SUMMARY OF ANTICOAGULATION LAB TESTS AT UWMedicine

<table>
<thead>
<tr>
<th>Description</th>
<th>Order Code</th>
<th>Specimen Collection</th>
<th>Availability</th>
<th>Turn-Around Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anti-Xa Based Tests</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>anti-Xa for heparin</td>
<td>HIXA</td>
<td>2ml or 3ml blue top</td>
<td>24/7</td>
<td>30min STAT upon receipt of sample at UWMC Lab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tube</td>
<td></td>
<td>4 hrs ROUTINE</td>
</tr>
<tr>
<td>anti-Xa for LMWH</td>
<td>LMWXA</td>
<td>2ml or 3ml blue top</td>
<td>24/7</td>
<td>30min STAT upon receipt of sample at UWMC Lab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tube</td>
<td></td>
<td>4hrs ROUTINE</td>
</tr>
<tr>
<td>anti-Xa for apixaban level</td>
<td>APIXN1</td>
<td>2ml or 3ml blue top</td>
<td>7am to 4pm daily</td>
<td>1hr STAT upon receipt of sample at UWMC Lab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tube</td>
<td></td>
<td>4hrs ROUTINE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Off hours with Lab Medicine Resident approval</td>
</tr>
<tr>
<td>anti-Xa for fondaparinux level</td>
<td>FNDXT</td>
<td>2ml or 3ml blue top</td>
<td>7am to 4pm daily</td>
<td>1hr STAT upon receipt of sample at UWMC Lab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tube</td>
<td></td>
<td>4hrs ROUTINE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Off hours with Lab Medicine Resident approval</td>
</tr>
<tr>
<td>anti-Xa for rivaroxaban level</td>
<td>RIVAR1</td>
<td>2ml or 3ml blue top</td>
<td>7am to 4pm daily</td>
<td>1hr STAT upon receipt of sample at UWMC Lab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>tube</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Off hours with Lab Medicine Resident approval</td>
</tr>
</tbody>
</table>
| Coagulation Based Tests          | dabigatran level | DABIGL | 2ml or 3ml blue top tube | 7am to 4pm daily | 1hr STAT upon receipt of sample at UWMC Lab
|----------------------------------|------------------|--------|--------------------------|-----------------|----------------------------------------------------------------
|                                  |                  |        |                          |                 | 4hrs ROUTINE
|                                  |                  |        |                          |                 | Off hours with Lab Medicine Resident approval
| direct oral anticoagulant screen | DOASP1           | 3ml or 5ml blue top tube | 24/7, sent as part of EMERGENCY STROKE PANEL | 30min STAT upon receipt of sample at UWMC Lab | 4hrs ROUTINE
| (combined thrombin time and direct Xa inhibitor screen) |                  |        |                          |                 |----------------------------------------------------------------
| direct thrombin inhibitor assay  | DTI              | 2ml or 3ml blue top tube | 24/7 | 1hr STAT upon receipt of sample at UWMC Lab | 4 hrs ROUTINE
| (plasma-diluted thrombin time)   |                  |        |                          |                 |----------------------------------------------------------------
| Factor X Tests                   | chromogenic factor X | CHRF10 | 2ml or 3ml blue top tube | 7am - 10pm daily | 1hr STAT upon receipt of sample at UWMC Lab
|                                  |                  |        |                          |                 | 4hrs ROUTINE
| factor X level                   | F10              | 2ml or 3ml blue top tube | 7:30am to 3pm Mon-Fri | 4 hrs ROUTINE |----------------------------------------------------------------

**Anti-Xa Activity (Heparin Activity)**

**a) Anti-Xa Activity for Heparin (HIXA)**

Used to monitor heparin activity and more accurately reflects the specific amount of heparin effect than PTT. [Click here](http://depts.washington.edu/anticoag/home) to see UWMedicine’s Heparin Infusion Using AntiXa Monitoring Protocol.

Therapeutic range for IV unfractionated heparin: 0.3-0.7 units/mL
b) Anti-Xa Activity for LMWH (LMWXA)

- routine monitoring is not recommended - there is no "therapeutic range" for LMWH
- dosing adjustments to reach a particular target range is not recommended
- no optimal target range is correlated with efficacy or clinical endpoints

- if measured, check peak anti-Xa level 3-4 hours after a dose
- observed peak anti-Xa levels for q12h dosing of LMWHs (e.g enoxaparin 1mg/kg q12h) = 0.5-1 units/mL
- observed peak anti-Xa levels for 1.5mg/kg q24h dosing of LMWHs (e.g enoxaparin 1.5mg/kg q24h) = 1-2 units/mL

- if measured, check trough anti-Xa level at end of dosing interval (just before next dose)
- expected trough anti-Xa levels = < 0.5 units/mL
- higher troughs suggest impaired clearance - an increased dosing interval may be indicated

APIXABAN ASSAY (APIXN1)

