Management of Anticoagulation in the Peri-Procedural Period (MAPPP) App:

Overview, Instructions and Case Studies

May 12, 2017

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Origin of the MAPPP app

- Evidence based clinician's guide developed by the multidisciplinary members of the Peri-Procedural Task Force of the NYS Anticoagulation Coalition and IPRO, the CMS designated Quality Improvement Organization for NYS

- Task Force Lead: Dr. Alex Spyropoulos

- Members: Darren Triller, Jason Gilleylen, Peter Kouides, Carol Patrick, Katherine Cabral, MaryAnne Cronin, Patrick Meek, Anne Myrka, Susan Wymer

Why is Perioperative Anticoagulant Management Relevant?

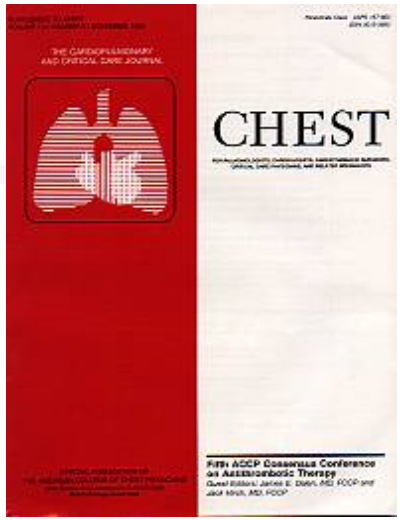
- **Perioperative management of patients on chronic warfarin is common…**
  - **400,000-500,000 patients per year in North America alone**
  - **~1 in 6 to 10 patients receiving long-term warfarin are assessed for periprocedural management annually**
  - **Every NYS Medicare beneficiary undergoes approximately 2 procedures annually requiring anticoagulant interruption**

Douketis J et al *Chest* 2012: 141(2):e326S-e350S
IPRO analysis of Medicare Fee for Service Claims 8/2014 –7/2015

The Perioperative Management of Antithrombotic Therapy*

American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition)

James D. Douketis, MD, FRCP(C); Peter B. Berger, MD, FACP; Andrew S. Dunn, MD, FACP; Amir K. Jaffer, MD; Alex C. Spyropoulos, MD, FACP, FCCP; Richard C. Becker, MD, FACP, FCCP; and Jack Ansell, MD, FACP, FCCP



Chest 2008;133;299-339

REVIEW ARTICLE

Periprocedural management of patients receiving a vitamin K antagonist or a direct oral anticoagulant requiring an elective procedure or surgery

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EXPERT CONSENSUS DECISION PATHWAY

2017 ACC Expert Consensus Decision Pathway for Periprocedural Management of Anticoagulation in Patients With Nonvalvular Atrial Fibrillation

A Report of the American College of Cardiology Clinical Expert Consensus Document Task Force

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Anticoagulant Overview

- **Warfarin**
- **Direct Oral Anticoagulants (DOACs)**
  - **Pradaxa® (dabigatran)**
  - **Xarelto® (rivaroxaban)**
  - **Eliquis® (apixaban)**
  - **Savaysa® (edoxaban)**
- **Common DOAC characteristics**
  - **More consistent effects at fixed doses**
  - **Lack of routine laboratory testing**
  - **Rapid onset of effects (anticoagulation achieved ~2 hrs)**
  - **Rapid loss of activity (e.g. when doses missed)**

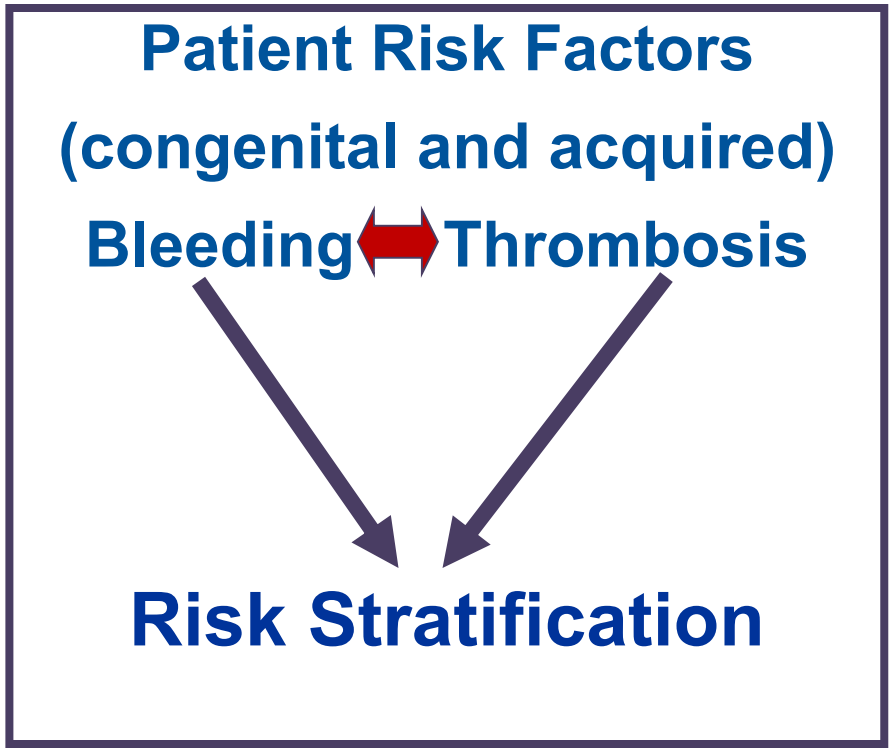
Significance of the MAPPP App

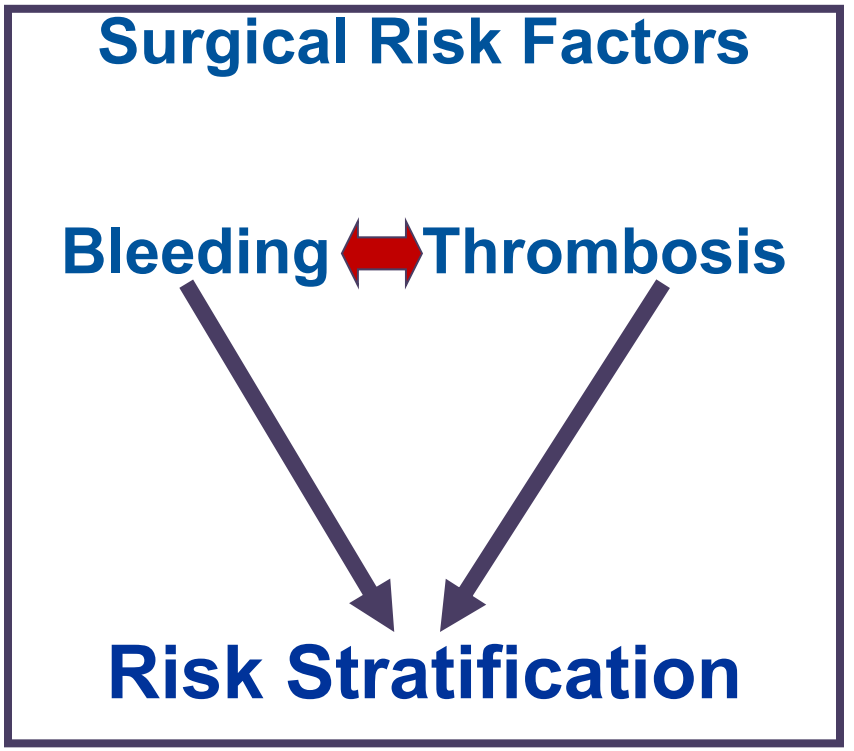
Clinical Decision Support that guides:

- Whether to interrupt anticoagulation for a procedure by balancing:
  - Risk of bleeding from procedure
  - Risk of thrombosis from underlying indication
- Timing for interruption of anticoagulation
- Peri-procedural “bridging” when appropriate
- Clinical monitoring
- Timing and dosing for resumption of anticoagulants

Overview

Perioperative Management of Anticoagulation





Suggested Thromboembolic Risk Stratification when Discontinuing VKAs

Northwell Health®

High

Atrial Fibrillation

- recent (<3 months) stroke/TIA
- CHADS score 5-6
- rheumatic heart disease

Mechanical Heart Valves

- any caged-ball or tilting disc valve in mitral/aortic position
- any mitral valve prosthesis
- Recent (within 6 mos) stroke/TIA

Venous Thromboembolism (VTE)

- VTE within past 3 months
- severe thrombophilia
  - deficiency of protein C, protein S or antithrombin
  - antiphospholipid antibodies
  - multiple thrombophilias

Moderate

Atrial Fibrillation

- CHADS score 3-4

Mechanical Heart Valves

- bileaflet AVR *with* major risk factors

VTE

- VTE within past 3-12 months
- Nonsevere thrombophilia
- Active cancer
- Recurrent VTE

Low

Atrial Fibrillation

- CHADS score 0-2

Mechanical Heart Valves

- bileaflet AVR *without* major risk factors

VTE

- VTE more than 12 months ago

Douketis J et al *Chest* 2008; 133:299 339S

Suggested Procedural Bleed Risk

HIGH BLEEDING RISK PROCEDURES (2 day risk of major bleed ≥ 2%)	LOW BLEEDING RISK PROCEDURES (2 day risk of major bleed <2%)	MINIMAL BLEEDING RISK PROCEDURES
Major surgery with extensive tissue injury	Arthroscopy	Minor dermatologic procedures (excision of basal and squamous cell skin cancers, actinic keratoses, and premalignant or cancerous skin nevi)
Cancer surgery	Cutaneous/lymph node biopsies	Cataract procedures
Major orthopedic surgery	Shoulder/foot/hand surgery	Minor dental procedures (dental extractions, restorations, prosthetics, endodontics), dental cleanings, fillings
Reconstructive plastic surgery	Coronary angiography	Pacemaker or cardioverter-defibrillator device implantation*
Urologic or Gastrointestinal surgery	Gastrointestinal endoscopy +/- biopsy	
Transurethral prostate resection, bladder resection or tumor ablation	Colonoscopy +/- biopsy	
Nephrectomy, kidney biopsy	Abdominal hysterectomy	
Colonic polyp resection	Laparoscopic cholecystectomy	
Bowel resection	Abdominal hernia repair	
Percutaneous endoscopic gastrotomy (PEG) placement, endoscopic retrograde cholangiopancreatography (ERCP)	Hemorrhoidal surgery	
Surgery in highly vascular organs (kidneys, liver, spleen)	Bronchoscopy +/- biopsy	
Cardiac, intracranial, or spinal surgery	Epidural injections with INR <1.2	
Any major operation (procedure duration >45 minutes)		

Minimal Bleed Risk:

Continue OAC

Low Bleed Risk

Allow residual AC effect pre-op

(i.e. 2-3 half lives)

Restart within 24 hrs

High Bleed Risk

No residual AC effect

(i.e. 4-5 half lives)

Restart within 48-72 hrs

Spyropoulos AC et al *J of Thromb Haemost* 2016;14(5):875-85

Consequences of Thromboembolism and Major Bleeding

- **Arterial thromboembolism**
  - 15% case-fatality for heart valve thrombosis
  - 70% rate of death or disability in stroke
- **Venous thromboembolism**
  - 6% rate of death or permanent disability for DVT; 25% rate for PE
- **Major bleeding**
  - 8-9% case-fatality

Martinelli J et al. Circulation 1991; 84(3)
Longstreth JR et al. Neurology 2001: 56:368 75
Douketis JD et al JAMA 1998; 279: 458-62
Linkins L et al Ann Intern Med 2003; 893-900

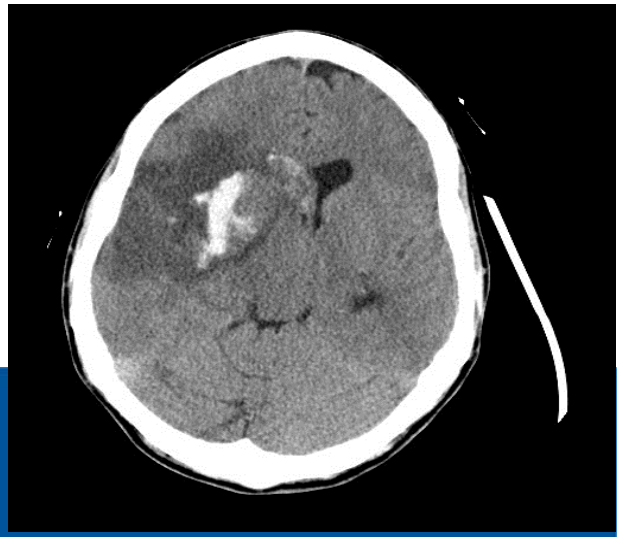
Hypercoagulability Associated with Surgery: Newer Concepts

- **Surgery increases risk of arterial thromboembolism**

  [Wahl 1998]

- **Perioperative arterial thromboembolic and stroke rates (1.6% and 0.6%) 10-fold higher than modeling suggests (~0.1-0.2% for 8d)**

  [Dunn A et al *Arch Intern Med* 2003; White RH, *JTH*, 2007]



Three Key Questions Regarding Perioperative Management of Patients on Chronic OACs?

