

## Patient Variables in PT/INR Testing

There are many factors that can influence the results of the PT/INR tests so that they do not reflect the patient's usual coagulation state. Coagulation tests are susceptible to errors introduced by suboptimal specimen quality because of a number of factors such as blood collection technique, labile state of several coagulation proteins, and laboratory transportation factors. In order to get acceptable accuracy it is important to understand and control these factors as much as possible.

### Factors that influence coagulation test results:

- **Age and Gender:** Age specific reference ranges are critical for correct interpretation of coagulation data. Bleeding time declines with age and many coagulation factors increase with age as do markers of coagulation activation. Age and gender can also influence platelet function. Females tend to have longer bleeding times than males.<sup>1,2</sup>
- **Blood Type:** Type O individuals have significantly lower von Willebrand factor and factor VIII activity than subjects with type A, B, or AB. This causes increased bleeding and clotting times.<sup>3</sup>
- **Within day variation:** Incidences of platelet activation are highest in the mornings, resulting in increased coagulation activation.<sup>4</sup>
- **Seasonal Variation:** Increased coagulation activity has been described in cold weather.<sup>5</sup>
- **Intraindividual variability:** Many coagulation analytes are less precise than other analytes and thus can give variable results within the same individual.
- **Diet, alcohol and smoking:** Cardiac risk factors can increase coagulation factor levels/activation. Smoking elevates plasma fibrinogen. Von Willebrand factor, thrombin generation and platelet activation may all have an effect causing variability. Moderate ethanol intake inhibits platelet reactivity and increases fibrinolysis and INR.<sup>6,7</sup>
- **Medications:** A number of other medications, including hormone replacement therapy, selective estrogen receptor modifiers and oral contraceptives can alter coagulation and raise the INR.<sup>8</sup>  
In addition, non-steroidal anti-inflammatory drugs, antibiotics and fluoroquinolones can also alter the INR.<sup>9,10</sup>
- **Menstrual cycle, pregnancy:** Significant hormonally-determined changes in coagulation factors, inhibitors, fibrinolysis and activation markers must be considered during interpretation of the results.<sup>11</sup>
- **Diseases:** States which lead to anemia, polycythemia or hemolysis or uremia can also interfere with coagulation tests.<sup>12</sup>
- **Physical and emotional stress:** These are commonly associated with increased coagulation and platelet activation.<sup>13</sup>
- **Posture:** Values can change from supine to upright positions due to the shift of water and subsequent reduction in plasma volume. Hence standardization of posture is recommended.<sup>13</sup>
- **Venous occlusion:** Traumatic or prolonged phlebotomy accentuates the hemostatic activation, producing artificially altered coagulation times.<sup>14</sup>
- **Vitamin K:** Certain fat substitutes in some snack-items contain unspecified amount of vitamin K. Green, leafy vegetables and green tea also contain high levels of vitamin K. This can have an impact on serum vitamin K levels and the INR can drop as a result.<sup>15</sup>
- **Alternative Medicines:** According to the AANA, American Association of Nurse Anesthetists, certain herbal drugs can cause interference in coagulation cycles, falsely elevating the INR.<sup>16</sup>
- **Anticoagulant therapy:** It is of utmost importance to bear in mind that patients on heparin will show inaccurate INR results.

While certain pre-analytical factors are not entirely controllable, every effort must be made to ensure that most conditions have been stable for a period of time. Patient preparation and blood collection should be standardized according to the guidelines.

**For further information and assistance  
please call HemoSense Technical Support  
1-877-436-6444**

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HemoSense, Inc.  
651 River Oaks Parkway  
San Jose, CA 95134  
1-877-436-6444 toll free  
408-719-1393 tel  
408-719-1184 fax  
[www.hemosense.com](http://www.hemosense.com)

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