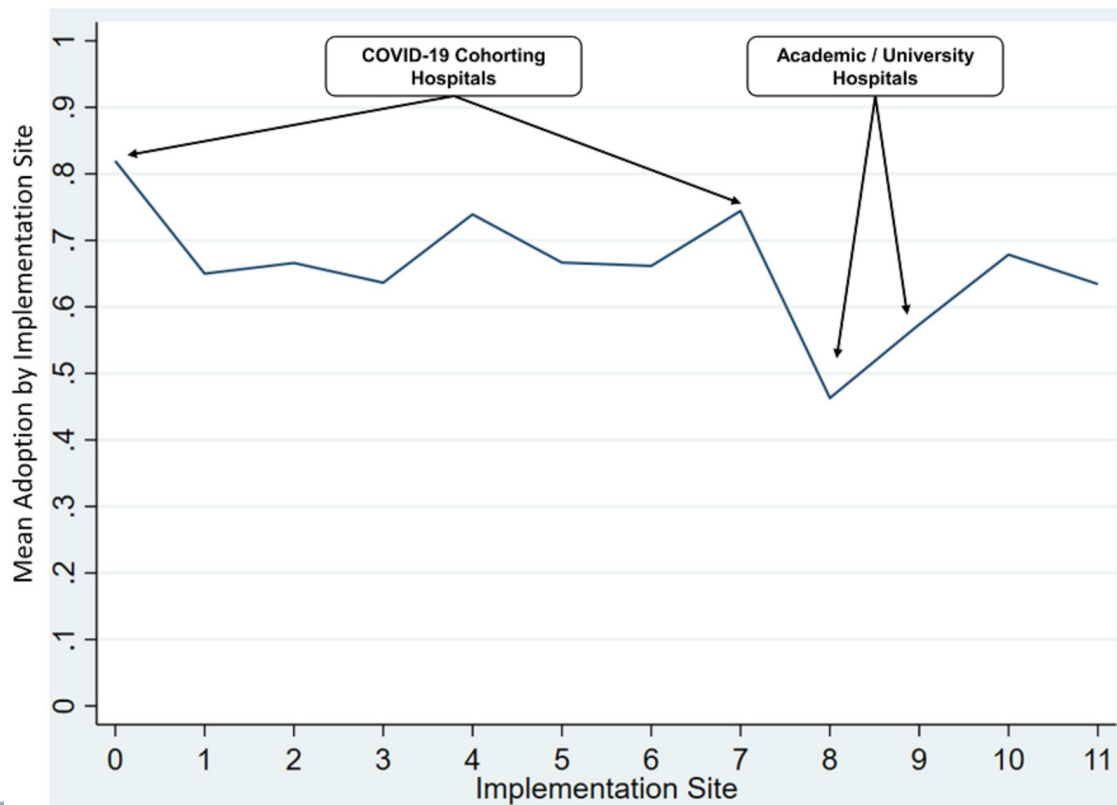
# Implementation of an anticoagulation practice guideline for COVID 19 via a clinical decision support system in a large academic health system and its RE-AIM evaluation

Likelihood of Adherence with CPG via multivariable logistic regression	Odds Ratio for CPG Adherence (vs. non-Adherence)	95% CI	p-value	C-statistic
(n = 2,406)				
ICU Admission within 48 hours	0.39	0.3-0.51	<0.001	0.87
ICU Admission	0.53	0.42-0.69	<0.001	0.87
Required Mechanical Ventilation	1.18	0.79-1.77	0.4	0.93
All-Cause In-Hospital Mortality	0.67	0.48-0.94	0.019	0.88
Composite Outcome	0.75	0.60-0.94	0.013	0.82
VTE Complication	0.87	0.65-1.17	0.4	0.79
Bleeding Complication	0.39	0.21-0.73	0.003	0.83

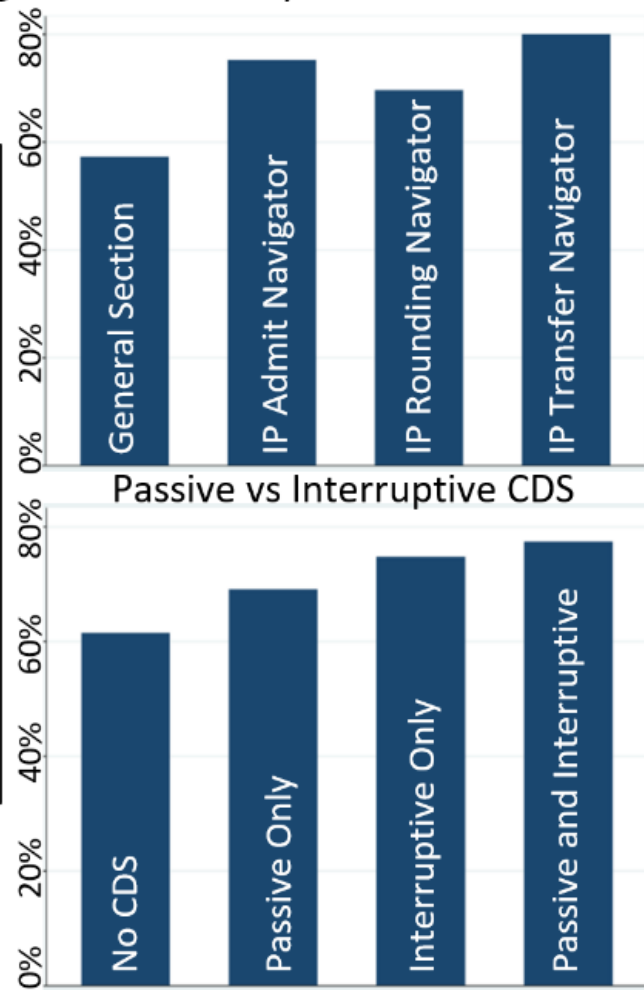
## Competing-risks regression



**Fig. 4.** Adherence by Passive CDS element



**Mean adherence for COVID-19 CDS**



# Next Steps

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- Translating the evidence synthesis process to FEvIR
- Converting CDS from native EHR to interoperable CPG-on-FHIR format
- Identification of additional sites for external implementation
- Scaling to next use cases (trauma, critical care, sepsis, ambulatory)



# Thank you!