- Should oral anticoagulant therapy be discontinued?
- When VKA is discontinued, should the patient have perioperative “bridging” therapy with heparin (UFH or LMWH)?
- What is the optimal periprocedural management of patients on DOACs needing interruption?

Three Key Questions Regarding Perioperative Management of Patients on Chronic OACs?

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Minimal Bleed Risk Procedures

Minor dermatologic, cutaneous, dental, opthalmologic procedures (cataract surgery), pacemaker/cardioverter-defibrillator device implantation

Do not interrupt OAC* (Grade 2C)

***May consider interrupting DOAC day of procedure**

Douketis J et al Chest 2008;133:299S- 339S

BRUISE Control Study for Pacemaker or Defibrillator Surgery (N = 681)[1]

Table 3. Primary and Secondary Outcomes.*

Outcome	Heparin Bridging (N=338)	Continued Warfarin (N=343)	Relative Risk (95% CI)	P Value
Primary outcome				
Clinically significant hematoma — no. (%)	54 (16.0)	12 (3.5)	0.19 (0.10–0.36)	<0.001
Components of primary outcome				
Hematoma prolonging hospitalization — no. (%)	16 (4.7)	4 (1.2)	0.24 (0.08–0.72)	0.006
Hematoma requiring interruption of anticoagulation — no. (%)	48 (14.2)	11 (3.2)	0.20 (0.10–0.39)	<0.001
Hematoma requiring evacuation — no. (%)	9 (2.7)	2 (0.6)	0.21 (0.05–1.00)	0.03

COMPARE Trial for Catheter Ablation in AF (N = 1584)[2]
Warfarin discontinuation/Heparin Bridging emerged as a strong predictor of periprocedural TE (OR 13; 95% CI, 3.1–55.6; P<0.001).

1. Birnie DH et al NEJM 2013; 368(22):2084 93
2. Di Biase L et al Circulation 2014; 129(25):2638 44

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Do We Need To Bridge?

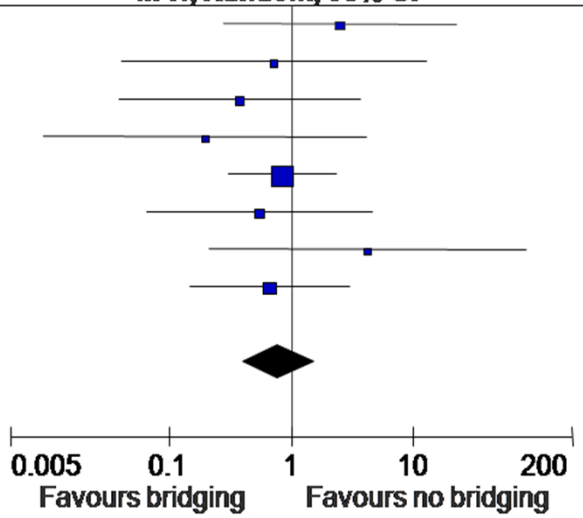
Bridging Therapy

The goal of bridging therapy with parenteral heparin (either UFH or LMWH), usually in therapeutic doses, is to allow for continued anticoagulation during temporary discontinuation of vitamin K antagonist (VKA) therapy, usually for an elective procedure or surgery

“This makes intuitive sense”

Meta-Analysis and Systematic Review of Bridging vs No-Bridging: Thromboembolic Events

Study or Subgroup	Bridging Events	Bridging Total	No bridging Events	No bridging Total	Odds Ratio M-H, Random, 95% CI
Daniels et al., 2009	4	342	1	213	2.51 [0.28, 22.60]
Garcia et al., 2008	0	108	7	1185	0.72 [0.04, 12.76]
Jaffer et al., 2010	1	229	3	263	0.38 [0.04, 3.68]
Marquie et al., 2006	0	114	2	114	0.20 [0.01, 4.14]
McBane et al., 2010	10	514	6	261	0.84 [0.30, 2.35]
Tompkins et al., 2010	1	155	6	513	0.55 [0.07, 4.59]
Varkarakis et al., 2005	0	25	3	762	4.25 [0.21, 84.56]
Wysokinski et al., 2008	3	204	4	182	0.66 [0.15, 3.01]
Total (95% CI)		**1691**		**3493**	**0.80 [0.42, 1.54]**
Total events	19		32		
Heterogeneity: $I^2 = 0\%$					



No risk reduction for TE with heparin bridging; no difference in ATE or VTE risks.

No difference in TE risk between full and intermediate/prophylactic dose LMWH.

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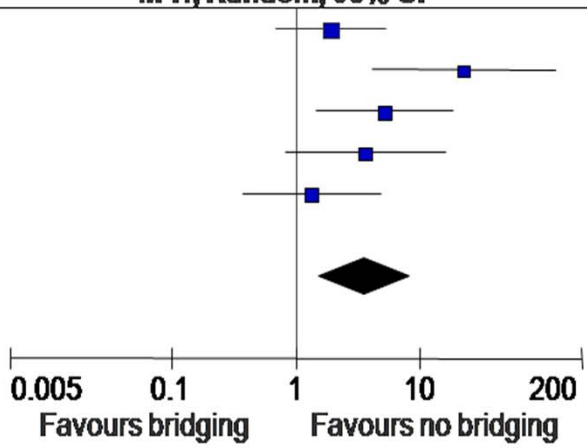
Meta-Analysis and Systematic Review of Bridging vs No-Bridging: Major Bleeding

Study or Subgroup	Bridging Events	Bridging Total	No bridging Events	No bridging Total	Odds Ratio M-H, Random, 95% CI
Daniels et al., 2009	15	342	5	213	1.91 [0.68, 5.33]
Garcia et al., 2008	4	108	2	1185	22.75 [4.12, 125.68]
Jaffer et al., 2010	13	229	3	263	5.22 [1.47, 18.54]
McBane et al., 2010	14	514	2	261	3.63 [0.82, 16.08]
Wysokinski et al., 2008	6	204	4	182	1.35 [0.37, 4.86]
Total (95% CI)		**1397**		**2104**	**3.60 [1.52, 8.50]**
Total events	52		16		
Heterogeneity: $I^2 = 52\%$					



Bridging associated with an increase in major bleeding.
Significant heterogeneity noted across studies.

Siegel D et al Circulation 2012;126:1630-39

Periprocedural Bridging vs No-Bridging Studies

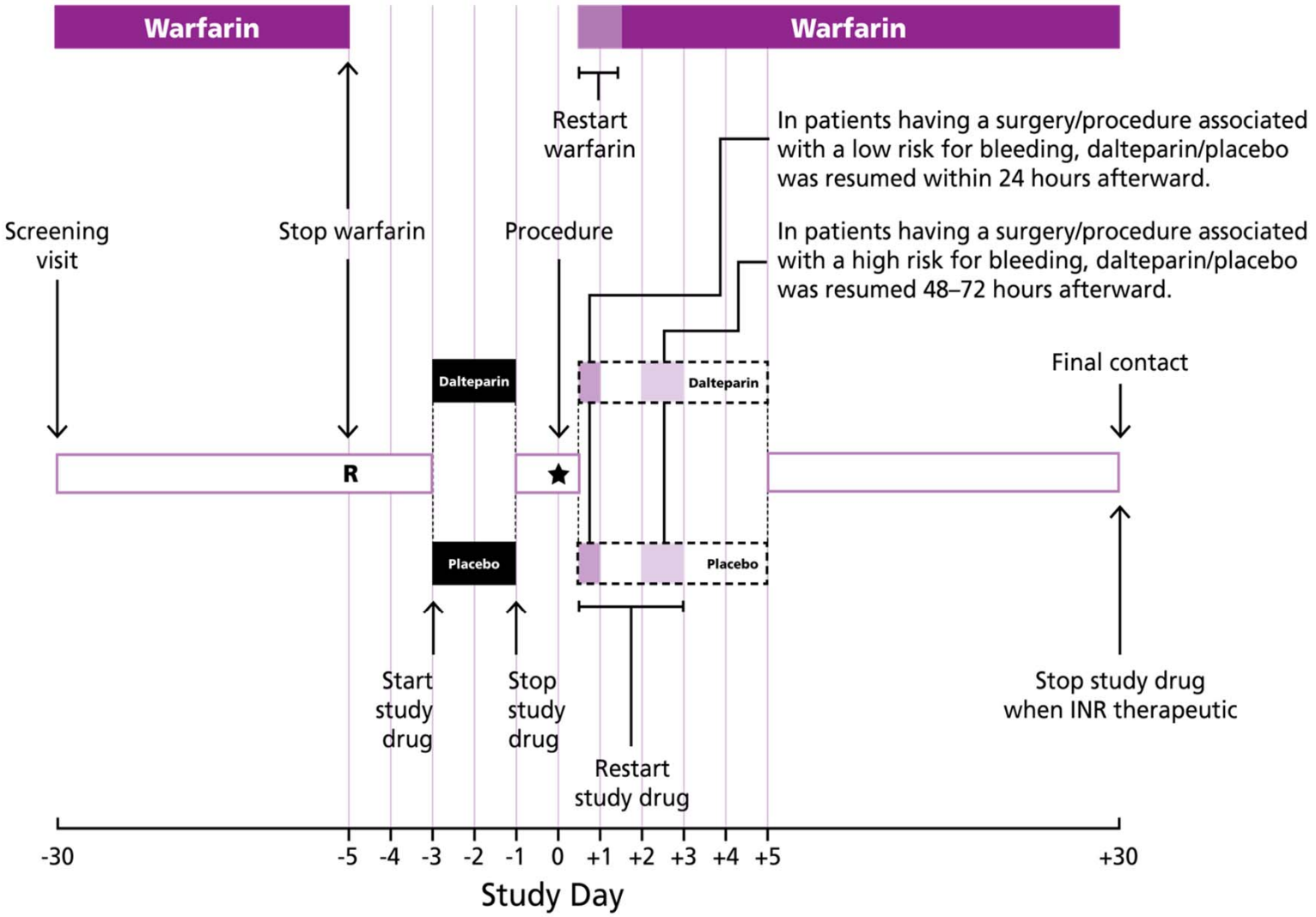
Study (N)	Year	Population	Comparators	30-day event (post-procedure)	
				ATE or VTE OR	MB +/- CRNMB
RELY (N = 1,415)	2014	AF	Bridging vs No Bridging	2.70 (0.38, 19.3)	4.62 (2.45, 8.72)
MVR Study (N = 1,777)	2014	MHV	Rx-dose vs Px-dose Bridging	0.90 (0.37, 2.18)	3.23 (1.58, 6.62)
Kaiser VTE (N = 1,178)	2015	VTE	Bridging vs No Bridging	0 vs 3	17.2 (3.9-75.1)

Background 30d Event Rates in No Bridging Arms:

ATE = ~ 0.5 – 1.0%

MB = ~ 1.0 – 1.5%

BRIDGE - Trial Design



Douketis JD, Spyropoulos AC et al *NEJM* 2015; 373(9):823-33

BRIDGE Trial - Primary Outcomes

Outcome No. (%)	No Bridging (N=918)	Bridging (N=895)	P Value
ATE	4 (0.4)	3 (0.3)	0.01 (non-inf) 0.73 (sup)
Stroke	2 (0.2)	3 (0.3)	
TIA	2 (0.2)	0 (0)	
Systemic embolism	0 (0)	0 (0)	
Major bleeding	12 (1.3)	29 (3.2)	0.005 (sup)

The mean $CHADS_2$ score in patients who sustained a thromboembolic event was 2.6 (range, 1-4)
The median time to an arterial thromboembolic event was 19.0 days (IQR, 6.0-23.0 days)
The median time to a major bleeding event after a procedure was 7.0 days (IQR, 4.0-18.0 days)

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Periprocedural DOAC Outcomes in SPAF Trials

Study	DOAC	30-day rate (post-procedure)	
		stroke/systemic	Major bleeding
(N = 4692)		1.50)	1.49)
ARISTOTLE (N = 5439)	apixaban	0.60% (0.32-1.12)	0.85% (0.61-1.12)

- Vast majority of patients underwent minor (non-high bleed risk) procedures
- Majority of patients (~80%) held DOAC 2 – 3 days prior to procedure and restarted within 2 days post-procedure
- Only minority underwent bridging (except RELY)

* Includes only 150mg non-bridging groups

Healey JS et al. Circulation 2012;126:343 8
Sherwood MW et al Circulation 2014; 129(18):1850 9
Garcia D et al Blood 2014; 124(25):3692 8

General principles of pre-procedure DOAC discontinuation

Stratify by procedural bleed risk (type, urgency) and renal function

‘Low’ bleed risk:
2–3 half-lives
i.e. 1 – 2 days pre-op

‘High’ bleed risk:
4–5 half-lives
i.e. 2 or more days pre-op

For moderate renal insufficiency: add 1–2 days pre-op

Consider coagulation tests in specific situations
aPTT, PT, TT, dTT (e.g. Hemoclot®), ECT

Pay special attention in patients on antiplatelet therapy and those requiring neuraxial anaesthesia

No heparin bridging!

