

## COMMENTARY

# Revisiting the Latest NRP Guidelines for Meconium: Searching for Clarity in a Murky Situation

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*First, do no harm.*

Attributed to various sources

To intubate or not to intubate an infant born through meconium-stained amniotic fluid (MSAF) has been a question that has challenged this often-quoted principle of first doing no harm, with the answer evolving significantly since the publication of the first Neonatal Resuscitation Program (NRP) guidelines >30 years ago.<sup>1</sup> Those who trained and practiced in the 1980s and 1990s remember an era when all infants born through MSAF (both vigorous and nonvigorous) were routinely intubated after delivery or when decisions to intervene were perhaps based on the consistency and thickness of the meconium. NRP recommendations have since evolved, such that intubation was no longer recommended for vigorous infants born through MSAF after the fourth edition of the NRP guidelines was published in 2000.<sup>2</sup>

However, the recommendation for management of nonvigorous infants born through MSAF remained unchanged until the most recent seventh edition of the NRP guidelines (published in 2016), which no longer recommended routine intubation and tracheal suctioning for nonvigorous infants born through MSAF.<sup>3</sup> These recommendations were made partly after a review of a few smaller single-center randomized controlled trials in which tracheal suctioning was compared with no suctioning in nonvigorous infants born through MSAF.<sup>4,5</sup> On the basis of this review and the lack of evidence to support routine intubation and tracheal suctioning of nonvigorous infants born through MSAF, the most recent NRP recommendations were made in the context of avoiding the potential harm of intubation and the subsequent delay in initiating the initial steps of neonatal resuscitation.

However, do we do more harm by intubating or by not intubating these infants? In recent studies, others have attempted to shed light on this question. Aldhafeeri et al<sup>6</sup> conducted a retrospective single-center study, comparing outcomes before and after implementation of the most recent NRP guidelines, and found no significant difference in meconium aspiration related complications between the 2 groups. A retrospective study conducted by Chiruvolu

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et al<sup>7</sup> revealed an increase in NICU admissions for respiratory causes and an increase in the need for mechanical ventilation, oxygen therapy, and use of surfactant after implementation of the new guidelines. However, no difference in the incidence of meconium aspiration syndrome (MAS) was observed. In this cohort study, the authors looked specifically at nonvigorous infants born through MSAF and noted that the proportion of these infants declined from 10% to 8% after adoption of the recent NRP guidelines. It is unclear if perhaps some of the nonvigorous infants in the preintervention period remained so because of attempts to withhold stimulation to perform intubation before the first cry. Nonetheless, the results of this study added to ongoing speculation regarding the latest changes in the NRP guidelines.

More recently, Kalra et al<sup>8</sup> queried a large California database and showed no increase in the incidence or severity of MAS after adoption of the new guidelines. Edwards et al<sup>9</sup> examined the Vermont Oxford Network database and found no increase in severe respiratory distress in infants with or without MAS and a decrease in NICU admissions. Both of these large population-based studies were limited by the databases studied, which only contained infants admitted to the NICU.

In this issue of *Hospital Pediatrics*, Myers and Gupta<sup>10</sup> submit another entry into the literature to help us answer these questions. In this study, the authors examined the clinical outcomes of term ( $\geq 37$  weeks' gestational age) infants born through MSAF at a single large academic center before and after adoption of the seventh edition NRP guidelines.<sup>10</sup> They found no difference among the 2 groups in NICU admission rates, length of stay, and need for respiratory support on admission. They did find a decrease in the need for respiratory support after the first day of life, improvement in 1-minute Apgar scores, and a decrease in the number of delivery room intubations. Their study stands apart in that they identified and included all deliveries attended for term infants born through MSAF at their institution. They did not include potentially higher-risk late preterm infants in

their cohort, nor did they limit their denominator to only those classified as nonvigorous at birth or to those admitted to the NICU.

All the studies to date have had various strengths and limitations. Although population-based studies benefit from large numbers of infants across multiple centers, there is often a lack of detail on the characteristics of meconium, the infant, and the therapies received at the time of delivery.<sup>8,9</sup> A large multicenter randomized controlled trial would be optimal in answering the question of ideal management for nonvigorous infants born through MSAF. However, challenges remain in performing such a trial. Furthermore, as rates of MAS and the need for extracorporeal membrane oxygenation continue to decline, the sample size to have adequate power for such a trial may be prohibitively large. In the meantime, further well-designed observational studies are useful in adding to the current available evidence.

In this study,<sup>10</sup> an important additional question related to the potential decline of intubation experience in practitioners and trainees is also asked. In an era of value-based care, we are performing fewer procedures and interventions as we move toward safely doing less in many areas of medicine.<sup>11</sup> Furthermore, because work-hour limits have reduced the time spent by pediatric trainees in inpatient settings, there are fewer opportunities for procedural experience, including neonatal intubation. This quandary is not new because opportunities for intubation, particularly in the delivery room, have been declining for some time.<sup>12-14</sup> The 2000 NRP recommendations, limiting intubations for vigorous infants born through MSAF, began a decline in delivery room intubation opportunities.<sup>15</sup> Other recent efforts to provide more noninvasive respiratory support for preterm infants have also led to subsequent decreases in neonatal intubation opportunities.<sup>16,17</sup> The latest seventh edition NRP guidelines are just the latest set of recommendations advocating for less invasive interventions, leading to

even fewer potential opportunities for neonatal intubation.

Although the decision to not intubate may benefit the individual patient, inadequate procedural experience for trainees and the subsequent decline in procedural skills may have other implications. It has already been shown that a majority of residents are currently unable to achieve competency in neonatal intubation.<sup>18,19</sup> So, how do we train the next generation so that they are proficient in these procedures? Simulation may be an answer, although it cannot fully substitute for real-life experience. Other complementary educational techniques and modalities, including use of video laryngoscopy and expert modeling, have also been suggested.<sup>18</sup> As the number of procedural opportunities continues to decrease, this will continue to be an ongoing problem. In the current era, we have to question whether residency training and NRP training are enough for trainees to gain proficiency in neonatal intubation.

The search for clarity on the management of infants born through MSAF in the delivery room continues. Although many welcomed the previous change away from intubating vigorous and crying infants born through MSAF, the more recent recommendation to not routinely intubate nonvigorous infants born through MSAF has been met with greater trepidation. In the absence of more conclusive evidence, the burden of proof remains on proving the benefit of a potentially harmful intervention in this subset of infants. In the absence of this proof, we continue to be guided by the tenet of first doing no harm and avoiding routine intubation and tracheal suctioning for nonvigorous infants born through MSAF.<sup>20</sup> This study adds to the current body of literature to support that notion.<sup>10</sup> However, the need still remains for further well-designed prospective studies to provide clearer answers to these questions. In the meantime, the answers (much like the consistency of MSAF) remain somewhat murky.

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