



**National
Association of
Neonatal
Nurses**

Medication Safety in the Neonatal Intensive Care Unit

Position Statement #3060

NANN Board of Directors
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The incidence and consequences of medication errors in the neonatal intensive care unit (NICU) demonstrate the importance of established safety procedures and guidelines for the prescribing, dispensing, and administration of medications. As the professional voice of neonatal nurses, the National Association of Neonatal Nurses (NANN) recommends that appropriate measures and education be made available to everyone who prescribes or administers medications in the NICU and that members be proactive in participating in the development and implementation of safe medication practices in the NICU.



Association Position

Procedures, safeguards, and strategies that ensure accurate administration of medications to the smallest and most fragile patient populations are at the forefront of concerns for bedside practitioners in the NICU setting. Healthcare providers need to ensure that drug therapy achieves maximum benefits and avoids therapeutic disasters. Organizational, environmental, and human factors should be taken into consideration when policies and procedures for medication administration and safety are developed.

Background and Significance

Despite efforts in the United States to standardize a definition of medication error, various definitions are used in the literature, in national organizations, within hospitals, and among healthcare professionals. For the sake of simplicity in this position statement, a *medication error* is any “preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional” (National Coordinating Council for Medication Error Reporting and Prevention, 2014). Nationally, the hospitalized patient experiences, on average, at least one medication error each day (Aspden, Wolcott, Bootman, & Cronenwett, 2007). The true incidence of medication errors is difficult to determine, in part because of the various medication error definitions used and the multiple methods of data collection techniques employed in published research studies. In addition, voluntary reporting and retrospective reviews identify only a fraction of all medication error events.

Although establishing the frequency of medication errors in the NICU is difficult, published studies indicate that medication errors in the NICU are common, ranging from 13 to 91 medication errors per 100 NICU admissions (Kaushal et al., 2001; Ross, Wallace, & Paton, 2000; Simpson, Lynch, Grant, & Alroomi, 2004) to approximately 5% of all medication orders (Dabliz & Levine, 2012). In addition, NICU patients are more likely to experience a medication error than other hospitalized patients (Sharek et al., 2006) and to experience more harm when a medication error does occur. The incidence of medication errors occurring during the care of preterm infants (24 to 27 weeks gestational age) is reported to be as high as 57%, compared with 3% in the care of full-term infants (Kugelman et al., 2008). Medication errors occur eight times more often in NICU patients than adult patients. These data demonstrate that NICU patients require additional systemwide safeguards against medication errors, and NICU healthcare providers must be especially vigilant when working with medications.

Three important variables make the medication administration process in the NICU uniquely and inherently risky: the vulnerable nature of NICU patients, the complexity of the medications used, and the challenges of the NICU environment. Patients in the NICU are undergoing maturational changes in drug-sensitive areas such as renal, gastrointestinal, and hepatic systems, resulting in variable responses to drugs and the disease process. Medications are

universally weight based, requiring calculations for each dose. But some of the drugs used also are based on gestational age, making it even more complex. NICU patients often have long hospital stays, which increases exposure to medications and medication errors. In premature infants, the immaturity of developing body systems affects the absorption, distribution, metabolism, and excretion of drugs, and therefore, an exponential risk for medication errors is present (Antonucci & Porcella, 2012; Stavroudis, Miller, & Lehmann, 2008).

NICU patients are nonverbal and unable to actively participate in the patient identification process, which increases the likelihood of wrong-patient errors. Wrong-patient errors are common, with an incidence rate of 25% of reported medication errors (Dabliz & Levine, 2012). The increased incidence of multiple gestation births has also contributed to the misidentification of NICU patients (Gray & Goldmann, 2004). In addition, keeping identification (ID) bands in place on small patients can be challenging because of their fragile skin, their small wrist and ankle size, and the need to remove the bands for intravenous (IV) line placement. One research study documented the lack of ID bands in 20%–80% of NICU patients (Gray et al., 2006.).