Spyropoulos AC et al *Blood*. 2012;120(15):2954-62
Darvis-Kasem S et al Semin Thromb Hemost. 2012(7):652-60

General principles of post-procedure DOAC resumption

Only after good control of hemostasis

Dependent on bleeding risk and type of operation

Wait at least 24 hours after operation to restart NOAC for minor or "low-bleed" risk procedures

Wait 48–72 hrs after operation to restart NOAC for major or "high-bleed" risk procedures
Consider initial prophylactic doses of NOAC

No full-dose heparin bridging!

In patients who cannot tolerate orals consider prophylactic doses of heparin for VTE prevention

Spyropoulos AC et al *Blood*. 2012;120(15):2954-62
Darvis-Kasem S et al Semin Thromb Hemost. 2012(7):652-60

Validated Periprocedural VKA, Bridging, and DOAC Protocols

Suggested Periprocedural Strategies of VKA and DOACs Based on Procedural Bleed Risk

	HIGH BLEEDING RISK PROCEDURES	LOW BLEEDING RISK PROCEDURES	MINIMAL BLEEDING RISK PROCEDURES
HIGH THROMBOEMBOLIC RISK	**DOAC users**: Interrupt DOAC. Bridging with LMWH not suggested for DOACs **Warfarin users**: Interrupt warfarin with LMWH bridging suggested based on clinician judgment and most current evidence* †	**DOAC users**: Interrupt DOAC. Bridging with LMWH not suggested for DOACs **Warfarin users**: Interrupt warfarin with LMWH bridging suggested based on clinician judgment and most current evidence*	Do not interrupt anticoagulants**
INTERMEDIATE THROMBOEMBOLIC RISK	**DOAC users**: Interrupt DOAC. Bridging with LMWH not suggested for DOACs **Warfarin users**: Consider interrupting warfarin without LMWH bridging based on clinician judgment and most current evidence* †	**DOAC users**: Interrupt DOAC. Bridging with LMWH not suggested for DOACs **Warfarin users**: Consider interrupting warfarin without LMWH bridging based on clinician judgment and most current evidence*	Do not interrupt anticoagulants**
LOW THROMBOEMBOLIC RISK	**DOAC users**: Interrupt DOAC. Bridging with LMWH not suggested for DOACs **Warfarin users**: Interrupt warfarin. Bridging with LMWH not necessary †	**DOAC users**: Interrupt DOAC, Bridging with LMWH not suggested for DOACS **Warfarin users**: Interrupt warfarin. Bridging with LMWH not necessary	Do not interrupt anticoagulants**

Spyropoulos AC et al *J of Thromb Haemost* 2016;14(5):875 85

Validated Periprocedural and Bridging Protocol

Table 4 Validated periprocedural warfarin and low molecular weight heparin (LMWH) bridging protocol

Day	Warfarin dose	Bridging with LMWH	INR monitoring
− 7 to − 10	Maintenance dose	Assess for perioperative bridging anticoagulation; classify patients as undergoing high or low bleeding risk procedures	Check baseline laboratory findings (hemoglobin, platelet count, serum creatinine, INR)
− 6 to − 5	Begin to hold warfarin on day − 5 or day − 6	No LMWH	None
− 4	No warfarin	No LMWH	None
− 3	No warfarin	Start LMWH at a therapeutic or intermediate dose*	None
− 2	No warfarin	LMWH at a therapeutic or intermediate dose*	None
− 1	No warfarin	Last preprocedural dose of LMWH administered no less than 24 h before the start of surgery at half the total daily dose	Assess INR before the procedure; proceed with surgery if the INR is < 1.5. If the INR is > 1.5 and < 1.8, consider low-dose oral vitamin K reversal (1–2.5 mg)
0 or + 1	Resume the maintenance dose of warfarin on the evening of or morning after the procedure	None	None
+ 1	Maintenance dose	Low bleeding risk: restart LMWH at the previous dose High bleeding risk: no LMWH administration	According cto linician judgement
+ 2 or + 3	Maintenance dose	Low bleeding risk: LMWH administration continued High bleeding risk: restart LMWH at the previous dose	According to clinician judgement
+ 4	Maintenance dose	Low bleeding risk: INR testing (discontinue LMWH if the INR is > 1.9) High bleeding risk: INR testing (discontinue LMWH if the INR is > 1.9)	INR
+ 7 to + 10	Maintenance dose	–	INR

INR, International Normalized Ratio. Both twice-daily LMWH regimens (i.e. enoxaparin 1 mg kg−1 subcutaneous, dalteparin 100 IU kg−1) and once-daily LMWH regimens (i.e. enoxaparin 1.5 mg kg−1 subcutaneous, dalteparin 200 IU kg−1 subcutaneous) have been used. Intermediate-dose LMWH has been less studied in this setting.

Spyropoulos AC et al *J of Thromb Haemost* 2016;14(5):875 85

Table 6 Suggested periprocedural direct oral anticoagulant therapy interruptions (adapted from [4])

Drug	Renal function	Low bleeding risk surgery	High bleeding risk surgery*	Resumption of therapy	
				Low bleeding risk surgery	High bleeding risk surgery
Dabigatran	CrCl > 50 mL min^{-1}	Last dose: 2 days before procedure	Last dose: 3 days before procedure	Resume ~ 24 h after procedure	Resume 2–3 days after procedure (48–72 h postoperatively)†
	CrCl 30–50 mL min^{-1}	Last dose: 3 days before procedure	Last dose: 4–5 days before procedure		
Rivaroxaban	CrCl > 50 mL min^{-1}	Last dose: 2 days before procedure	Last dose: 3 days before procedure	Resume ~ 24 h after procedure	Resume 2–3 days after procedure (48–72 h postoperatively)†
	CrCl 30–50 mL min^{-1}	Last dose: 2 days before procedure	Last dose: 3 days before procedure		
	CrCl 15–29.9 mL min^{-1}‡	Last dose: indivualized on the basis of patient and procedural factors for bleeding and thrombosis	Last dose: indivualized on the basis of patient and procedural factors for bleeding and thrombosis		
Apixaban	CrCl > 50 mL min^{-1}	Last dose: 2 days before procedure	Last dose: 3 days before procedure	Resume ~ 24 h after procedure	Resume 2–3 days after procedure (48–72 h postoperatively)†
	CrCl 30–50 mL min^{-1}	Last dose: 2 days before procedure	Last dose: 3 days before procedure		
	CrCl 15–29.9 mL min^{-1}	Last dose: indivualized on the basis of patient and procedural factors for bleeding and thrombosis	Last dose: indivualized on the basis of patient and procedural factors for bleeding and thrombosis		
Edoxaban	CrCl > 50 mL min^{-1}	Last dose: 2 days before procedure	Last dose: 3 days before procedure	Resume ~ 24 h after procedure	Resume 2–3 days after procedure (48–72 h postoperatively)†

CrCl, creatinine clearance. *Includes any procedure/surgery requiring neuraxial anesthesia. †For patients at high risk for thromboembolism and with a high bleeding risk after surgery, consider administering a reduced dose of dabigatran (75 mg twice daily), rivaroxaban (10 mg once daily) or apixaban (2.5 mg twice daily) on the evening after surgery and on the following day (first postoperative day) after surgery. ‡Value for patients receiving rivaroxaban 15 mg once daily.

Spyropoulos AC et al J of Thromb Haemost 2016; 14:875-85

2015 ASRA Guidelines for DOACs

TABLE 4. Recommended Intervals Between Discontinuation of the New Anticoagulants and Interventional Pain Procedure and Between the Procedure and Resumption of the New Anticoagulants

Drug	Half-life	Recommended Interval Between Discontinuation of Drug and Interventional Pain Procedure* (5 Half-lives)†‡	Recommended Interval Between Procedure and Resumption of Drug
Dabigatran	12–17 h	4–5 d	24 h
	28 h (renal disease)	6 d (renal disease)	
Rivaroxaban	9–13 h	3 d	24 h
Apixaban	15.2 ± 8.5 h	3–5 d‡	24 h

*The procedures include medium- and high-risk interventional pain procedures. For low-risk procedures, a shared decision making should be followed, a 2 half-life interval may be considered.

†Because of the lack of published studies and in view of the added risks involved in patients with spine abnormalities, we took the upper limit of the half-life of each drug in calculating the 5 half-lives.

‡The potency and the wide variability in the pharmacokinetics of these drugs make us recommend a longer interval.

Narouze S et al Reg Anesth Pain Med 2015;40: 182 212)

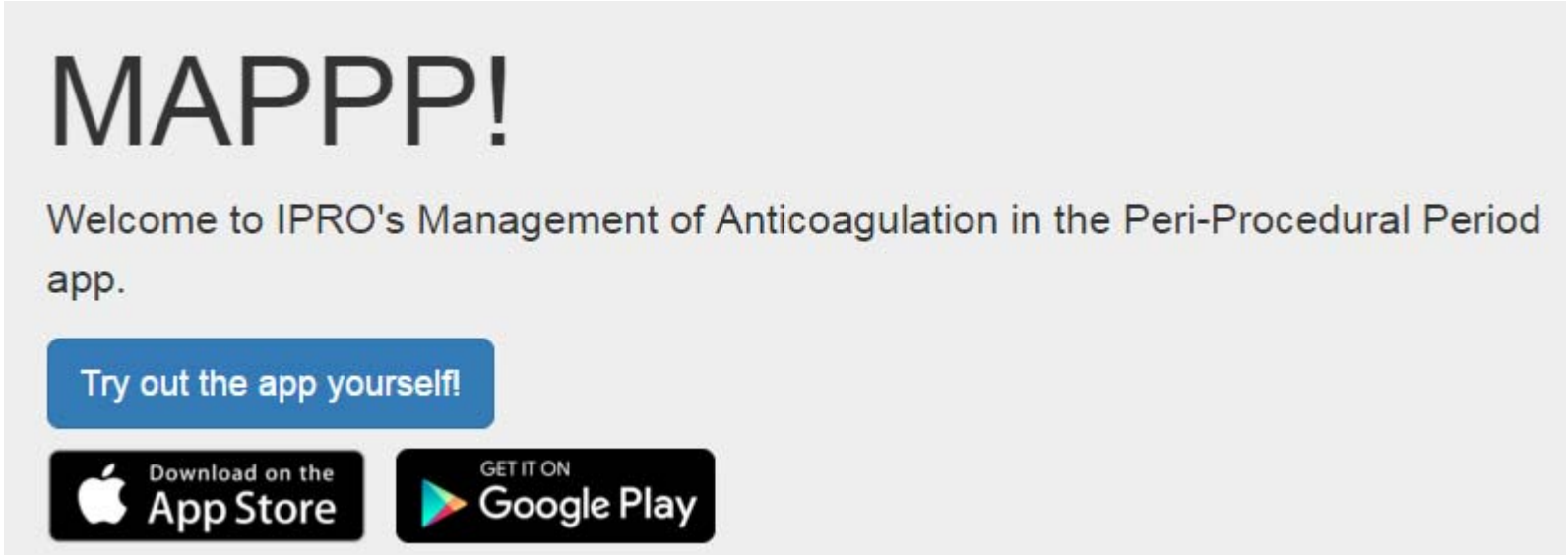
How to Apply the MAPPP App

Applicability of the MAPPP App

- Performs patient anticoagulation assessment 7+ days prior to procedures
- Categorizes procedure-related bleeding risk and underlying thrombosis risk for each patient
- Provides final recommendation for anticoagulant interruption and bridging related to bleeding and thromboembolic risk
- Each recommendation is coupled to specific guidance for DOAC users, warfarin users and/or antiplatelet users

