Implementing Computerized Decision Support for Ordering Titratable Drugs in a Pediatric Critical Care Unit
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Introduction: In pediatric patients, titratable infusions often do not follow the standard concentrations used for adults. Dosing is usually weight based and for neonates fluid volumes are often restricted to prevent fluid overload. Thus, pediatric infusion bags are typically custom concentrations tailored to the needs of an individual patient.

The physician normally specifies the dose, e.g., 5 mcg/kg/min and the rate at which the dose should be delivered, e.g., 1 ml/hr. The pharmacist then calculates the appropriate drug concentration for the specified dose and rate. If the calculated concentration exceeds practice guidelines, the physician must be contacted to adjust the order. This could result in a delay in the initiation of therapy.

In preparing to implement Vanderbilt’s provider order entry system, WizOrder [1], in the Pediatric Critical Care Unit (PCCU), we recognized an opportunity to reduce the complexity and potential for errors when prescribing infusions.

Implementation: A team of pharmacists examined how current manual calculations (including dose range and concentration checking) could be automated during order entry. An infusion calculation module was developed for 38 titratable infusions. In addition to calculating infusion mixture and checking dose and concentration, the infusion calculator also limits diluent selection to drug-appropriate solutions.

To place an initial infusion order, the physician specifies the dose and either the hourly infusion rate or concentration through an html-based interface (Figure 1). Both suggested and mandatory infusion concentration limits are incorporated into the program. Concentrations, whether calculated or defined, that are above the suggested concentration limit but under the maximum concentration limit are orderable only if the patient is identified as being fluid restricted. Both overdose and underdose checks are performed. If the ordered dose is greater than the defined maximum, the physician must either revise the ordered dose or provide a reason for exceeding maximum dose recommendations.

When an existing infusion order is modified, a similar screen is used by the physician to change the dose but keep the same concentration since a bag with that concentration is already being used. The system also provides a printable customized drip rate chart. These drip rate charts ease the rapid escalation or de-escalation of doses that often occurs during crisis situations.

Once an order is complete, it is sent electronically to the pharmacy system and processed online. Since the infusion mixture instructions are part of the order, the pharmacist is relieved of performing the mixture calculations. The pharmacist evaluates if the mixture instructions are correct and ensures that the order contents conform to the specified instructions.

Discussion: We are currently evaluating this intervention by examining its impact on four roles: the patient, the physician, the nurse, and the pharmacist.

For the patient, we know that prior to implementation of this decision support a large number of infusion orders were verbally communicated in an abbreviated, incomplete fashion to nurses and pharmacists. Our module proactively ensures complete orders with correct calculations at each dose adjustment and provides dose and concentration checking at the time of order entry.

For the clinical staff, we are addressing workflow issues by facilitating automated order customization and documentation generation as well as improving the quality and consistency of communication from physicians to nurses and pharmacists.

References: