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Simulation and education

Use of laryngeal mask for neonatal resuscitation in Brazil: A national survey



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Abstract

Background: The International Liaison Committee on Resuscitation suggests using the laryngeal mask airway (LMA) as an alternative to the face mask for performing positive pressure ventilation (PPV) in the delivery room in newborns ≥ 34 weeks. Because not much is known about the health professionals' familiarity in using LMA in Brazil, this study aimed to describe the health professionals' knowledge and practice of using LMA, who provide neonatal care in the country.

Methods: An online questionnaire containing 29 questions was sent to multi-healthcare professionals from different regions in the country through email and social media groups (WhatsApp[®], Instagram[®], Facebook[®], and LinkedIn[®]). The participants anonymously answered the questions regarding their knowledge and expertise in using LMA to ventilate newborns in the delivery room.

Results: We obtained 749 responses from all the regions in Brazil, with 80% from health professionals working in public hospitals. Most respondents were neonatologists (73%) having > 15 years of clinical practice. Among the respondents, 92% recognized the usefulness of LMA for performing PPV in newborns, 59% did not have specific training in LMA insertion, and only 8% reported that they have already used LMA in the delivery room. In 90% of the hospitals, no written protocol was available to use LMA; and in 68% of the hospitals, LMA was not available for immediate use.

Conclusion: This nationwide survey showed that most professionals recognize the usefulness of LMA. However, the device is scarcely available and underused in the routine of ventilatory assistance for newborns in delivery rooms in Brazil.

Keywords: Supraglottic airway, Newborn, Resuscitation, Pulmonary ventilation, Survey

Background

Neonatal resuscitation aims to provide appropriate cardiorespiratory support during the transition from fetal to extrauterine life in newborns unable to breathe spontaneously.¹ When promptly initiated, positive pressure ventilation (PPV) is sufficient to reestablish the cardiovascular status in 90% of the patients.² However, PPV can often be ineffective mainly because of the leaks around the ill-fitting face mask (FM), requiring tracheal intubation,^{3,4} which is a complex and invasive procedure requiring specific professional training and experience.⁵

The laryngeal mask (LMA) is an alternate option to provide lung ventilation to the newborns in the delivery room. The use of LMA is associated with a higher success rate in neonatal resuscitation⁶

and shorter ventilation time⁷ than the use of FM. Furthermore, LMA is less invasive, requires less training, and is more prone to success on the first insertion attempt⁸ than tracheal intubation. A meta-analysis comparing LMA with FM concluded that LMA was more effective than FM because of the following reasons: need for intubation, time to spontaneous breathing, ventilation time, Apgar scores, and admission to the neonatal intensive care unit.⁹ Another recent meta-analysis, which included 6 randomized controlled trials and 1823 newborns, showed that lung ventilation with LMA, compared with FM, reduced the time for achieving heart rate >100 bpm, with a shorter ventilation time, and decreased the need for intubation.¹⁰

As of 2022, the International Liaison Committee on Resuscitation (ILCOR) suggests using the LMA as an alternative to the FM for performing PPV in the delivery room immediately after the birth of newborns >34 weeks' gestational age, emphasizing the need of

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availability of resources and adequate training of healthcare professionals.^{11,12}

Brazil is a middle-income country, where 99% of deliveries are in-hospital, and in which there is a strong emphasis on neonatal resuscitation training, with >120,000 trained health professionals. However, to date, the training did not emphasize the use of LMA. The aims of this study were to investigate the health professionals' knowledge of providing neonatal care in Brazil regarding the usefulness of the LMA in the neonatal period, as well as the use of this device for performing lung ventilation in newborns in the delivery room.

Methods

We conducted a cross-sectional study from March 1 to March 31, 2022. Professionals involved in newborn care from different regions of the country were invited to participate voluntarily and anonymously. An online questionnaire containing 29 questions was created using Google Forms™. The participants received a link to the form through email or other social media groups such as WhatsApp™, Instagram™, Facebook™, and LinkedIn™. After providing consent, participants had access to the questions about their profession, time since graduation, experience in caring for newborns in the delivery room, and the main characteristics of their workplaces. The questionnaire included specific questions about LMA, such as knowledge of LMA as an alternative interface for PPV in neonates, indications for its use, availability, training, and assessment of personal competency regarding its use in neonatal resuscitation. The questionnaire included multiple-choice questions, and respondents were allowed to choose one or more answers if necessary. The questionnaire is available as a supplementary chart.