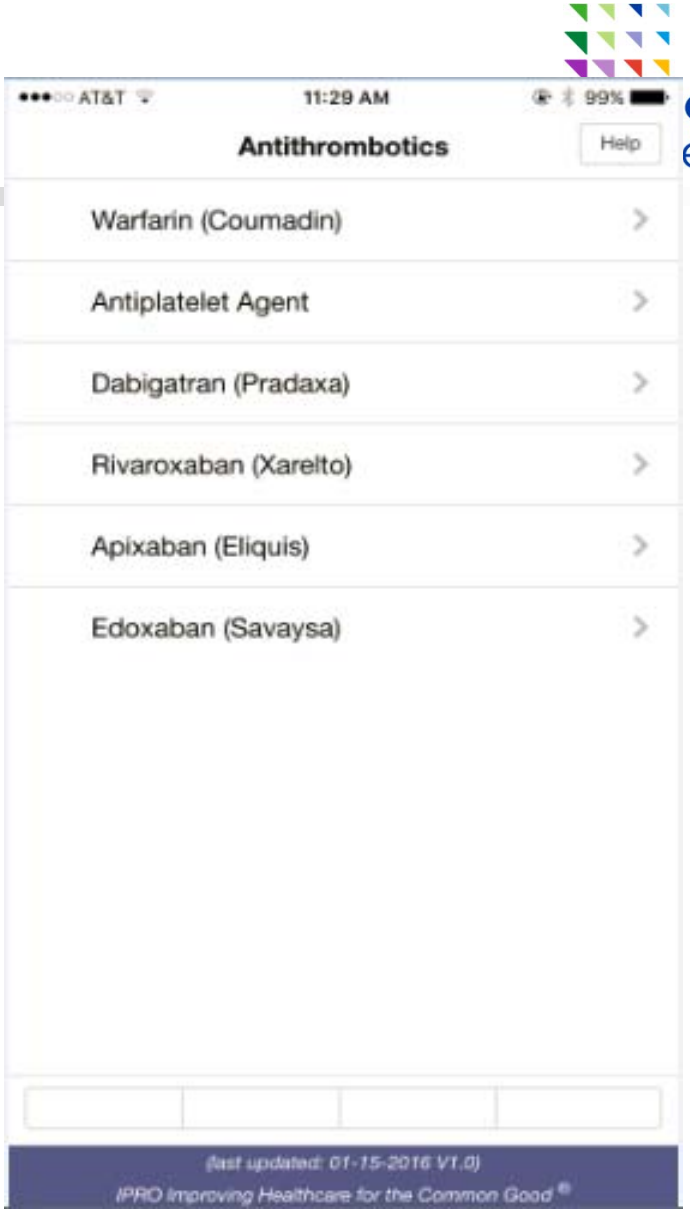
MAPPP Instructions

- **To download the app or view the web-based version, please visit: http://mappp.ipro.org/**



MAPPP Instructions

- **Once clicking on accept and continue (disclaimer screens), you'll be presented with a screen displaying various antithrombotic options**
- **Select the antithrombotic agent relevant to your patient**



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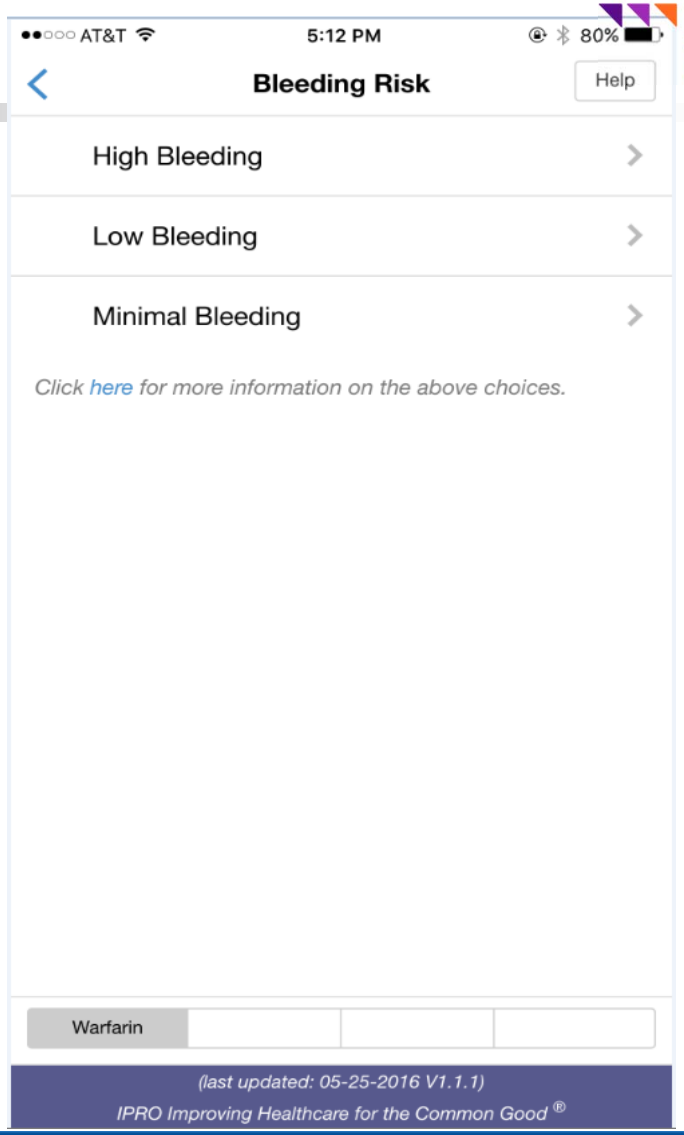
MAPPP Instructions

- **The next screen then prompts you to categorize the specific procedure bleeding risk as High, Low or Minimal**
- **If the procedure bleeding risk is known simply click on the appropriate choice**
- **If the procedure bleeding risk is unknown, click on the "*Click here for more information on the above choices*" which will allow you to view definitions of each level of bleeding risk**



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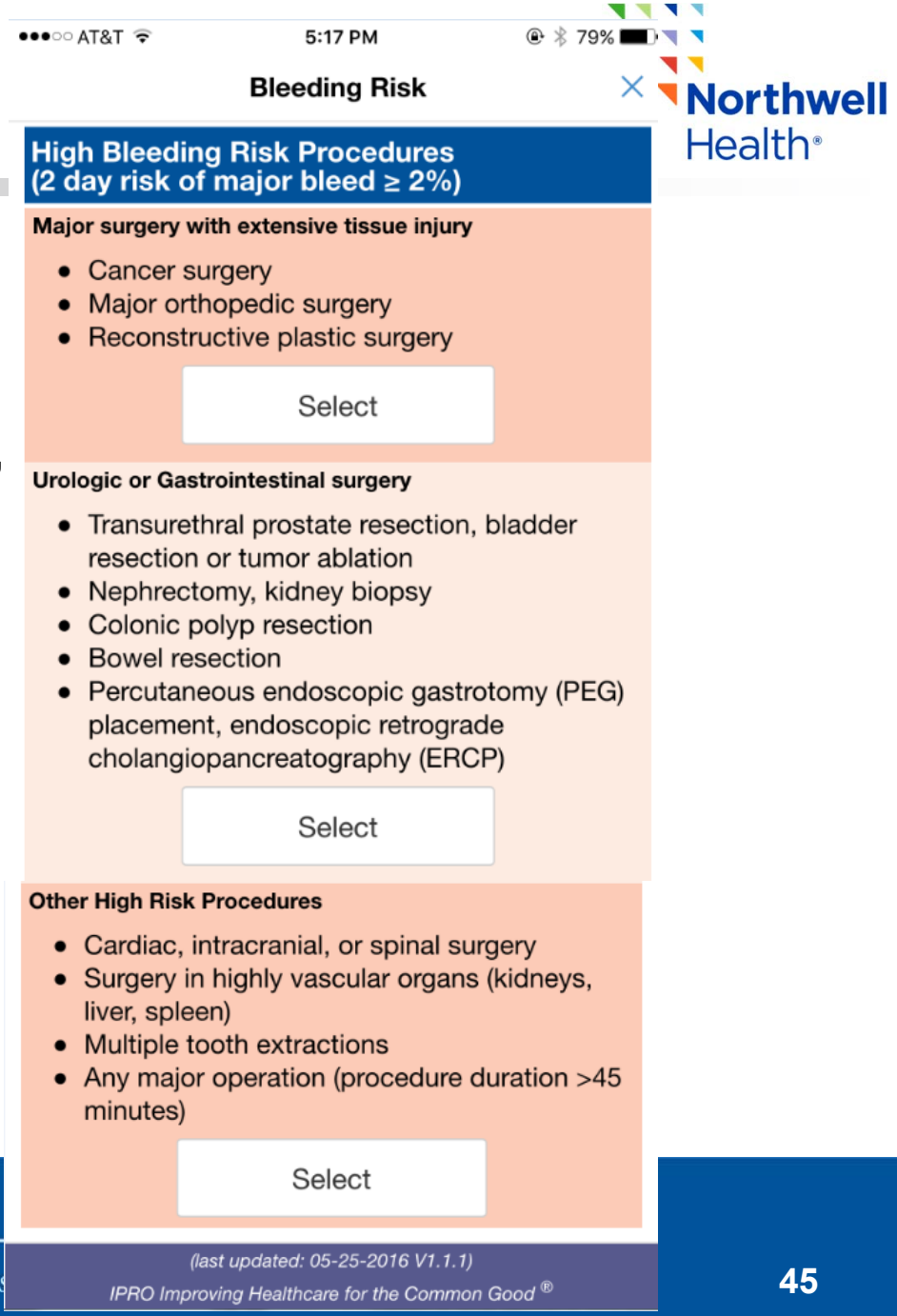
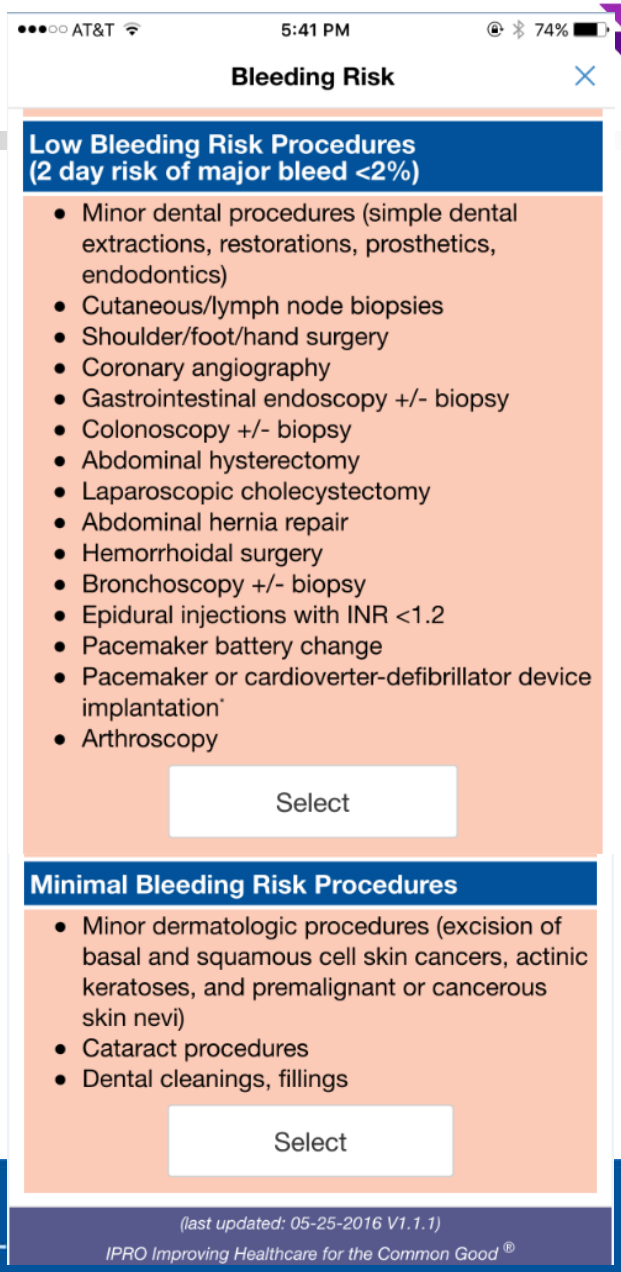
MAPPP Instructions

- The "*Click here for more information on the above choices*" selection reveals the full definition guidance for High, Low and Minimal Bleeding Risk Procedures.
- Procedure bleeding risk can also be selected from this page by clicking on the appropriate choice