Medications commonly used in the NICU are an independent risk factor for medication errors. These medications often are either unlicensed (i.e., not registered) or have off-label uses. Conroy (2011) found a higher incidence of medication errors with unlicensed drugs. In 2008, the Institute for Safe Medication Practices (ISMP) published a list of high-alert medications that can cause significant patient harm when used in error. In a recent study, administration of the high-alert medications described by ISMP has been shown to be a risk factor for harm in neonatal patients (Stavroudis et al., 2010). Because very few studies involving many medications commonly used in neonates have been conducted, information about dosing and anticipated side effects is limited and variable. The medications dispensed are often adult-strength, requiring complex, multistep dilutions prior to dispensing or administering them, which increases the opportunity for errors. Multiple neonatal and pediatric medications require less than 0.1 mL of stock solution to prepare the dose, leading to a higher incidence of error (Uppal, Yasseen, Seto, & Parshuram, 2011).

To combat these complex medication error issues, the ISMP and the Vermont Oxford Network (VON) collaboratively developed a list of standard concentrations of neonatal drug infusions, with the goal of decreasing medication errors and stimulating the development of standardized infusion-device drug libraries (ISMP & VON, 2011). In 2010, the World Health Organization (WHO) published its *Model Formulary for Children*, which built on its 2007 publication, *Model List of Essential Medicines for Children*. This effort was undertaken to provide the best information to healthcare providers administering medications to children (WHO, 2010). Of note, 80% of drugs used in the NICU have no safety or prescribing information for use in this population (Antonucci & Porcella, 2012).

The complex, high-stress NICU environment increases risk to patients. These environmental factors include a demanding workload, unpredictable workflow and quickly changing patient acuity, poor lighting and loud noise, and frequent distractions and interruptions. A number of studies demonstrate that distractions and interruptions during the medication administration process are a major contributing factor in medication errors (Beyea, 2007; Pape et al., 2005; Sumwalt, 1993; Vecchione, 2003). The NICU meets the criteria as a high-risk environment, which requires specialized attention to reduce the risk of medical error (Dabliz & Levine, 2012; Institute of Medicine, 1999). In addition, human factors such as fatigue, burnout and complacency, having a false sense of security with technology, poor team communication, and intimidation may also contribute to medication errors (Samra, McGrath, & Rollins, 2011).

The NICU structure and work flow process is an important variable, including human factors and workplace hazards (Samra et al., 2011). Medication administration can be compromised on multiple levels, such as delivery of medications to the wrong patient, dispensing errors, and the design and malfunction of medical devices. At the organizational level, staffing levels, look-alike and sound-alike drug names, inadequate education for staff, cost-cutting measures, poor communication, and the environmental design of the unit can contribute to medical errors (Chuo & Lambert, 2011; Handyside & Suresh, 2010).

Similar to medication error incidence, it is difficult to determine the most common type of medication error in the NICU because published research results vary. This variation is likely due to the multiple definitions of harm and the varied ways to report near misses (Stavroudis et al., 2010). It also may be due to the different roles of NICU staff members. Prescribers are more likely to make an error when ordering a medication. Numerous studies identify administration errors as the most common errors, specifically misprogramming of the syringe pump (Chuo, Lambert, & Hicks, 2007; Ligi et al., 2008). The most common error for prescribing providers is in dose calculation; for nurses, wrong time; and for pharmacists, reviewing prescriptions and diluting medications (Antonucci & Porcella, 2012). Other studies identify dosing errors during the ordering phase as the most common medication error (Kaushal et al., 2001; Simpson et al., 2004). Pharmacists may make dispensing errors and have difficulty diluting stock solutions to minute amounts; NICU nurses must consider the rights of medication administration and are in an important position to identify potentially adverse prescribing and dispensing errors.

Although few trials exist in the literature comparing the effectiveness of preventive strategies, the majority of medication errors that occur in the NICU are preventable (Frey et al., 2000; Sharek et al., 2006). Prevention methods cited in the literature include systemwide changes such as computerized physician order entry (Kaushal et al., 2001; Taylor, Loan, Kamara, Blackburn, & Whitney, 2008), the involvement of pharmacists in medication order review and on patient care rounds (Simpson et al., 2004), the use of smart pumps for medication administration (Lemoine & Hurst, 2012), the standardization of processes, and

being aware of patient safety advances within other industries (Gray & Goldmann, 2004). An example of patient safety is the barcode system for medication administration, which has been found in one study to decrease preventable adverse drug events by 47% (Morriss et al., 2009). We must support the promotion of a safety culture by improving communication among NICU staff and creating an environment that includes medication error reporting, monitoring, tracking, and prevention management, with the potential for creating new strategies to improve existing practice (Samra et al., 2011).