For this survey, we applied the exponential nondiscriminative snowball sampling strategy to distribute the questionnaire, from which one subject recruited to the sample provides multiple referrals. Each new referral can then provide the researchers with more potential research subjects in geometric chain.¹³ In this study, data collection was interrupted 30 days after starting when responses were obtained from all regions and states of the country, characterizing a convenience sample.

The study was approved by the Ethics Committee of the leading institution (no. 5.277.971). The Free and Informed Consent Term was available for reading and acceptance on the first page of the form.

Statistical analysis

Survey responses were expressed as a number or proportions. Data were summarized as descriptive statistics using Sigma Plot (Systat Software, San Jose, CA).

Results

We obtained 749 responses from 5 regions and 27 federative units of the country (Fig. 1). Most respondents were neonatologists (73%) having >15 years of clinical practice and frequently working in the delivery room. Sixty-six percent of the participants (492/749) were instructors of the Brazilian Neonatal Resuscitation Program (BNRP) of the Brazilian Society of Pediatrics, corresponding to 40% of the total number of instructors working in the country. Eighty percent of the hospitals where the respondents work were public. The characteristics of the respondents and their professional activities are shown in Table 1.

Ninety-two percent of professionals recognized the usefulness of LMA for performing PPV in newborns, 59% did not have specific training in LMA insertion, and only 8% reported that they have already used LMA in the delivery room. When asked about LMA indications, 65% would consider its use for newborns with difficult airway and only 2.3% as the first choice for PPV in the delivery room (Fig. 2).

In 90% of the hospitals, there was no written guideline for using LMA. Among those with a local protocol (36 hospitals), 32 (89%) recommend LMA only for difficult airways; 3 (8%) for PPV in the delivery room, neonatal transport, and difficult airway; and 1 (3%) for transport and difficult airway. Only 32% (239/749) of the respondents answered that they had an LMA available for immediate use in their workplaces. In 46% (110/239) of the hospitals that had LMA, the device was available for immediate use in the delivery room (Fig. 3), and 41% (99/239) of the hospitals that had LMA belonged to the private healthcare sector. The answers regarding the knowledge and expertise of the professionals in the use of LMA and indications for neonatal assistance are shown in Table 2.

Among the participants who responded that they recognized the usefulness of the LMA (649/749), knew how to use it (n = 457), and had it available for ready use at their institution (n = 93), only 3.6% (27/749) reported having already used the LMA for performing PPV in the newborns in the delivery room.

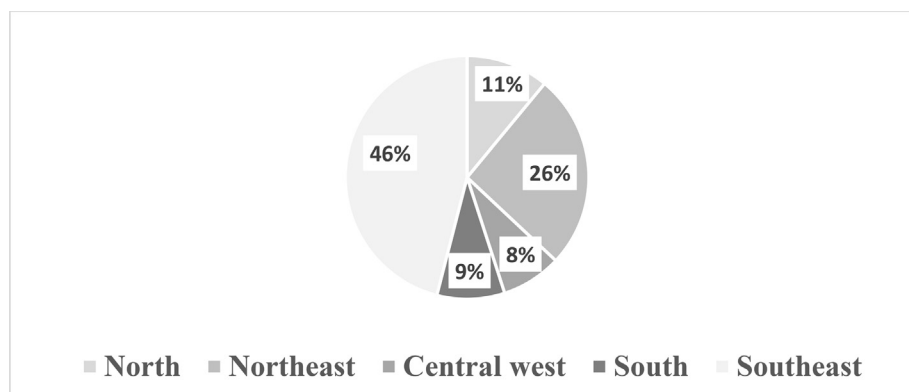


Fig. 1 – Distribution of answers according to the region of the country.

Table 1 – Survey questionnaire regarding professionals and hospital characteristics.