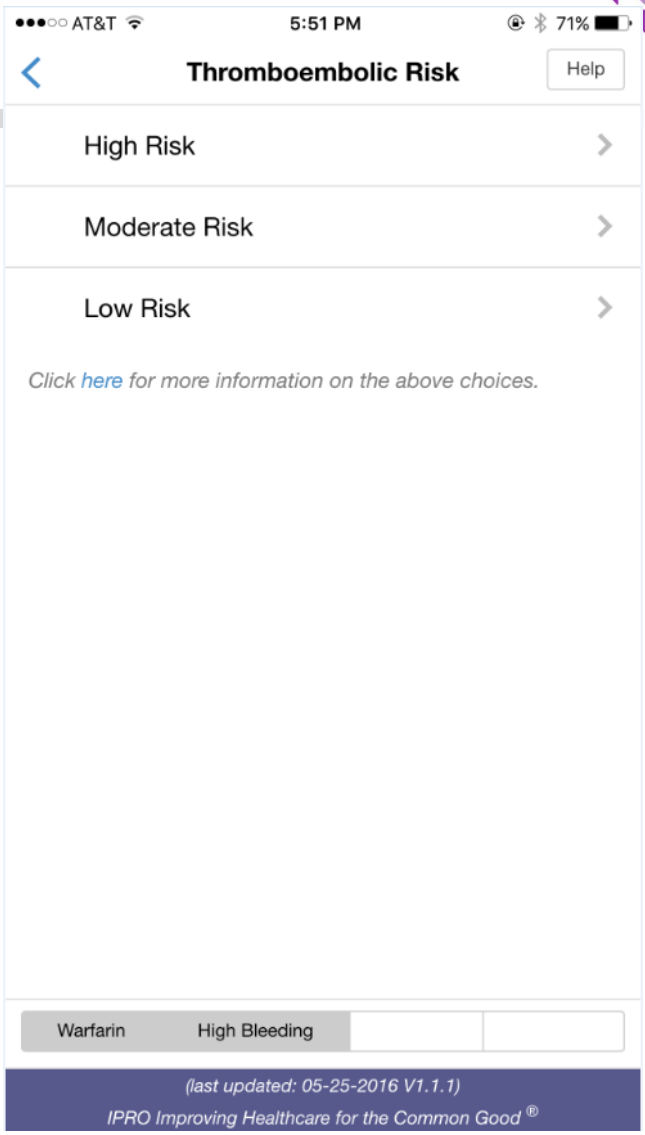
MAPPP Instructions

- **This screenshot depicts the Low Bleeding Risk and Minimal Bleeding Risk Procedure categories**



MAPPP Instructions

- **The next screen then prompts you to categorize the specific thromboembolic risk as High, Moderate/Medium or Low**
- **If the thromboembolic risk is known simply click on the appropriate choice**
- **If the thromboembolic risk is unknown, click on the "*Click here for more information on the above choices*" which will allow you to view definitions of each level of thromboembolic risk**



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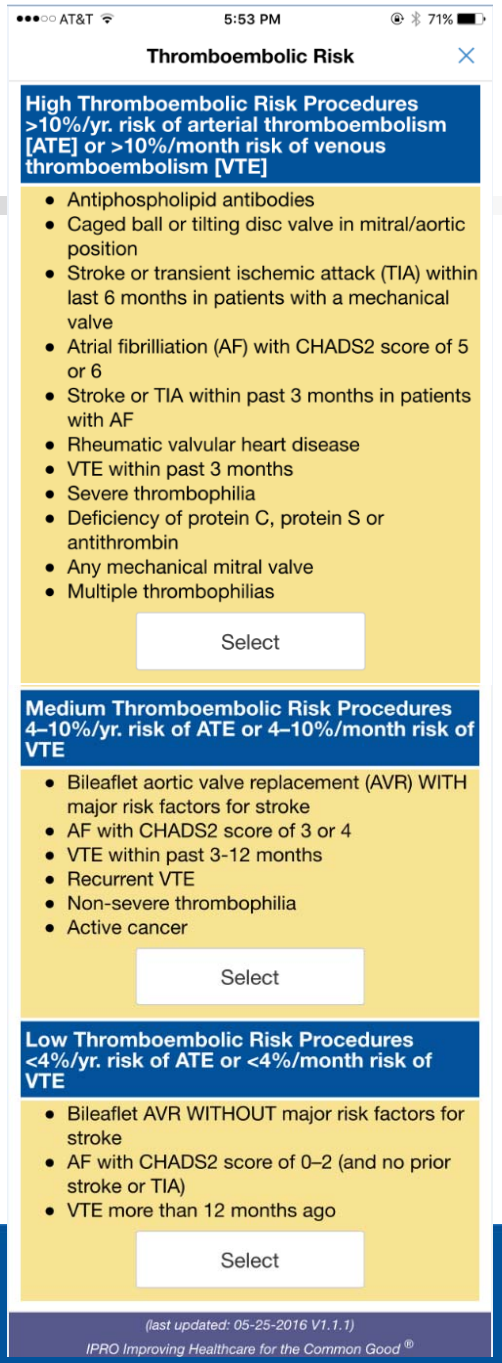
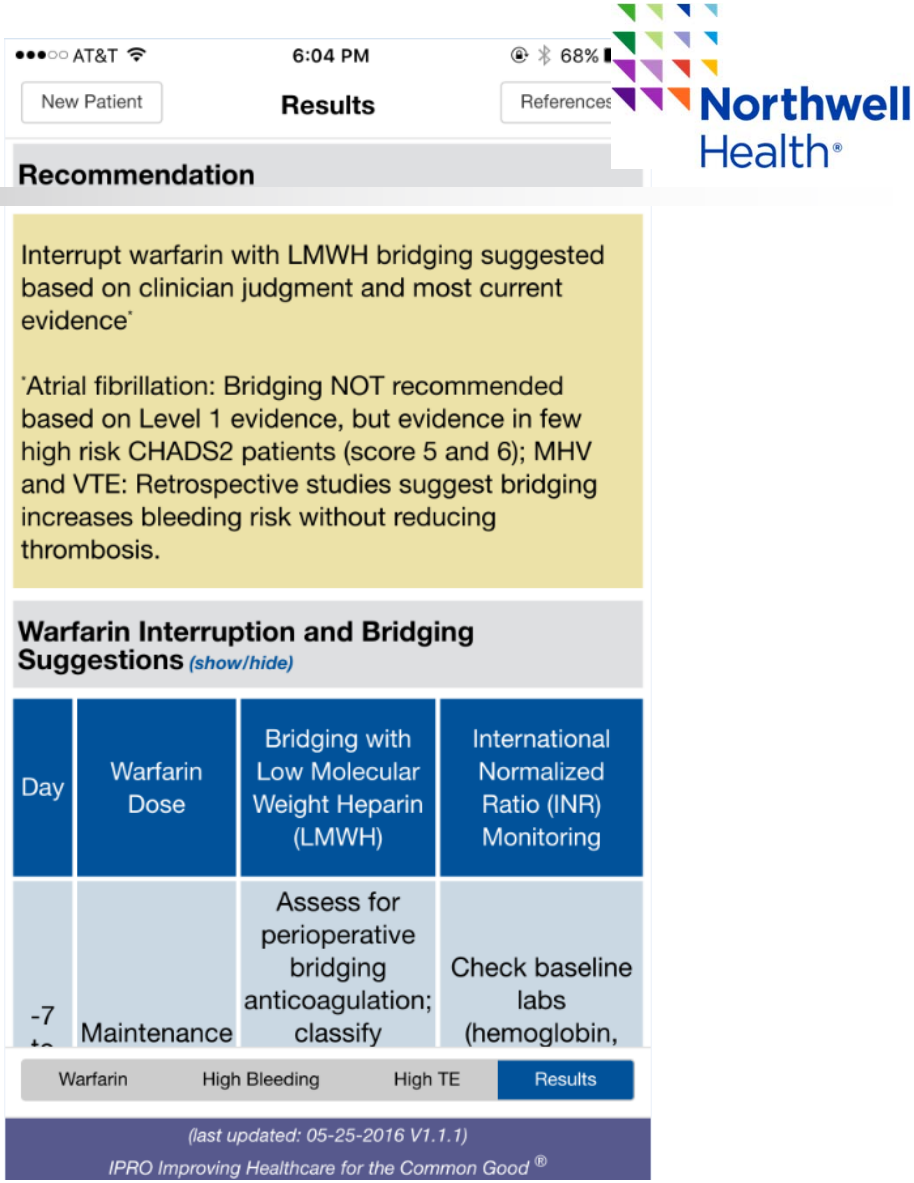
MAPPP Instructions

- **The "*Click here for more information on the above choices*" selection reveals the full definition guidance for High, Moderate/Medium and Low Thromboembolic Risk**
- **Thromboembolic risk can also be selected from this page by clicking on the appropriate choice**



MAPPP Instructions

- **Once a Bleeding Risk and Thromboembolic Risk is selected for each patient, the MAPPP app will automatically select the appropriate recommendation**
- **The final "Results" section will provide a Recommendation with References (upper right corner) and option to select another patient (upper left corner)**
- **At any point in time, you can double check your input data for Antithrombotic agent selection, Bleeding Risk and Thromboembolic Risk by viewing the information bar at bottom of the screen. Backward navigation can occur by clicking this bar or swiping the screen**



Case 1

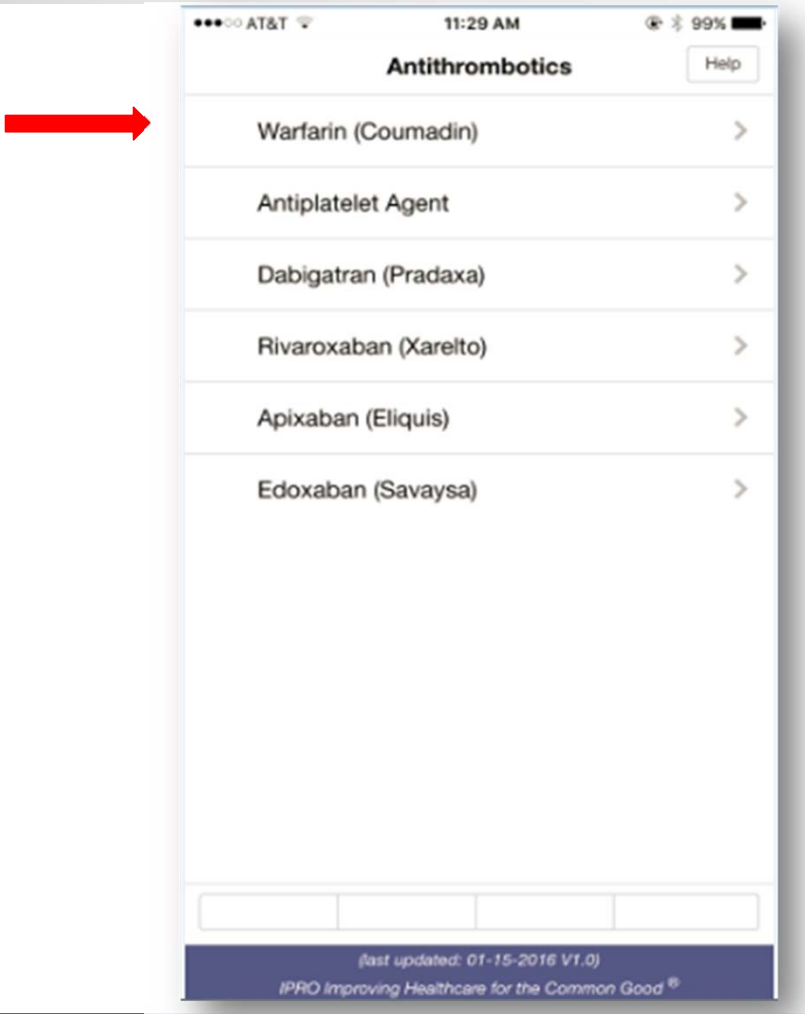
A 58-year-old female with a bileaflet AVR without major risk factors for stroke is scheduled for a laparoscopic cholecystectomy. She is on warfarin 4mg daily with stable INR within therapeutic range.

Using the MAPPP app, what recommendations would you make regarding the patient's peri-procedural anticoagulation?

Case 1- Antithrombotic Agent Selection

Step 1:

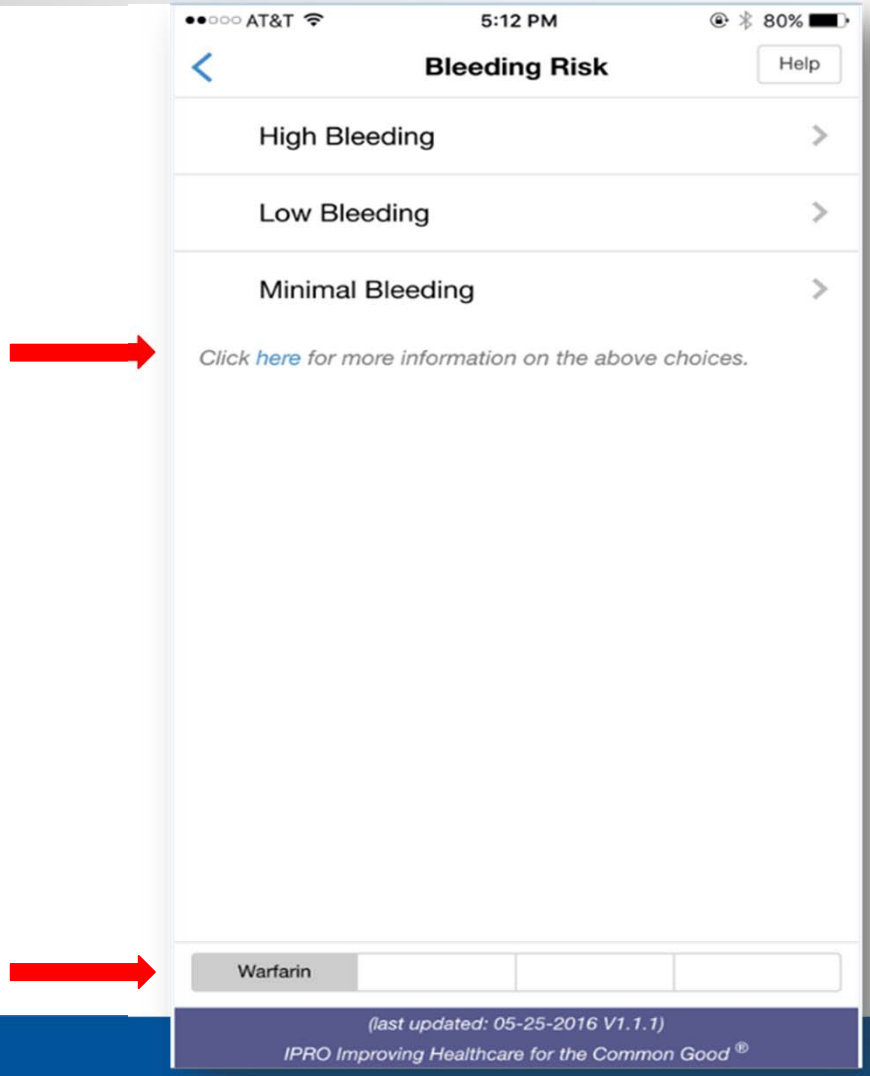
- **Since the patient is currently taking warfarin, select warfarin (Coumadin) as the proper Antithrombotic**



Case 1- Bleeding Risk Evaluation

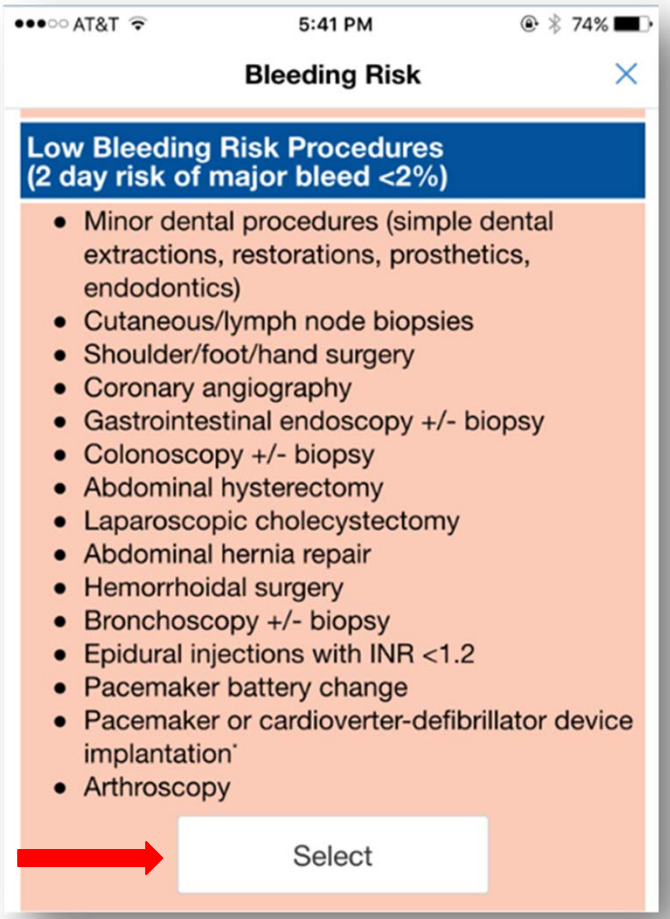
Step 2

- You now have access to the Bleeding Risk screen and will be prompted to select a procedure-specific Bleeding Risk
- Click on the "*Click here for more information on the above choices*"
- Note that the drug selection confirmation appears in the bottom information navigation bar



Case 1- Bleeding Risk Evaluation

- **Since patient is scheduled for a laparoscopic cholecystectomy, the Low Bleeding Risk category should be selected**



Case 1- Thromboembolic Risk Evaluation

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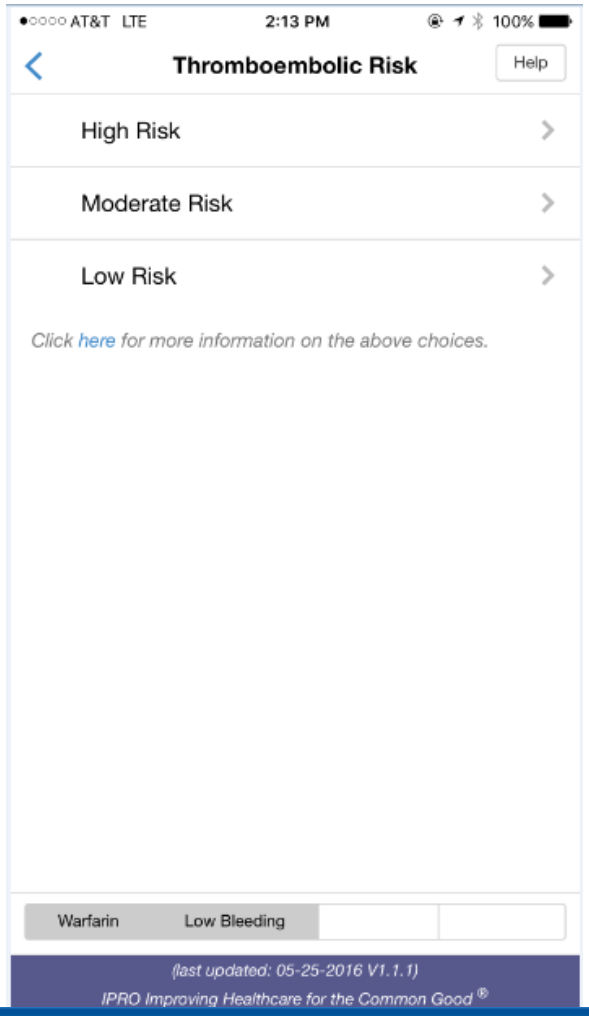
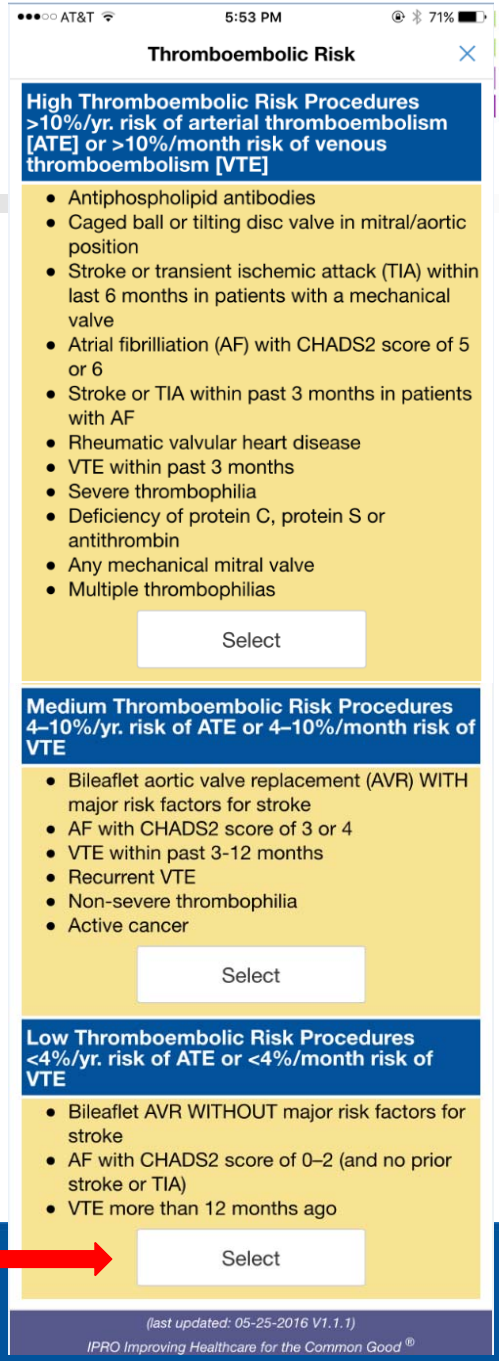
Step 3

- You now have access to the Thromboembolic Risk screen and will be prompted to select the Thromboembolic Risk
- Click on the "*Click here for more information on the above choices*"
- Note that the drug selection and the Bleeding Risk confirmation appears in the bottom information navigation bar



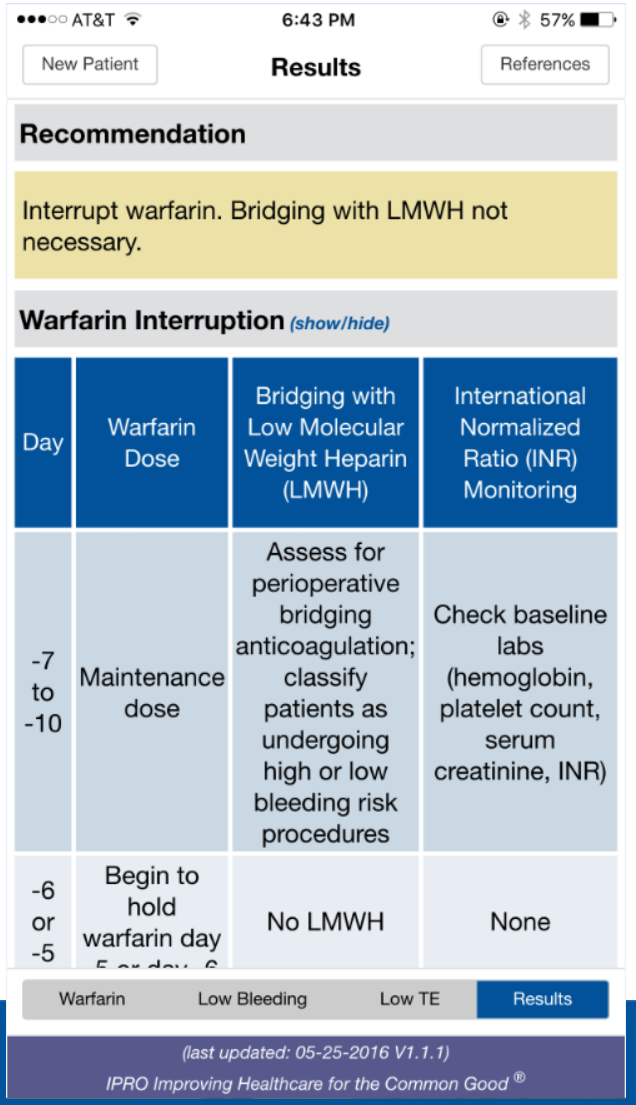
Case 1- Thromboembolic Risk Evaluation

- **Since patient presents with a bileaflet AVR without major risk factors for stroke , the Low Thromboembolic Risk category should be selected**



Case 1- Recommendation

- **Based on patient's anticoagulant, procedure bleeding risk and thromboembolic risk, the MAPPP-generated result is shown**
- **The Warfarin Interruption guidance appears below the recommendation**



Case 1- Recommendation

- **The Warfarin Interruption guide provides a detailed chart guiding anticoagulation bridging or interruption protocols on days leading up to procedures:**

Day	Warfarin Dose	Bridging with Low Molecular Weight Heparin (LMWH)	International Normalized Ratio (INR) Monitoring
-7 to -10	Maintenance dose	Assess for perioperative bridging anticoagulation; classify patients as undergoing high or low bleeding risk procedures	Check baseline labs (hemoglobin, platelet count, serum creatinine, INR)
-6 or -5	Begin to hold warfarin day -5 or day -6	No LMWH	None
-4	No Warfarin	No LMWH	None
-3	No Warfarin	Start LMWH at therapeutic or intermediate dose†	None
-2	No Warfarin	LMWH at therapeutic or intermediate dose†	None
-1	No Warfarin	Last preprocedural dose of LMWH administered no less than 24h before start of surgery at half the total daily dose	Assess INR before the procedure; proceed with surgery if INR <1.5; If INR > 1.5 and <1.8, consider low-dose oral vitamin K reversal (1-2.5 mg)

Case 1- Recommendation

- **The recommendation will additionally extend guidance to include anticoagulation regimens for days following a patient's procedure:**

0 or +1	Resume maintenance dose of warfarin on evening of or morning after procedure	None	None
+ 1	Maintenance dose	Restart LMWH at previous dose	Per clinician judgment
+2 or +3	Maintenance dose	LMWH administration continued	Per clinician judgment
+4	Maintenance dose	INR testing (discontinue LMWH if INR > 1.9)	INR
+7 to +10	Maintenance dose		INR

† Either twice daily LMWH regimens (i.e. enoxaparin 1mg/kg subcutaneous, dalteparin 100 IU/kg subcutaneous) or once-daily LMWH regimens have been used (i.e. enoxaparin 1.5 mg/kg subcutaneous, dalteparin 200 IU/kg subcutaneous). Intermediate-dose LMWH has been less studied in this setting.

Decisions to interrupt, bridge, and resume anticoagulants MUST be clearly communicated among providers and to patient.

Warfarin	Low Bleeding	Low TE	Results

Case 2

A 76-year-old female with a history of HF, Atrial Fibrillation and HTN is scheduled to undergo a total hip replacement. She is currently on warfarin therapy for a recent DVT (2 months ago).

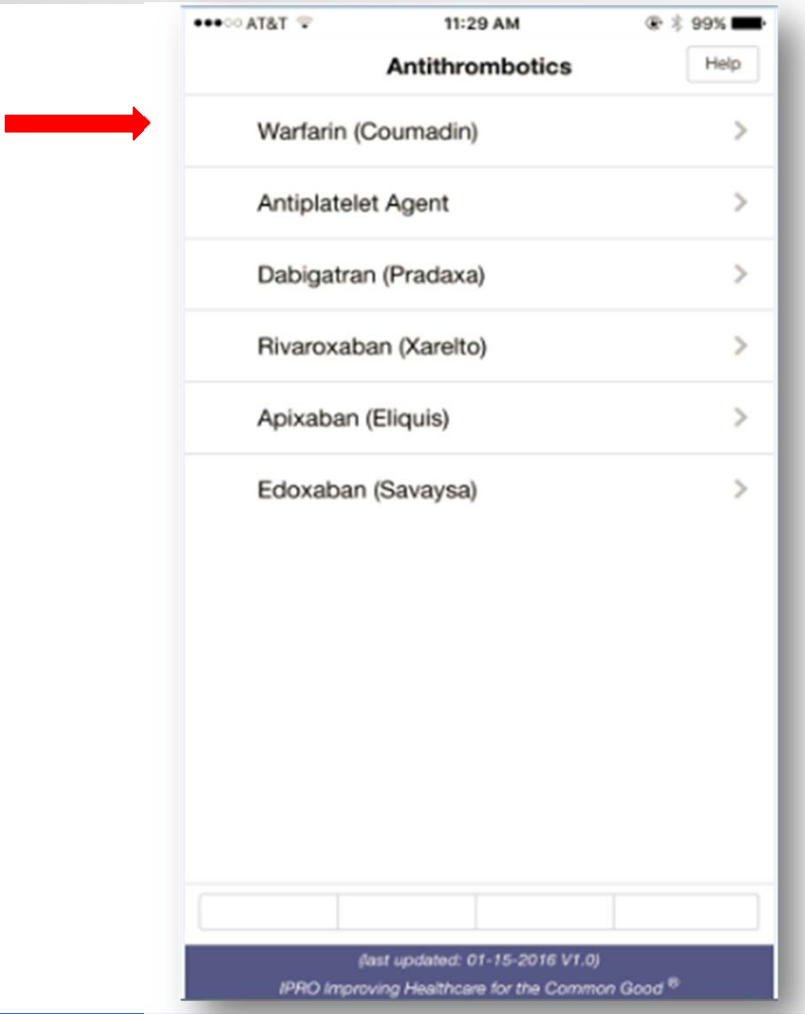
- $CHADS_2 = 3$
- CrCl = 42 ml/min

Using the MAPPP app, what recommendations would you make regarding the patient's peri-procedural anticoagulation?

Case 2- Antithrombotic Agent Selection

Step 1:

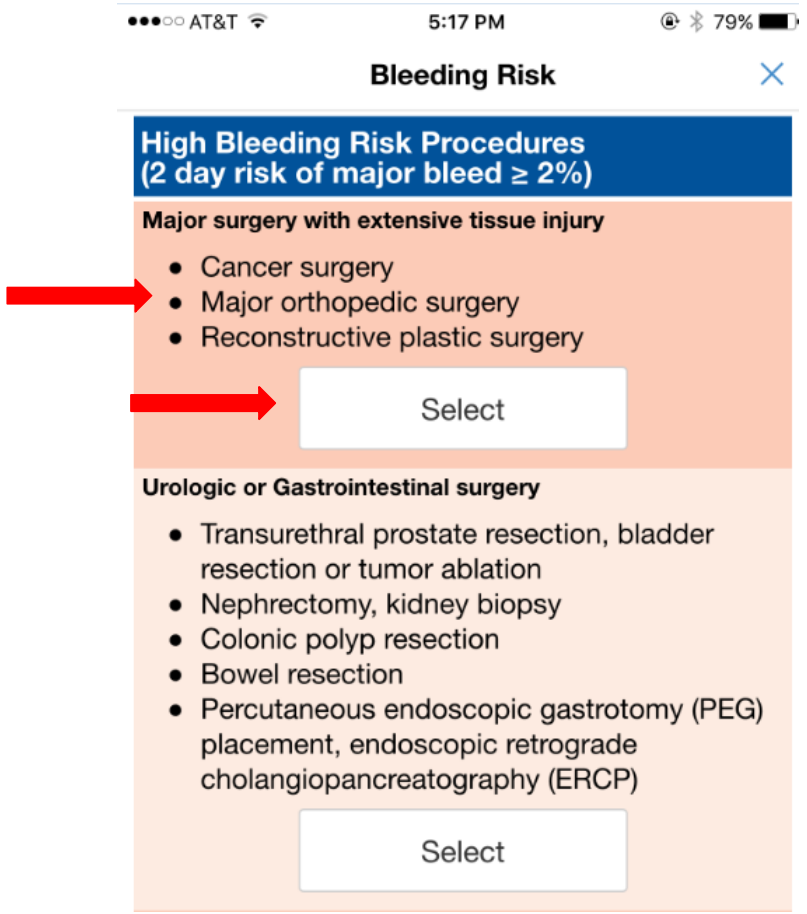
- **Since the patient is currently taking warfarin, select warfarin (Coumadin) as the proper Antithrombotic**



Case 2- Bleeding Risk Evaluation

Step 2:

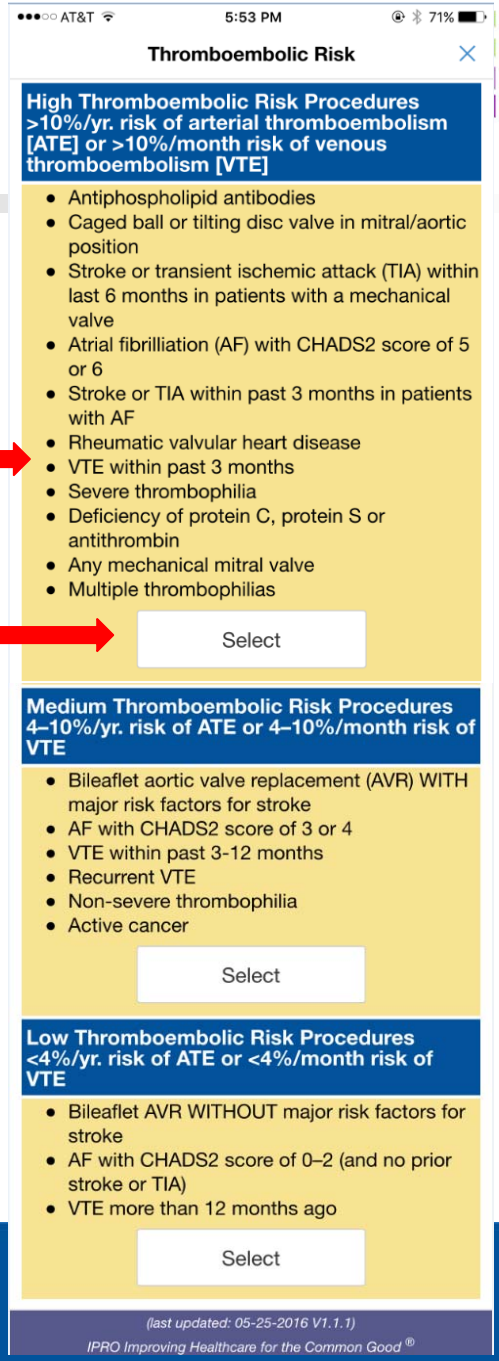
- **Since patient is undergoing major orthopedic surgery, the High Bleeding Risk category should be selected**



Case 2- Thromboembolic Risk Evaluation

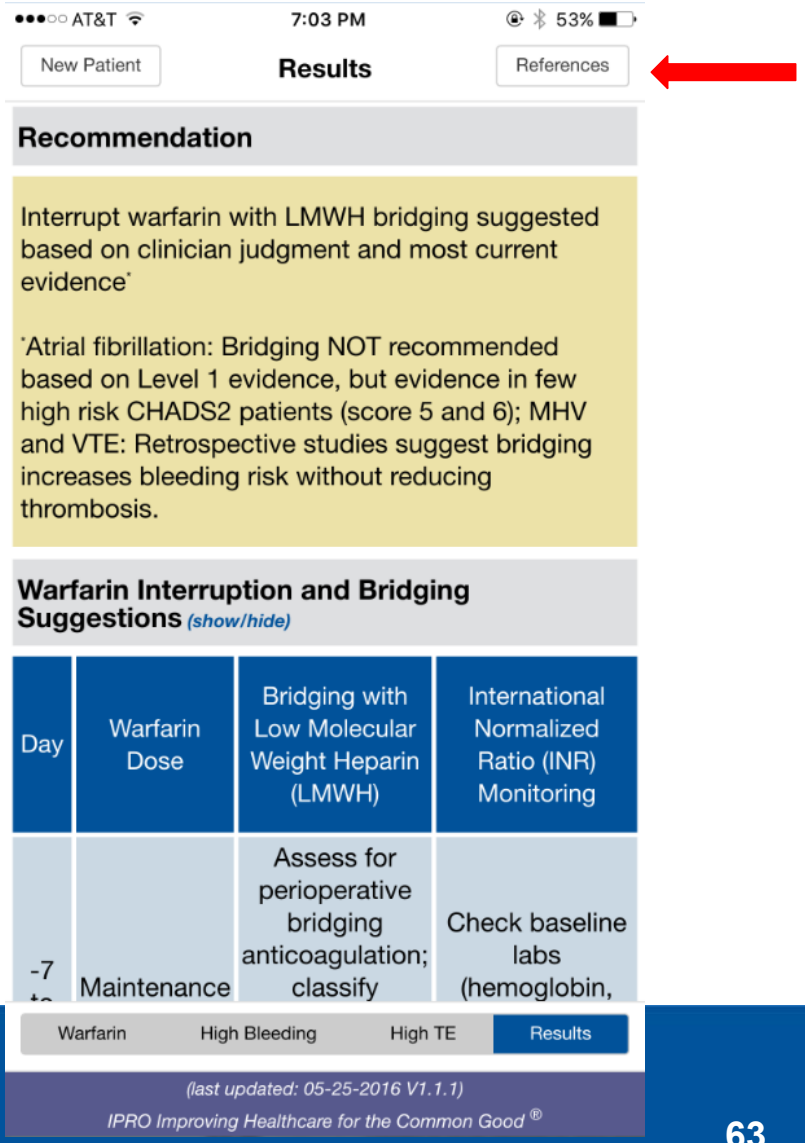
Step 3:

- **Due to patient's recent DVT (2 months ago), the High Thromboembolic Risk category should be selected**



Case 2 - Recommendation

- **Based on patient's anticoagulant, procedure bleeding risk and thromboembolic risk, the MAPPP-generated result is shown**
- **The Warfarin Interruption and Bridging Suggestions appear below the recommendation**



Case 2- Recommendation

- **The recommendation will provide a detailed chart guiding anticoagulation bridging or interruption protocols on days leading up to procedures:**

Day	Warfarin Dose	Bridging with Low Molecular Weight Heparin (LMWH)	International Normalized Ratio (INR) Monitoring
-7 to -10	Maintenance dose	Assess for perioperative bridging anticoagulation; classify patients as undergoing high or low bleeding risk procedures	Check baseline labs (hemoglobin, platelet count, serum creatinine, INR)
-6 or -5	Begin to hold warfarin day -5 or day -6	No LMWH	None
-4	No Warfarin	No LMWH	None
-3	No Warfarin	Start LMWH at therapeutic or intermediate dose†	None
-2	No Warfarin	LMWH at therapeutic or intermediate dose†	None
-1	No Warfarin	Last preprocedural dose of LMWH administered no less than 24h before start of surgery at half the total daily dose	Assess INR before the procedure; proceed with surgery if INR <1.5; If INR > 1.5 and <1.8, consider low-dose oral vitamin K reversal (1-2.5 mg)

Case 2- Recommendation

- **The recommendation will additionally extend guidance to include anticoagulation regimens for days following a patient's procedure:**

0 or +1	Resume maintenance dose of warfarin on evening of or morning after procedure	None	None
+ 1	Maintenance dose	No LMWH administration	Per clinician judgment
+2 or +3	Maintenance dose	Restart LMWH at previous dose	Per clinician judgment
+4	Maintenance dose	INR testing (discontinue LMWH if INR > 1.9)	INR
+7 to +10	Maintenance dose		INR

Case 3

A 64-year-old male with a history of Atrial Fibrillation, HTN, and Type 2 Diabetes is scheduled to undergo a coronary angiography in 2 weeks. He is on Eliquis (apixaban) 5mg BID.

