

## 2.08 NON-INVASIVE MONITORING

### Introduction

Noninvasive monitoring provides objective data that, when coupled with clinical assessments, is helpful in making therapeutic and diagnostic decisions. Knowledge of noninvasive monitoring techniques is necessary for accurate interpretation of the data generated. While the appropriate use of noninvasive monitoring is not controversial, there is increasing recognition of the importance of being selective in choosing the correct type and level of monitoring. Indiscriminant monitoring can lead to alarm fatigue, medical errors, patient harm, and may unnecessarily prolong the length of the hospitalization. Consequently, pediatric hospitalists should understand the various types of noninvasive monitoring techniques available, as well as the indications for and limitations of each.

### Knowledge

Pediatric hospitalists should be able to:

- List the different types of noninvasive monitoring available and describe the indications for each.
- Compare and contrast the types and level of monitoring available on the inpatient ward compared to the intensive care unit or other care settings, attending to local context.
- Describe the proper procedures for common noninvasive monitoring techniques, including vital sign measurement, cardiopulmonary monitoring, pulse oximetry, capnography, and cardiac telemetry.
- List the limitations or complications associated with common noninvasive monitoring techniques, such as inadequate waveform for pulse oximetry.
- Compare and contrast the indications for cardiopulmonary monitoring and cardiac telemetry.
- Discuss the importance of accurate and timely interpretation of information generated by monitoring devices, as well as the importance of an immediate response when abnormal data is noted.
- Compare and contrast patients who need ongoing monitoring versus discontinuation of monitoring based on clinical course and established evidence when available.

### Skills

Pediatric hospitalists should be able to:

- Select the type and level of monitoring needed based on the clinical situation and medical complexity of the patient in

order to provide necessary data while limiting false alarms.

- Identify the need for a higher or lower level of monitoring as changes in the clinical status occur, including when transfers between clinical settings are indicated as a result.
- Ensure proper placement of monitoring equipment and execution of proper technique (including manual blood pressure measurement), in order to obtain accurate data.
- Interpret monitor data and respond with appropriate actions.

### Attitudes

Pediatric hospitalists should be able to:

- Recognize that not all patients require intense monitoring and promote the judicious use of monitoring based on clinical assessments of patients.
- Recognize the importance of effective communication with patients and the family/caregivers regarding the use or discontinuation of noninvasive monitoring and how it relates to the care plan.
- Acknowledge the value of collaboration with nurses, respiratory therapists, subspecialists, and other healthcare providers to determine the appropriate level of monitoring and the corresponding care setting, especially when clinical changes occur.

### Systems Organization and Improvement

In order to improve efficiency and quality within their organizations, pediatric hospitalists should:

- Lead, coordinate, and participate in the development and implementation of cost-effective, safe, evidence-based procedures and policies related to noninvasive monitoring, including implementation of strategies to limit alarm fatigue.
- Work with hospital administration, biomedical engineering, and others to obtain high quality and reliable monitoring equipment.
- Lead, coordinate, or participate in the development and implementation of a system for review of family/caregiver and healthcare provider satisfaction with monitoring strategies.

### References

1. Rives WL, Carlson D. Noninvasive monitoring. In: Rauch DA, Gershel JC, eds. *Caring for the Hospitalized Child*. 2<sup>nd</sup> ed. Itasca, IL: American Academy of Pediatrics, 2017:185-188.
2. Paine CW, Goel VV, Ely E, et al. Systematic review of physiologic monitor alarm characteristics and pragmatic interventions to reduce alarm frequency. *J Hosp Med*. 2016;11(2):136-144. <https://doi.org/10.1002/jhm.2520>.