

Point Of Care Anticoagulation Monitoring In Pediatric Patients

The relatively recent successes in tertiary care of critically ill children have increased the frequency of long term secondary complications resulting in an increasing use of warfarin for both primary and secondary prophylaxis.^{1,2} Warfarin can be used safely if administered and monitored carefully. Monitoring oral anticoagulation therapy (OAT) in children is difficult and requires close observation with frequent dose adjustments. In contrast to adults, only 10 to 20% of children can be safely monitored monthly, hence require higher frequency of testing.^{6,1}

Whole blood monitors use various techniques to measure the INR (International Normalized Ratio). These devices have been shown to be acceptable and reliable for use in the outpatient laboratory and in the home setting.

The major advantages identified by patient families included

- Reduced trauma from venipunctures.
- Smaller sample volume compared to phlebotomy.
- Minimal interruption of school and work.
- Ease of operation, and portability.
- Immediate result as compared to long waits to get results from lab.^{3,4,5}

There are many important variables that make the use of anticoagulant drugs in pediatric patients, different from the use of the same drugs in adults. These variables contribute to the need for more frequency of testing and are listed as below ¹:

- The epidemiology of diseases in pediatric patients is vastly different from that seen in the adults.
- The response to anticoagulant drugs may be different in children.
- The distribution, binding and clearance of anticoagulant drugs are age dependent.
- The frequency and type of inter-current illnesses and concurrent medications varies with age.
- There are no pediatric specific formulations of anticoagulant drugs, making accurate, reproducible, weight adjusted dosing difficult, thus impacting the ability to monitor.
- Dietary differences make the use of oral anticoagulant drugs particularly difficult, especially in infants because infant formulas have different levels of vitamin K.
- Compliance issues are vastly different in pediatric populations,
 - a. Younger population does not understand the need for anticoagulation therapy.
 - b. Adolescents who intellectually may comprehend but are emotionally unable to cooperate, and
 - c. Children in dysfunctional families experiencing non-compliance due to inadequate parenting

Most children taking anticoagulants are receiving multiple medications, both on a long term basis, to treat their primary problems, or intermittently, to treat acquired problems (eg infections). These medications influence the dose requirements for OAT.⁷

The most commonly used medications in children that affect the INR are listed in Table 1.⁸

TABLE 1

Commonly Used Drugs in Children That Affect Their INR Values

Drug	Effect of INR
Amiodarone	Increase
Aspirin	Increase or no change
Amoxicillin	Slight increase
Cefaclor	Increase
Carbamazepine	Decrease
Phenytoin	Decrease
Phenobarbital	Decrease
Cloxacillin	Increase
Prednisone	Increase
Trimethoprim	Increase
Ranitidine	Increase

Conclusion:

- More frequent INR measurements lead to an increased percentage of INR values within the target range and the use of whole-blood monitors may assist in maintaining INR values in the target ranges in children.
- The proven reliability and accuracy of the results obtained from whole blood monitors and the short turn around time for physicians contribute to better care.
- The parent directed or self-managed adolescent patients tend to test themselves more frequently than patients who only use an anticoagulant clinic, which can improve clinical outcome.
- Many families prefer the portable monitor because they are emotionally less traumatic for their child, eliminating laboratory waiting room anticipation for toddlers.
- Other advantages include minimal interruption of work and school, ease of use and sample size.

References:

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