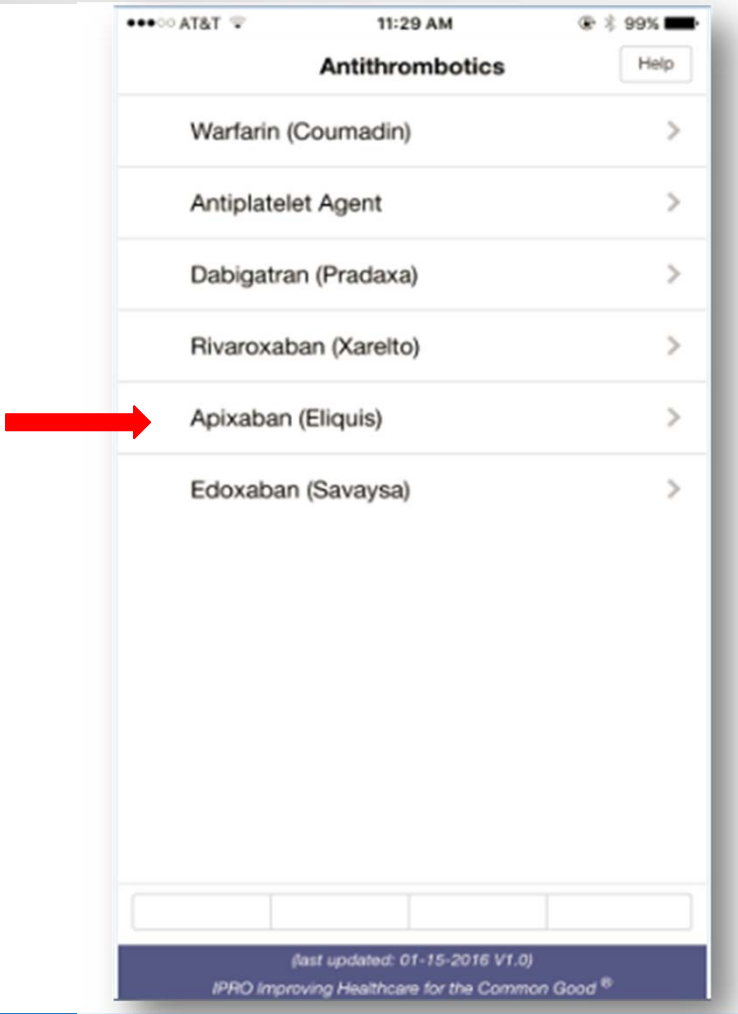
- $CHADS_2 = 2$
- CrCl = 84 ml/min

Using the MAPPP app, what recommendations would you make regarding the patient's peri-procedural anticoagulation?

Case 3 - Antithrombotic Agent Selection

Step 1:

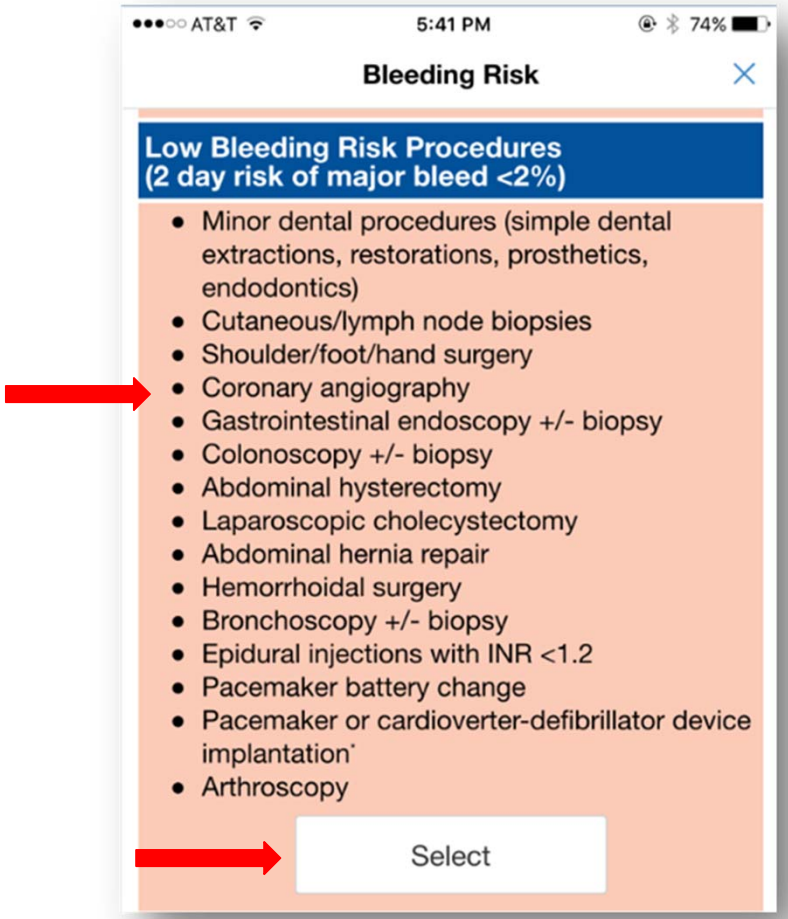
- **Since the patient is currently taking Eliquis, select Eliquis (apixaban) as the proper Antithrombotic**



Case 3 - Bleeding Risk Evaluation

Step 2:

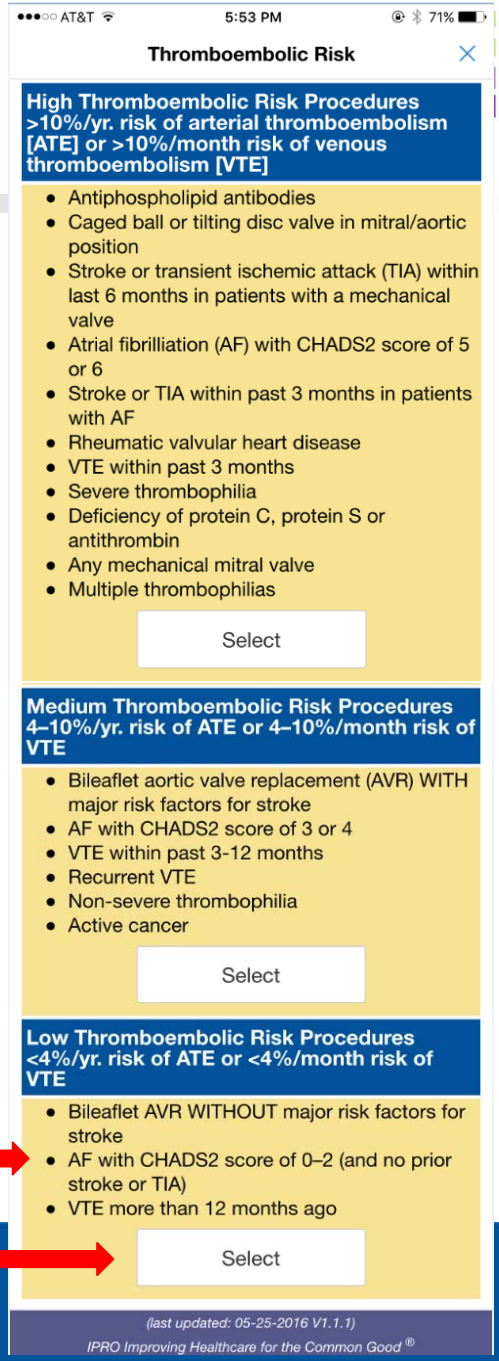
- **Since patient is undergoing coronary angiography, the Low Bleeding Risk category should be selected**



Case 3 - Thromboembolic Risk Evaluation

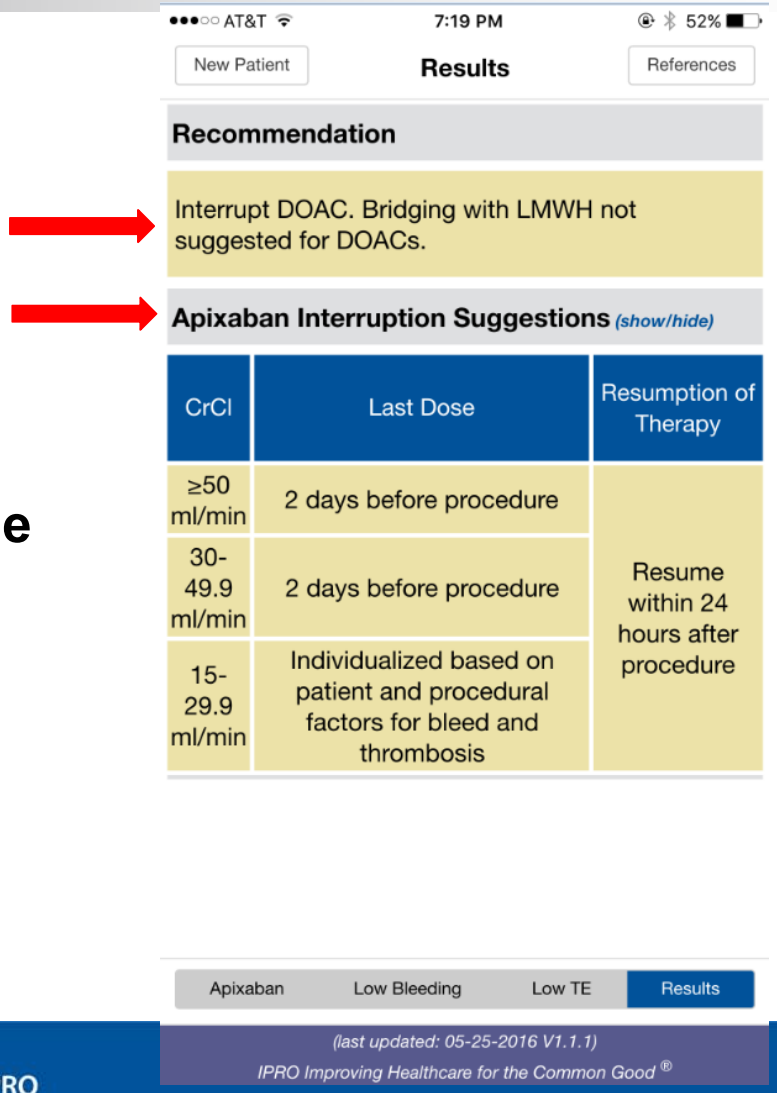
Step 3:

- **Due to patient's $CHADS_2$ score of 2 and lack of significant past medical history (prior stroke/TIA), the Low Thromboembolic Risk category should be selected**



Case 3 - Recommendation

- **Based on patient's anticoagulant, procedure bleeding risk and thromboembolic risk, the MAPPP-generated result is shown**
- **The Apixaban Interruption Suggestions appear below the recommendation**



Questions/Discussion

Please complete the program evaluation you will be directed to when you close the webinar.

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References

Management of Anticoagulation in the Peri-Procedural Period: A Tool for Clinicians. IPRO; The Medicare Quality Improvement Organization for New York State. Revised 2016.

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