Uses chromogenic anti-Xa activity to extrapolate apixaban concentrations in ng/mL. Lower limit of measurable range is < 20 ng/mL

Measuring the presence of apixaban may be helpful to:

- assure absence of drug prior to invasive procedures
- assure absence of drug prior to use of thrombolytic therapy

Measuring presence of apixaban is less likely to be useful to:

- assess compliance
- assess possible over-anticoagulation in cases of hemorrhage
- assess possible under-anticoagulation in cases of treatment failure

For apixaban, no “therapeutic range” has been established. Observed peak and trough concentrations patients exposed to therapeutic dosing are described below*

<table>
<thead>
<tr>
<th>Apixaban dose</th>
<th>Observed Peak Concentration</th>
<th>Observed Trough Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTE Prophylaxis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5mg bid</td>
<td>41-146 ng/ml</td>
<td>23-109 ng/ml</td>
</tr>
<tr>
<td>VTE Treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5mg bid</td>
<td>30-153 ng/ml</td>
<td></td>
</tr>
<tr>
<td>5mg bid</td>
<td>59-302 ng/ml</td>
<td>11-90 ng/ml</td>
</tr>
<tr>
<td>10mg bid</td>
<td>111-572 ng/ml</td>
<td>22-177 ng/ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41-335 ng/ml</td>
</tr>
<tr>
<td>Stroke Prevention in AF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dosage</td>
<td>CFX Range</td>
<td>INR Range</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>2.5mg bid</td>
<td>69-221 ng/ml</td>
<td>34-162 ng/ml</td>
</tr>
<tr>
<td>5mg bid</td>
<td>91-321 ng/ml</td>
<td>41-230 ng/ml</td>
</tr>
</tbody>
</table>


**CHROMOGENIC FACTOR X (CHRF10)**

Used instead of INR to monitor warfarin in patients with antiphospholipid antibodies or other inhibitors that might interfere with INR, or in patients on concurrent direct thrombin inhibitors that might interfere with INR.

- Therapeutic range for warfarin: INR 2-3.5 ~ CFX 35% - 25%
DABIGATRAN ASSAY (DABIGL)

Uses plasma dilute thrombin time (see below) to extrapolate dabigatran concentrations in ng/mL. Lower limit of measurable range is < 50 ng/mL.

Measuring the presence of dabigatran may be helpful to:

- assure absence of drug prior to invasive procedures
- assure absence of drug prior to use of thrombolytic therapy

Measuring presence of dabigatran is less likely to be useful to:

- assess compliance
- assess possible over-anticoagulation in cases of hemorrhage
- assess possible under-anticoagulation in cases of treatment failure

For Dabigatran no “therapeutic range” has been established. Observed peak and trough concentrations in patients exposed to therapeutic dosing are outlined below.

<table>
<thead>
<tr>
<th>In patients receiving dabigatran 150mg bid</th>
<th>Observed Serum concentrations¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak values</td>
<td>64 – 443 ng/ml</td>
</tr>
<tr>
<td>Trough values</td>
<td>31 – 225 ng/ml</td>
</tr>
</tbody>
</table>


DIRECT ORAL ANTICOAGULANT SCREEN (DOASP1)

Used to rapidly identify patients who may be taking direct oral anticoagulants. Two tests are performed: the thrombin time (TTPAT) will detect direct thrombin inhibitors (units of measure in...
seconds) and the Direct Xa Inhibitor Screen (DOXAS) will detect the presence of absence of direct Xa inhibitors (reported as positive/negative). Available rapidly and sent as part of the Emergency Stroke Panel to screen for the presence of anticoagulants.

Measuring DOAC Screen may be helpful to:

- assure absence of drugs prior to invasive procedures
- assure absence of drugs prior to use of thrombolytic therapy

**DIRECT THROMBIN INHIBITOR ASSAY (DTI)**

*(Plasma-Diluted Thrombin Time)*

Used instead of aPTT to monitor injectable DTI therapy. Preferred over aPTT due to better sensitivity, and is not affected by antiphospholipid antibodies. Cost, turn-around time and 24/7 availability at UWMC are similar to aPTT.

- Therapeutic range for DTIs administered by continuous infusion
  - For argatroban: 60-100 seconds
  - For bivalirudin: 60-90 seconds
  - For lepirudin: 90-160 seconds

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**FONDAPARINUX ASSAY (FNDXT)**

Uses chromogenic anti-Xa activity to extrapolate serum concentrations of fondaparinux in mcg/mL.

There is no “therapeutic range” for fondaparinux, and dosing adjustments to reach a particular target or goal range are not recommended. Observed peak and trough levels from clinical trials, based on dose administered, are described below.

