Title: A simulation study to evaluate the clinical workflow for administering medication infusions in a neonatal intensive care unit using a maternal & new-born electronic health record.

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Aims: This study was conducted to evaluate the administration phase of the medication use process for infusions in a neonatal intensive care unit using an electronic health record (EHR).

Methods: Thirty-one NICU nurses participated in simulation sessions between March-April 2017. Each participant was asked to simulate the labelling and administration of five infusions. Each simulation involved the review of the prescription on the screen, cross-checking against medication protocols, preparing syringe labels and programming the infusion pump. Quantitative data were gathered on identified errors. Qualitative data were collected via a post-simulation survey to explore participants' perceptions of the administration process. Errors were classified using the NCC-MERP classification system.

Results: Out of 155 prescription orders, 31 had either a programming error (n=11, 7%) or wrong labelling parameters (n=12, 7.7%) or both (n=8, 5.2%). All the syringe labels had one or more missing labelling parameters. 89% of programming errors belonged to NCC-MERP category C, or D. More than half (52.6%, n=10) of the infusion orders with programming errors led to a 10% or greater deviation from the prescribed dose and 70% (n=7) of these deviations were due to programming the wrong concentration. Logistic regression analysis showed that labelling errors were associated with subsequent programming errors.

Conclusion: Transcribing labels from onscreen information is an error-prone process. Printing infusion labels generated from the EHR prescription would be an effective strategy to reduce this risk. EHR infusion prescriptions should provide sufficient information to guide nursing staff through the preparation and administration process. Integration of the EHR with infusion pumps could remove the risk of pump programming errors. Resulting from the research, at the proof of concept stage, a prescribed concentration and a printer with the EHR were included. Simulation is a useful technique to examine medication use processes and identify potential risk before implementation of health information technology.

Keywords: Clinical simulation, Evaluation of clinical workflow, Health information technology, Patient safety, Electronic Health record.

Key Sentence: Clinical simulation is a useful technique to examine error-prone processes and identifying potential risk before implementation of health information technology.