Medication safety can be enhanced by technology (e.g., bar code medication administration and prescriber order entry); hardwired through the use of checklists, standard formularies, and standard drug concentrations; and improved by pharmacists on bedside rounds. There must be the involvement of a multidisciplinary NICU team, with a mindful, educated NICU nurse who is aware of the unique risk factors that exist for the neonate and the high potential that exists in the NICU for medication errors. Technology alone will not prevent medication errors. Rather, it is the combination of the alert NICU nurse, a dedicated NICU team, the appropriate use of technology, and a safety-conscious NICU environment that offers the most comprehensive strategy for preventing medication errors.

Recommendations

The Joint Commission delineates specific hospital-wide medication safety standards, which are applicable to the NICU (www.jointcommission.org). In addition to these standards and any applicable state standards, NANN recommends the following practices to those caring for the neonatal population.

Adoption of a Systems Approach to Medication Safety

1. Preventing medications errors requires a systemwide, multidisciplinary, patient-centered effort to create a culture of safety and identify and correct system and individual failures (Campino, Lopez-Herrera, Lopez-de-Heredia, & Vallis-i-Soler, 2009; Dabliz & Levine, 2012).
2. Medication errors, potential errors (near misses), adverse drug events, and systems' issues are reported in a confidential, nonpunitive environment. A system-based approach to error investigation is a priority with corrective action taken to reduce recurrences (Thomas, Cordonnier-Jourdin, Benhamou-Jantelet, Divine, & Le Louet, 2011).
3. Medication safety is included as part of the NICU performance improvement plan, including root cause analysis (retrospective investigation of a sentinel event by a multidisciplinary team using observation, interviews, and chart reviews) and development of action plans that correct systems' flaws.
4. Clear, specific policies and procedures that outline how medications are ordered, processed, dispensed, administered, and monitored have been established and are accessible to all healthcare professionals involved in the medication use process in the NICU.

5. All technology that is implemented in the NICU to improve medication safety is evaluated in a multidisciplinary fashion. All aspects of the technology, including its efficacy in enhancing safety and making a positive impact on work-flow issues, are evaluated.
6. As part of creating a culture of safety in the NICU, all staff members are encouraged to report medication errors or potential errors, engage in improving the medication use process, and regularly share results of medication safety efforts.
7. The nursing staff is involved in the development, implementation, and evaluation of medication delivery systems used in the NICU.
8. All staff members charged with writing for and administering medications are familiar with and have access to error tracking and reporting systems. An open, just culture for the reporting and reviewing of medication errors is encouraged (Stucky, American Academy of Pediatrics Committee on Drugs, & American Academy of Pediatrics Committee on Hospital Care, 2003).

Education

1. Medication safety is identified as a core competency for all staff in the NICU and is included in the orientation education given to all new hires in the NICU and in ongoing annual education. Medication safety education includes medication administration best practices and policy review and may be provided in a variety of modalities including written, lecture, simulation, procedural review, and readily available medication reference material. Also, medication safety efforts should regularly be shared with all staff, with a focus on problem prone processes and prevention efforts.
2. NICU staff members remain current and proficient in the use of medication delivery devices (e.g., infusion pumps, syringe pumps) and are aware of the potential for errors with these devices (American Society of Health-System Pharmacists, 2008; Stucky et al., 2003).
3. All healthcare providers who participate in the medication use process participate in educational programs in calculating, prescribing, preparing, and administering medications for neonates (Stucky et al., 2003).
4. Know the diagnosis, patient, and intended pharmacologic recommended treatment, including both pharmacokinetics and pharmacodynamics (Dabliz & Levine, 2012).

NICU Environment and Medication Safety

1. The specific environment in which medications are prescribed, prepared, and administered is evaluated, with a focus on lighting, available work space, control of distractions, availability of reference materials, and availability of frequently used supplies.
2. Adequate staffing levels are followed, with acceptable workload and, schedule permitting, sufficient rest to prevent fatigue errors (Dabliz & Levine, 2012; Kenyon, Gluesing, White, Dunkel, & Burlingame, 2007).

3. Staff members attempt to reduce distractions during all phases of the medication process by avoiding interrupting healthcare providers during medication ordering and other nurses during medication administration.