<table>
<thead>
<tr>
<th>Fondaparinux dose</th>
<th>Observed Peak concentrations (3 hours after dose)</th>
<th>Observed Trough concentrations (24 hours after dose)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTE Prophylaxis 2.5mg</td>
<td>Mean (1): 0.39 and 0.5 mcg/ml</td>
<td>Mean (1): 0.14 and 0.19 mcg/ml</td>
</tr>
<tr>
<td></td>
<td>Range (2): &lt; 0.042-1.161 mcg/ml</td>
<td>Range (2): &lt; 0.042-0.569 mcg/ml</td>
</tr>
<tr>
<td>VTE Treatment</td>
<td>Mean (3): 1.2 and 1.26 mcg/ml</td>
<td>Mean (3): 0.46 and 0.62 mcg/ml</td>
</tr>
</tbody>
</table>

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Fondaparinux dose | Observed Peak concentrations (3 hours after dose) | Observed Trough concentrations (24 hours after dose)
---|---|---
5mg (< 50kg) | Ranges (4): 0.685 - 1.522 mcg/ml | 0.242 - 1.003 mcg/ml
7.5mg (50-100 kg) | 0.206 - 2.95 mcg/ml | 0.048 - 2.023 mcg/ml
10mg (> 100 kg) | 0.582 - 1.713 mcg/ml | 0.081 - 1.041 mcg/ml

(1) mean concentrations in PENTHIFRA and PENTATHLON clinical trials, as noted in package insert
(2) range of concentration values from these trials (data on file, GSK)
(3) mean concentrations in MATISSE DVT and MATISSE PE trials, as noted in package insert
(4) range of concentration values from these trials (data on file, GSK)

**INR POINT-OF-CARE TESTING (Rapid INR; PRORPD)**

Whole blood INR testing using point-of-care devices is available for eligible patients at UW Neighborhood Clinics. Home INR testing devices using similar technology are available for eligible patients through certain third party companies.

UWMedicine Anticoagulation Services does not routinely use whole blood INR testing, and does not recommend whole blood INR testing in the following circumstances:

- patients initiating warfarin who have not yet reached steady-state and a stable maintenance dose
- patients with variable response to warfarin and/or frequent warfarin dose adjustments
- patients with goal INR upper limit greater than 3.5
- patients with known HCT < 30.0 (INRatio/Alere) or HCT < 25.0 (Coaguchek/Roche) or HCT > 55.0
- patients with ventricular assist devices (LVAD)
- patients undergoing weekly INR testing prior to/following cardioversion or ablation
- patients with end stage renal disease and/or on hemodialysis or peritoneal dialysis
- patients with chronic inflammatory conditions (eg: rheumatoid arthritis, Crohns disease, ulcerative colitis, hepatitis, diabetic nephropathy, glomerulonephritis)
- patients with acute inflammatory conditions (for example: acute viral infection, acute bacterial infection including sepsis)
- patients with advanced malignancy
- patients with known chronic elevated fibrinogen for any reason
- patients with known antiphospholipid antibodies (lupus anticoagulant, anti -beta-2-glycoprotein I, anticardiolipin antibody)
- patients exposed to an injectable direct thrombin inhibitor in the last 24 hours (argatroban, bivalirudin)
- patients exposed to an injectable heparin product in the last 48 hours (heparin, dalteparin, enoxaparin)
- patients exposed to an injectable factor Xa inhibitor in the that 5 days (fondaparinux)
- patients transitioning between warfarin and any direct oral anticoagulant (apixaban, dabigatran, edoxaban, rivaroxaban)
- self-testing in patients during the first three months of warfarin therapy
- self-testing in patients who are non-compliant with followup or non-adherent to medication administration
RIVAROXABAN ASSAY (RIVAR1)

Uses chromogenic anti-Xa activity to extrapolate rivaroxaban concentrations in ng/mL. Lower limit of measurable range is < 25 ng/mL

Measuring the presence of rivaroxaban may be helpful to:

- assure absence of drug prior to invasive procedures
- assure absence of drug prior to use of thrombolytic therapy

Measuring presence of rivaroxaban is less likely to be useful to:

- assess compliance
- assess possible over-anticoagulation in cases of hemorrhage
- assess possible under-anticoagulation in cases of treatment failure

For rivaroxaban no “therapeutic range” has been established. Observed peak and trough concentrations in patients exposed to therapeutic dosing are outlined below

<table>
<thead>
<tr>
<th></th>
<th>Stroke Prevention in AF (20mg daily)</th>
<th>VTE Treatment (20mg daily)</th>
<th>VTE Prevention (10mg daily)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak values</td>
<td>160 – 360 ng/ml</td>
<td>175 – 360 ng/ml</td>
<td>91 – 196 ng/ml</td>
</tr>
<tr>
<td>Trough values</td>
<td>4 – 96 ng/ml</td>
<td>19 – 60 ng/ml</td>
<td>1.3 – 38 ng/ml</td>
</tr>
</tbody>
</table>


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http://depts.washington.edu/anticoag/home/content/uw-medicine-monitoring-antithrombotic-agents