**WEIGHT-BASED DOSING VS STANDARD CARE NOMOGRAM FOR IV HEPARIN**

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**Introduction**

IV unfractionated heparin is a high-risk anticoagulant medication that binds to anti-thrombin, inactivating Factor IIa and Factor Xa, and prevents the conversion of fibrinogen to fibrin. Based on the Institute of Safe Medication Practice (ISMP), unfractionated heparin is considered a high-alert medication due to its significant risk of causing life-threatening bleeding or thrombosis. Since heparin is on the list of high-alert medications, cautious prescribing, dispensing, administering, and monitoring of the medication is important to prevent fatal adverse drug events.

At Kern Medical, we have two heparin protocols for specific indications: venous thromboembolism and acute coronary syndrome. In the heparin protocols, we provide targeted therapeutic range, initial dosing recommendations, dosing adjustment recommendations, and monitoring parameters. Based on the indication, prescribers would order the specific heparin protocol and nurses would follow the outlined steps for heparin management stated on the protocol while clinical pharmacy provides monitoring and dosing recommendations for all patients on IV unfractionated heparin.

Prior to 2016, heparin dosing was based on standard care nomograms. However, studies showed that weight-based nomograms may be more effective than the standard care nomograms. In July 2017, a new heparin protocol was implemented to change IV heparin dosing from a standard care nomogram to a weight-based dosing nomogram.

**Objective**

The main objective is to evaluate the effectiveness of weight-based dosing nomogram compared to the standard care nomogram for IV unfractionated heparin.

**Methods**

- Retrospective, chart review study
- Data for Standard Care Nomogram was collected from January 2016 to June 2016
- Data for Weight-based Dosing Nomogram was collected from July 2017 to November 2017.
- Inclusion Criteria: IV heparin indicated for venous thromboembolism or acute coronary syndrome, use of targeted aPTT listed in protocol, and use of heparin flow sheet
- Exclusion Criteria: Different target aPTT level in each protocol, indications that are not included in the protocol, lack of documentation, and discontinuation of IV heparin after one dose
- Used heparin flowsheet and tracked time on drip and time therapeutic on drip

**Results**

The weight-based dosing nomogram has older patients compared to the standard care nomogram. However, the weight-based dosing nomogram group weighed less compared to the standard care nomogram (Table 1). The weight-based dosing nomogram and standard care nomogram had similar amount of patients with acute coronary syndrome and pulmonary embolism. However, the standard care nomogram had more patients with deep vein thromboembolism compared to the weight-based dosing nomogram (Figure 1).

**Table 1. DEMOGRAPHICS**

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<tr>
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<th>Standard Care Nomogram</th>
<th>Weight-based Dosing Nomogram</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>Mean: 50.8 Range: 23-90</td>
<td>Mean: 57.4 Range: 26-91</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>Mean: 80.7 Range: 48-198</td>
<td>Mean: 80.6 Range: 52.2-122.5</td>
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**Table 2. EFFICACY**

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<thead>
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<th>Standard Care Nomogram (N=30)</th>
<th>Weight-based Dosing Nomogram (N=23)</th>
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<tr>
<td>Total hours on drip (Mean)</td>
<td>60.6 (14-283)</td>
<td>52.98 (6-236.5)</td>
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<tr>
<td>Total hours therapeutic on drip (Mean)</td>
<td>29.8 (0-128)</td>
<td>32.45 (0-160.17)</td>
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<td>Mean % of time in therapeutic range</td>
<td>41.5%</td>
<td>57.0%</td>
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<td>Mean time to first therapeutic aPTT (hours)</td>
<td>16.4 (3-79)</td>
<td>13.28 (6-32)</td>
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**Conclusions**

After assessing the efficacy of the standard care nomogram and comparing it to the weight-based dosing nomogram implemented in the new IV heparin administration protocol, we found that the weight-based protocol had more therapeutic aPTT levels compared to the standard care nomogram. It also takes less time for patients to reach therapeutic aPTT compared to the standard care nomogram.

However, despite these differences, there are several limitations to the study. With the advent of oral direct acting anticoagulants (DOACs) and low molecular weight heparins (LMWH), heparin is not as frequently used as it once was, which led to relatively small sample size of patients in each arm. Furthermore, the data collection from the Standard Care arm came from a routine medication use evaluation (MUE) and lacked some statistical data to allow for a statistical comparison between groups. A third limitation is that safety measures were not assessed in the study so we could not determine if one nomogram was associated with more adverse events than the other. Another limitation is that when the new heparin protocol was rolled-out hospital-wide, staff may have not received adequate education or training to the protocol changes. Since heparin infusions are infrequently utilized, staff training and competency assessments are likely warranted. There were cases of incorrect initial dosing and dosing adjustments when using the weight-based dosing protocol that may be due to some degree of unfamiliarity with new protocol. This improper use of the weight-based dosing nomogram possibly influenced the data and underestimated the efficacy of the weight-based data.

Despite the limitations, after changing the IV heparin protocol to weight-based, there are numerical improvements in total hours in therapeutic aPTT while on the heparin drip and time to first therapeutic aPTT. Overall this change in the IV heparin protocol suggests a trend towards improvement in patient outcomes. However, future research is necessary and planned to further assess safety and efficacy of heparin infusion protocols.

**References**