Medication Ordering, Dispensing, and Administration Practices

1. System processes are in place, including medication preparation by pharmacy, standard concentrations of medications whenever possible, limited use of high-alert medications and small volume doses when possible, computerized order-entry systems, barcode medication verification with limitation of work-around processes, and limited interruptions during patient handoff (Jozefczyk et al., 2013; Morriss, Abramowitz, Carmen, & Wallis, 2009; Morriss et al., 2009, 2011).
2. All medications and calculations are checked independently by another licensed professional prior to administration (American Society of Health-System Pharmacists, 2008; ISMP, 2003; Stucky et al., 2003).
3. Standard references for use in drug evaluation, selection, and use have been identified (American Society of Health-System Pharmacists, 2008; Eisenhut, Sun, & Skinner, 2011; Stucky et al., 2003).
4. Availability of a reliable and standardized method to obtain pediatric and neonatal drug reference information, which would ideally be available electronically (De Giorgi, Guignard, Fonzo-Christe, & Bonnabry, 2010).

Conclusions

NICU nurses care for a uniquely vulnerable population of patients who require additional safeguards to ensure that medication errors are prevented and harm mitigated. Medication administration in the neonatal population is a high-volume, high-risk activity with a narrow margin of error between therapeutic benefits and lethal consequences. Working in a multidisciplinary and collegial fashion, NICU healthcare professionals should strive to develop standardized safety practices in the prescribing, dispensing, and administration of medications in the NICU. Along with these efforts, a robust plan for monitoring and reducing medication errors is critical.

References

- American Society of Health-System Pharmacists. (2008). Proceedings of a summit on preventing patient harm and death from intravenous medication errors. (2008). *American Journal of Health-System Pharmacy*, 65, 2367–2379.
- Antonucci, R., & Porcella, A. (2012). Current pharmacotherapy in the newborn. *Research and Reports in Neonatology*, 2012(2), 85–94.
- Aspden P., Wolcott, J. A., Bootman, J. L., & Cronenwett, L. R. (Eds.). (2007). *Preventing medication errors*. Washington, DC: The National Academies Press.
- Beyea, S. C. (2007). Distractions, interruptions, and patient safety. *AORN Journal*, 86(1), 109–112.

- Campino, A., Lopez-Herrera, M. C., Lopez-de-Heredia, I., & Valls-i-Soler, A. (2009). Educational strategy to reduce medication errors in a neonatal intensive care unit. *Acta Paediatrica*, *98*(5), 782–785. doi:10.1111/j.1651-2227.2009.01234
- Chuo, J., & Lambert, G. (2011). Medication errors. In S. J. Yaffe, & J. V. Aranda (Eds.), *Neonatal and pediatric pharmacology* (4th ed., pp. 905–916). Philadelphia, PA: Wolters Kluwer.
- Chuo, J., Lambert, G., & Hicks, R. W. (2007). Intralipid medication errors in the neonatal intensive care unit. *Joint Commission Journal on Quality and Patient Safety*, *33*(2), 104–111.
- Conroy, S. (2011). Association between license status and medication errors. *Archives of Disease in Childhood*, *96*(3), 305–306.
- De Giorgi, I., Guignard, B., Fonzo-Christe, C., & Bonnabry, P. (2010). Evaluation of tools to prevent drug incompatibilities in pediatrics and neonatal intensive care units. *Pharmacy World and Science*, *32*(4), 520–529.
- Dabliz, R., & Levine, S. (2012). Medication safety in neonates. *American Journal of Perinatology*, *29*(1), 49–56.
- Eisenhut, M., Sun, B., & Skinner, S. (2011). Reducing prescribing errors in pediatric patients by assessment and feedback targeted at prescribers. *ISRN Pediatrics*, *2011*, 545681.
- Frey, B., Kehrer, B., Losa, M., Braun, H., Berweger, L. Micallef, J., & Ebenberger, M. (2000). Comprehensive critical incident monitoring in a neonatal-pediatric intensive care unit: Experience with the system approach. *Intensive Care Medicine*, *26*(1), 69–74.
- Gray, J. E., & Goldmann, D. A. (2004). Medication errors in the neonatal intensive care unit: Special patients, unique issues. *Archives of Disease in Childhood. Fetal and Neonatal Edition*, *89*(6), F472–F473
- Gray, J. E., Suresh, G., Ursprung, R., Edwards, W. H., Nickerson, J., Shiono, P. H., . . . Horbar, J. (2006). Patient misidentification in the neonatal intensive care unit: Quantification of risk. *Pediatrics*, *117*(1), e43–e47.
- Handyside, J., & Suresh, G. (2010). Human factors and quality improvement. *Clinics in Perinatology*, *37*(1), 123–140.
- Institute for Safe Medication Practices. (2003). The virtues of independent double checks: They really are worth your time! *ISMP Medication Safety Alert*. Retrieved from www.ismp.org/newsletters/acutecare/articles/20030306.asp.
- Institute for Safe Medication Practices. (2008). ISMP's list of high-alert medications. Retrieved from <http://www.ismp.org/Tools/highalertmedications.pdf>.
- Institute for Safe Medication Practices, & Vermont Oxford Network. (2011). Standard concentrations of neonatal drug infusions: A collaborative effort between Institute for Safe Medication Practices (ISMP) and Vermont Oxford Network (VON). Retrieved from www.ismp.org/tools/PediatricConcentrations.pdf.

- Institute of Medicine. (1999). *To err is human: Building a safer health system* (L. T. Kohn, J. M. Corrigan, & M. S. Donaldson, Eds.). Washington, DC: The National Academies Press.
- Jozefczyk, K. G., Kennedy, W. K., Lin, M. J., Achatz, J., Glass, D. M., Eidam, W. S., & Melroy, M. J. (2013). Computerized prescriber order entry and opportunities for medication errors: Comparison to traditional paper-based order entry. *Journal of Pharmacy Practice, 26*(4), 434–437.
- Kenyon, T. A., Gluesing, R. E., White, K. Y., Dunkel, W. L., & Burlingame, B. L. (2007). On call: Alert or unsafe? A report of the AORN on-call electronic task force. *AORN Journal, 86*(4), 630–639.
- Kaushal, R., Bates, D. W., Landrigan, C., McKenna, K. J., Clapp, M. D., Federico, F., & Goldmann, D. A. (2001). Medication errors and adverse drug events in pediatric inpatients. *Journal of the American Medical Association, 285*(16), 2114–2120.
- Kugelman, A., Inbar-Sanado, E., Shinwell, E. S., Makhoul, I. R., Leshem, M., Zangen, S., . . . Bader, D. (2008). Iatrogenesis in neonatal intensive care units: Observational and interventional, prospective, multicenter study. *Pediatrics, 122*(3), 550–555.
- Lemoine, J. B., & Hurst, H. M. (2012). Using smart pumps to reduce medication error in the NICU. *Nursing for Women's Health, 16*(2), 151–158.
- Ligi, I., Arnaud, F., Jouve, E., Tardieu, S., Sambuc, R., & Simeoni, U. (2008). Iatrogenic events in admitted neonates: A prospective cohort study. *Lancet, 371*(9610), 404–410.
- Morriss, F. H., Jr., Abramowitz, P. W., Carmen, L., & Wallis, A. B. (2009). “Nurses don’t hate change”—survey of nurses in a neonatal intensive care unit regarding the implementation, use and effectiveness of a bar code medication administration system. *Healthcare Quarterly, 12* Spec No Patient, 135–140. N
- Morriss, F. H., Jr., Abramowitz, P. W., Nelson, S. P., Milavetz, G., Michael, S. L., Gordon, S. N., . . . Cook, E. F. (2009). Effectiveness of a barcode medication administration system in reducing preventable adverse drug events in a neonatal intensive care unit: A prospective cohort study. *Journal of Pediatrics, 154*(3), 363–368.
- Morriss, F. H., Jr., Abramowitz, P. W., Nelson, S. P., Milavetz, G., Michael, S. L., & Gordon, S. N. (2011). Risk of adverse drug events in neonates treated with opioids and the effect of a barcode-assisted medication administration system. *American Journal of Health-System Pharmacy, 68*(1), 57–62.
- National Coordinating Council for Medication Error Reporting and Prevention. (2014). What is a medication error? Retrieved from www.nccmerp.org/aboutMedErrors.html.
- Pape, T. M., Guerra, D. M., Muzquiz, M., Bryant, J. B., Ingram, M., Schraner, B., . . . Welker, J. (2005). Innovative approaches to reducing nurses’ distractions during medication administration. *Journal of Continuing Education in Nursing, 36*(3), 108–116.

