

Background



- DDI often assigned meaningless labels such as "Major" or "Contraindicated"
- Use of subjective terms concerning risk \bullet of harm is not useful to clinicians or patients
- Clinicians override more than 90% of DDI warnings, contributing to alert fatigue
- Novel approaches to represent risk of harm are needed

- **bleeding** (GIB) for patients on oral anticoagulants (OAC) and:
- To model the risk of gastrointestinal non-steroid anti-inflammatory
- (NSAIDs); • antidepressants,
- accounting for other patient risk factors and medications

DDInteract

The model was calibrated to estimate GIB risk of 2% for warfarin and 1% for apixaban. See Table 1.

OAC	GIB Risk	Attribute	GIB Risk
Warfarin	2.0	Age	2.5
Apixaban	1.2	Aspirin	1.6
Rivaroxaban	3.1	Antiplatelet	1.5
Dabigatran	3.0	Corticosteroids	1.8
Edoxaban	3.3	Hx of GI Bleed	6.7
SSRI		NSAID	
Bupropion	1.0	Celecoxib	1.0
Venlafaxine	1.1	Ibuprofen	1.8
Desvenlafaxine	1.1	Diclofenac	4.1
Fluvoxamine	1.1	Indomethacin	6.6
Mirtazapine	1.1	Naproxen	6.8
Escitalopram	1.2	Meloxicam	8.0
Paroxetine	1.2	Piroxicam	12.8
Duloxetine	1.3	Ketoprofen	13.6
Citalopram	1.3	Ketorolac	21.6
Fluoxetine	1.3	PPI	
Sertraline	1.4	Any PPI	0.7

Table 1. Model Inputs for Various Medications and Risk Factors
 OAC oral anticoagulant; GIB gastrointestinal bleeding; SSRI serotonin selective reuptake inhibitors; NSAIDs: non-steroidal anti-inflammatory drugs; PPI: proton pump inhibitors;

References

DDI-CDS About us



DDInteract SMART app demonstration



A Novel Approach to Estimating the Risk of Harm Due to Drug-Drug Interactions: An Exemplary Model with Common Mediations That Interact with Oral Anticoagulants

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Objective

• Model is called:

Methods

Results

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Figure	Pointeract REIMAGINEEHR	act Ri	sk Mod	el: Di Ant	splaying icoagula Risk for Anti	g Estimated Risk Int Drug Interacti idepressant and Pain Me
Ste	ep 1: Review Patient Profile	Step 2: C	Consider Treatm	ent Altern	atives	Step 3: Evaluate Results
	Patient currently on: apixaban 2.5 MG Start Date: Patient Age: 72 NSAIDs:None SSRI:None	Comp Lower Risk Non-E	oare Pain Ma	nageme	ent Options Higher Risk Oral NSAID	
	Risk Factors Previous GI bleed On Aspirin On Antiplatelet On Oral Corticosteroid	Select	NameCelecoxibDiflunisalNabumetoneIbuprofen	Cost \$\$\$ \$\$\$ \$\$\$ \$\$\$\$ \$\$\$\$ \$\$\$\$\$ \$	Risk Ratio for GI Bleeding 1.00 1.63 1.63 1.81	 1 Potential bleeds 99 People NOT expected to bleed
	Click to see more information on patient prescription.		 Diclofenac Mefenamic Acid Etodolac Indomethacin Sulindac Tolmetin 	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4.10 4.10 6.62 6.62 6.62 6.62	1 GI bleeds per 100 patients
		Conside to decre None	er adding (or starting) ease risk of bleeding	a proton pum	ap inhibitor (PPI)	
	ore Information What is a drug-drug in	teraction?			What is a Gastroi	intestinal bleed?

Conclusions

- > The OAC GI bleeding risk calculator incorporates patient-level risk factors to estimate bleeding risk
- > DDInteract allows clinicians to enhance share decision making when visiting patients on OAC that are receiving NSAIDs and/or antidepressants

• A literature research was conducted in PubMed to identify risk of GIB based on age, previous history of GIB, OAC (warfarin, apixaban, rivaroxaban, dabigatran and edoxaban), NSAIDs, antidepressants, glucocorticoids, antiplatelets, aspirin and proton pump inhibitors (PPI)

Bleeding risk was estimated by incorporating evidence across multiple studies using the following formula:

$$Y_i = \theta_0 + \theta_i X_i$$

Where X_i represents each risk factor and β_i represents exposure (0/1) for that risk factor. We estimated the likelihood of bleeding for hypothetical 100 using this formula: Probability of $GIB = \frac{e^{it}}{(1+eYi)}$.

Predicted GIB rounded to nearest whole number

ario to provide the estimation of the GIB

spirin GIB risk

proxen plus PPI oion and sertraline sk for bupropion and sertraline

k of GIB for Simulated Patient

Provide Feedback Print Summary ONS dications Shared Decision-Making Points											
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Figure 2C. Naproxen vs Diclofenac

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Figure 2E. Comparing Diclofenac and Bupropion / Sertraline



ofenac	to Apixaban										
es	Step 3: Evaluate Results										
ants	Estimated GI Bleeds in 100 Patients										
Dptions Higher Risk	Taking: Diclofenac										
Dral NSAID	* * * * * * * * * * * * * * * * * * *										
Ratio for Bleeding											
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Figure 2D. Multiple Medications

	Estimated GI Bleeds in 100 Patients																
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Con	npare	ed To	D: Na	apro	xen,	Bup	orop	ion a	and	Lans	sopr	azo	le				
 Potential bleeds with Diclofenac, Bupropion And Lansoprazole 3 More bleeds with Naproxen, Bupropion And Lansoprazole 94 People NOT expected to have bleeds 																	
These estimates include the reduction in risk when using a proton pump inhibitor (PPI).																	
Naproxen, Bupropion and Lansoprazole increase potential GI bleeds by 3 per 100 patients.																	

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Figure 2F. Comparing Diclofenac/ **Bupropion / Omeprazole**

Estimated GI Bleeds in 100 Patients							
Taking: Diclofenac, Bupropion and Omeprazole							
Compared To: Diclofenac, Sertraline and Omeprazole							
 Potential bleeds with Diclofenac, Bupropion And Omeprazole 2 More bleeds with Diclofenac, Sertraline And Omeprazole 95 People NOT expected to have bleeds These estimates include the reduction in risk when using a proton pump inhibitor (PPI). 							
Diclofenac, Sertraline and Omeprazole increase potential GI bleeds by 2 per 100 patients.							