Survey questionnaire n = 749 (%)	
Profession	
Neonatologist	546 (73)
Pediatrician	165 (22)
Nurse	15 (2)
Respiratory physiotherapist	8 (1)
Resident	15 (2)
Years of experience	
≥ 15	479 (64)
10–14	120 (16)
5–9	112 (15)
< 5	30 (4)
Newly graduated	8 (1)
Frequency of delivery room activity	
Once a day	187 (25)
Once a week	117 (15)
More than once a week	245 (33)
Once a month	22 (3)
Sporadically	123 (17)
Never	55 (7)
Gestational age of assisted newborns	
≥ 34 weeks	37 (5)
< 34 weeks	15 (2)
Both	637 (85)
None	60 (8)
Type of hospital	
Public	464 (62)
Private	150 (20)
Both	135 (18)

Discussion

As of 2022, based on the ILCOR recommendations,¹¹ the BNRP suggests the use of LMA for performing lung ventilation in the newborns in the delivery room.¹⁴ This study was conducted to assess the knowledge, availability, and use of healthcare professionals about LMA in neonatal resuscitation practice in Brazil. The survey encompassed all regions of the country, and the sample comprised experienced professionals, regularly working in the delivery room and presumably updated, because most of them were instructors of BNRP. Our research showed that LMA is not widely available in the country and is underused by health professionals. Although almost all professionals (92%) recognized the usefulness of the LMA for performing PPV in newborns, very few had used this device in their clinical practice. Only 8% of the participants had ever used the LMA during neonatal resuscitation in the delivery room, and only 2.3% would recommend the LMA as their first choice for performing PPV in the delivery room.

In a 2003 study in 43 centers in Italy, 27% of the anesthesiologists and 5% of the pediatricians considered the LMA an essential device for ventilation.¹⁵ Recently, a survey similar to ours was carried out by the Australia New Zealand Neonatal Network (ANZNN).¹⁶ An online questionnaire was sent to 34 tertiary neonatal centers and answered by a senior neonatologist in each center, and it was found that 67% of the participating services had an LMA available, 68% reported using LMA after two or more unsuccessful intubation attempts, and 8% used it before intubation if FM ventilation was inadequate. It is important to note that only tertiary-level neonatal care centers were included in the ANZNN survey. In addition, the questionnaire was answered by the senior neonatologists at each center.

The FM is the most used interface to perform PPV in the delivery room. Although studies show that 90% of the newborns who receive PPV with a FM at birth improve and do not require further resuscita-

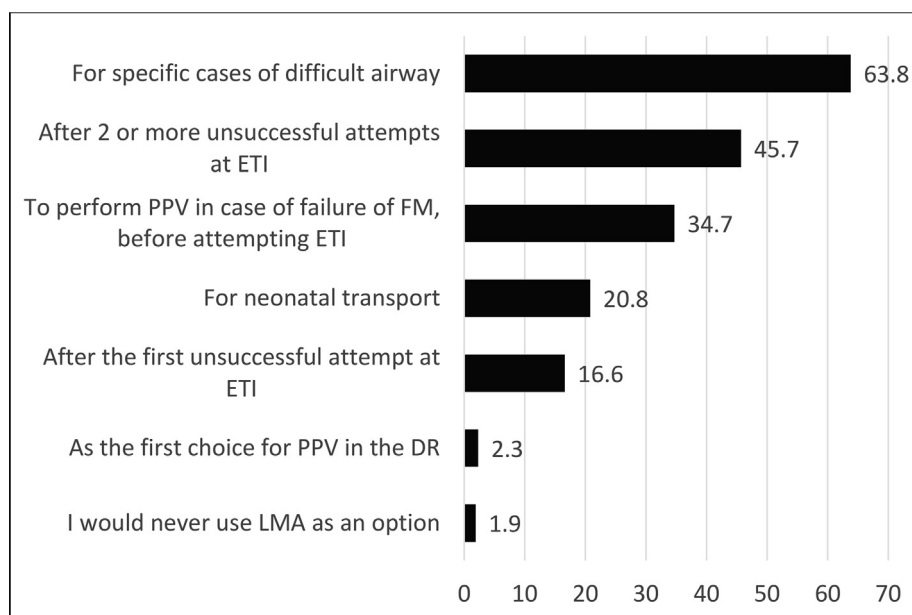


Fig. 2 – Answers about the indications for use of LMA in neonates (%). Respondents could choose more than one option. LMA: laryngeal mask; ETI: endotracheal intubation; FM: face mask; PPV: positive pressure ventilation; DR: delivery room.

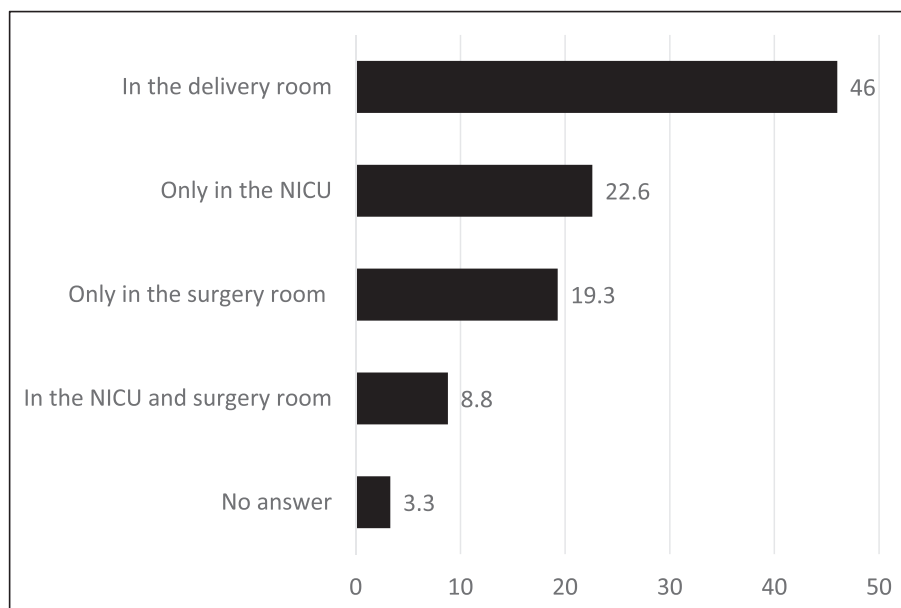


Fig. 3 – Answers from all participants (749) about the availability of LMA in the workplaces (%). LMA: laryngeal mask; NICU: neonatal intensive care unit.

Table 2 – Survey questionnaire regarding knowledge and expertise about LMA.

Survey questionnaire n = 749 (%)

In your opinion, is LMA useful for PPV in DR?	
Yes	689 (92)
Have you used LMA for PPV in the DR?	
Yes	58 (8)
Have you used LMA for NB transportation?	
Yes	44 (6)
Do you know how to insert the LMA	
Yes	483 (64)
For what gestational age do you consider LMA?	
NB ≥34 weeks	487 (65)
NB < 34 weeks	5 (1)
Both	239 (32)
None	18 (2)
For what birth weight do you consider LMA?	
≥ 2000 g	524 (70)
< 2000 g	22 (3)
Any weight	187 (25)
None	15 (2)
Is there a guideline to use LMA at your hospital?	
No	674 (90)
Yes	36 (5)
Do not know	39 (5)
Have you had any training in LMA use?	
Yes	308 (41)
Is your staff able to use LMA as an option for neonatal PPV?	
Yes	137 (18)
No	444 (60)
Maybe	168 (22)
Is LMA available at your hospital?	
No	510 (68)
Yes	239 (32)
Only at private hospital	99/239 (41)
Only at public hospital	58/239 (25)
Both types of hospitals	82 /239 (34)
Do you know how much the LMA costs?	
Yes	129 (17)

LMA: laryngeal mask; PPV: positive pressure ventilation; DR: delivery room; NB: newborn.

tion procedures, this technique is not simple.² Leakage around the mask is one of the main problems related to its use, with losses of 50–70% of the delivered flow.^{8,17} This leak is not always perceived by the professionals, causing insufficient delivery of tidal volume and compromising the success of PPV.^{18,19} The application of the mask to the face of the newborn can also trigger the trigeminal-cardiac reflex, with consequent stimulation of the brainstem nuclei, causing apnea, bradycardia, and hypotension through reflex vagal action.^{20,21}

A number of studies show that supraglottic devices may be more effective than FMs for performing PPV in late preterm and term newborns immediately after birth, reducing the need for endotracheal intubation, which can be attributed mainly to the lower occurrence of gas leakage between the mask and the newborn's face.^{10,17,22–24} An effective lung ventilation may also be delayed because of the difficulties related to tracheal intubation.^{24,25} In a prospective study conducted in neonatal intensive care units, intubation success rates ranged from 20% to 72% according to the practitioner's experience.²⁶ This is an important consideration, particularly in places where neonatal resuscitation is performed by inexperienced professionals or by in-training professionals, a situation in which the availability of an effective and easier-to-use interface for PPV is relevant.

In our study, only a few professionals responded that they had some experience using LMA in clinical practice, and only 2.3% would recommend it as the first option for performing PPV in the delivery room. This may have occurred because of the limited availability of LMA as only 32% (239/749) responded that the device was available for use in their workplaces, and in only 46% of them (110/239) LMA was available in the delivery room. However, even considering the hospitals where the LMA was available in the delivery room, only 24% (27/110) of the participants responded that they had already used it during neonatal resuscitation. These results reflect the scarce training of professionals using the device, who work in the delivery room in the country.

The low availability of LMA in most of the sites evaluated in our study may be due to the cost of the device because 62% of the hospitals belong to the public health system. This is an important factor in the incorporation of LMA in neonatal care in middle- and low-income countries. In contrast, it should be considered that in Brazil, as in other countries with similar characteristics, the heterogeneity of healthcare and the scarcity of tertiary neonatal care centers further justify the importance of having an easier option than intubation to perform PPV in newborns during resuscitation.^{27–29}

It is also important to highlight that 59% of the respondents reported they had never been trained to use the LMA. Interestingly, this was the same percentage of professionals who reported receiving routine training in the use of LMA in the AZNN survey.¹⁶ These results were expected because specific training for the use of LMA as an option for PPV was introduced by the BNRP only in August 2022. Training healthcare workers how to insert the LMA is much faster and easier than training them how to use tracheal intubation.^{29,30} In addition, studies show that brief training results in high rates of success on the first attempt of use of LMA because of ease of insertion and effectiveness of ventilation.^{31–33} Our study will need to be repeated after the introduction of LMA training by BNRP to see whether knowledge dissemination changes the availability and use of the device in the Brazilian neonatal settings. Recently, the Brazilian Network on Neonatal Research conducted a study to evaluate the implementation of the guidelines proposed by the BNRP for the delivery room care of preterm newborns in 20 neonatal centers through-

out the country. The study showed that there was a significant increase in the application of the proposed recommendations over the years, including lung ventilation techniques.³⁴ These results show the power of this program to disseminate knowledge and promote training in neonatal resuscitation across the country.

The method for disseminating the questionnaire in our study, through social media and without control of the total number of people who received it, constitutes a limitation for the interpretation of the results. In addition, the responses given individually may not reflect the opinion of the entire professional community because the number of participating neonatal institutions may have been small -compared to the size of the country. In contrast, studies show that social media is an effective way to increase the coverage of surveys and to disseminate scientific knowledge.^{35–37} Despite these limitations, our survey reached a significant number of participants, with representation from all states and regions of the country, most of them being experienced professionals and instructors of the BNRP, i.e., people who play a leadership role in their workplaces. Moreover, the study was carried out at a very low cost, in a short time, and with simple and pragmatic questions.

Conclusion

This nationwide survey showed that, although admittedly useful, LMA is rarely available in the country and underused by health professionals. We suggest specific training through workshops and courses on neonatal resuscitation so that professionals acquire skills in handling the LMA, allowing this device to be introduced into routine neonatal care in places where this is not yet a common practice.

CRedit authorship contribution statement

João Cesar Lyra: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Ruth Guinsburg:** Supervision, Project administration, Visualization. **Maria Fernanda Branco de Almeida:** Conceptualization, Methodology, Visualization, Writing – review & editing. **Gabriel Fernando Todeschi Variane:** Software, Formal analysis, Investigation. **Ligia Maria Suppo de Souza Rugolo:** Supervision, Project administration, Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.resplu.2022.100336>.

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