- Ross, L. M., Wallace, J., & Paton, J. Y. (2000). Medication errors in a paediatric teaching hospital in the UK: Five years operational experience. *Archives of Disease in Childhood*, 83(6), 492–497.
- Samra, H. A., McGrath, J. M., & Rollins, W. (2011). Patient safety in the NICU: A comprehensive review. *Journal of Perinatal and Neonatal Nursing*, 25(2), 123–132.
- Sharek, P. J., Horbar, J. D., Mason, W., Bisarya, H., Thurm, C. W., Suresh, G., ...Classen, D. (2006). Adverse events in the neonatal intensive care unit: Development, testing, and findings of a NICU-focused trigger tool to identify harm in North American NICUs. *Pediatrics*, 118(4), 1332–1340.
- Simpson, J. H., Lynch, R., Grant, J., & Alroomi, L. (2004). Reducing medication errors in the neonatal intensive care unit. *Archives of Disease in Childhood, Fetal Neonatal Edition*, 89(6), F480–F482.
- Stavroudis, T. A., Miller, M. R., & Lehmann, C. U. (2008). Medication errors in neonates. *Clinics in Perinatology*, 35(1), 141–161.
- Stavroudis, T. A., Shore, A. D., Morlock, L., Hicks, R. W., Bundy, D., & Miller, M. R. (2010). NICU medication errors: Identifying a risk profile for medication errors in the neonatal intensive care unit. *Journal of Perinatology*, 30(7), 459–468.
- Stucky, E. R., American Academy of Pediatrics Committee on Drugs, & American Academy of Pediatrics Committee on Hospital Care. (2003). Prevention of medication errors in the pediatric inpatient setting. *Pediatrics*, 112(2), 431–436.
- Sumwalt, R. (1993). The sterile cockpit. *Aviation Safety Reporting System Directline*, 4, 1–4. Retrieved from http://web.archive.org/web/20070410193354/http://asrs.arc.nasa.gov/directline_issues/dl4_sterile.htm.
- Taylor, J. A., Loan, L. A., Kamara, J., Blackburn, S., & Whitney, D. (2008). Medication administration variances before and after implementation of computerized physician order entry in a neonatal intensive care unit. *Pediatrics*, 121(1), 123–128.
- Thomas, L., Cordonnier-Jourdin, C., Benhamou-Jantelet, G., Divine, C., & Le Louet, H. (2011). Medication errors management process in hospital: A 6-month pilot study. *Fundamental & Clinical Pharmacology*, 25(6), 768–775. doi: 10.1111/j.1472-8206.2010.00907.x
- Uppal, N., Yasseen, B., Seto, W., Parshuram, C. S. (2011). Drug formulations that require less than 0.1 mL of solution to prepare doses for infants and children. *Canadian Medical Association Journal*, 183(4), E246–E248.
- Vecchione, A. (2003). USP drug safety review: Distractions contribute to medication errors. *Drug Topics*, 147, HSE42. Retrieved from <http://drugtopics.modernmedicine.com/drugtopics/article/articleDetail.jsp?id=111201>.
- World Health Organization. (2010). New WHO guidance to improve use of medicines in children: Model Formulary for Children provides information on how to use over 240 essential medicines. Retrieved from

www.who.int/mediacentre/news/releases/2010/medicines_children_20100618/en/.

Bibliography

- American Academy of Pediatrics. (2012). Safe and effective drugs and medical devices for children. Retrieved from www.aap.org/en-us/advocacy-and-policy/federal-advocacy/pediatric-drugs-and-medical-devices/Pages/Improving-Access-to-Safe-Drugs-Devices-for-Children.aspx
- Kunac, D. L., & Reith, D. M. (2005). Identification of priorities for medication safety in neonatal intensive care. *Drug Safety*, 28(3), 251–261.
- Rack, L. L., Dudjak, L. A., Wolf, G. A. (2012). Study of nurse workarounds in a hospital using bar code medication administration system. *Journal of Nursing Care Quality*, 27(3), 232–239.
- Rivera-Rodriguez, A. J., & Karsh, B. T. (2010). Interruptions and distractions in healthcare: Review and reappraisal. *Quality and Safety in Health Care*, 19(4), 304–312.
- The Joint Commission. (2010) Critical access hospitals: 2011 National Patient Safety Goals. Retrieved May 26, 2011, from www.jointcommission.org/cah_2011_npsgs.
- Wong, I. C., Wong, L. Y., & Cranswick, N. E. (2009). Minimising medication errors in children. *Archives of Disease in Childhood*, 94(2), 161–164.

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