Determinants of Compliance to National Neonatal Resuscitation Guidelines among Nurses at Pumwani Maternity Hospital Nairobi, Kenya.

Jane Wangui Munyiri KOGI[1], Dr. KARONJO[2], Mr. MUYA[3]

[123] School of Nursing, Mount Kenya University, Kenya

[1]Correpsonding author: janekogi1958@gmail.com

ABSTRACT

This study sought to establish facility related factors determining compliance to National Neonatal Resuscitation Guidelines among nurses at Pumwani Maternity Hospital. The study adopted a cross-sectional survey design to in- cooperate qualitative and quantitative research methods. The study targeted nurses working at Pumwani Maternity Hospital. A sample of 108 nurses was used. A semi-structured questionnaire with closed and open ended questions was used to collect data. An observation checklist was also used to collect data. A total of 99 nurses working at Pumwani Maternity Hospital participated and completed their questionnaires for the study. Majority of nurses were dissatisfied with the availability of resuscitation equipment. Majority 61% (58) indicated that resuscitation equipment had good functionality. Availability of equipment ($\chi2$=17.378, df=8, p=0.026) and training ($\chi2$=37.767, df=16, p=0.002). The study concluded that availability and functionality of equipment influences compliance of nurses. The study recommended that the County Government of Nairobi should ensure that the resuscitation rooms are fully equipped at all times and maintain functionality of equipment through regular checkups.

Keywords: Resuscitation, neonatal resuscitation, National Neonatal Resuscitation Guidelines, compliance.

INTRODUCTION

The global burden of stillbirth and neonatal deaths remains a challenge in low-income countries. Annually, up to 2.7 million neonatal deaths occur worldwide, and 25% of these deaths are caused

by birth asphyxia (Mendhi *et al.*, 2018). About three - quarters of all neonatal deaths occur during the first week of life, with over half of these occurring within the first 24 hour soon after birth. The first minutes after birth are critical to reducing neonatal mortality. An important intervention when the infant does not initiate and sustain breathing after birth is the practice of neonatal resuscitation, which can significantly reduce intra-partum related stillbirth and neonatal mortality (Wrammert *et al.*, 2018). Successful neonatal resuscitation (NR) has the potential to prevent these peri -natal mortalities related to birth asphyxia (Shikuku *et al.*, 2018).

Neonatal resuscitation is defined as the set of interventions at the time of birth to support the establishment of breathing and circulation (Raza & Haq, 2014). The principle of resuscitation is to provide oxygen by helping breathing and metabolism with artificial respiration and to help blood circulation by giving pressure to a ventricle with chest compression (Oh & Kim, 2016). Nursing assessment of the baby at birth, help to identifying the need for resuscitation early and the skilful resuscitation of the asphyxiated neonate to restore health and prevent further complications (Ezenduka, Ndie & Oburoh, 2016). Bhatnagar (2014) indicate that anticipation, adequate preparation, accurate evaluation, and prompt initiation of respiratory support are critical for successful neonatal resuscitation.

World Health Organization (WHO) (2012) developed guidelines for the purpose of enhancing neonatal resuscitation outcomes. The objective of these guidelines is to ensure that new-borns in resource-limited settings who require resuscitation are effectively resuscitated. WHO adds that these guidelines can assist program managers responsible for implementing maternal and child health programs to develop or adapt national or local guidelines, standards and training materials on new-born care. WHO recommendations on basic new-born resuscitation states that: 'In neonates born through clear amniotic fluid who start breathing on their own after birth, suctioning of the mouth and nose should not be performed'. The guidelines contain recommendations for nurses and other health workers on what to do with newly-born term or preterm babies who do not require positive-pressure ventilation, who do not breathe spontaneously after thorough drying and presence of meconium-stained amniotic fluid among others.

Neonatal resuscitation guidelines originated from the WHO and have been adopted by the Ministry of Health and it is recommended that all delivery room personnel complete the New-born Resuscitation Program (NRP) training in order to improve the outcome of the resuscitation (Otido, 2013). The Ministry of Health (2010) developed national neonatal resuscitation

guidelines in the form of a working aide. In summary, the guidelines dictate that nurses should check the availability of equipment and test it, place neonate on warmer/ resuscitative and dry neonate thoroughly and remove wet blanket. The guidelines indicate that after drying, the nurse should look into airway, suction airway in the presence of meconium only if the neonate had not taken first breath, assess for breathing and make decision to ventilate by use of mask or call for help. The nurse should also give inflation breaths and chest rise compressions.

Skilled, guideline and timeline adhered neonatal resuscitation remains the cornerstone of advanced neonatal care ensuring a favorable outcome (Woodward, 2019). Healthcare organizations have an obligation to provide a high-quality resuscitation service, and to ensure that staff are trained and updated regularly to a level of proficiency appropriate to each person's expected role. However, available studies show poor compliance with resuscitation guidelines. Woodward (2019) established a gap between guideline adherence and clinical practice. Chikuse, Chirwa, Maluwa, Malata and Odland (2012) found that there was substandard adherence to guidelines on identification of warning signs of birth asphyxia and neonatal resuscitation. Similarly, Otido (2013) found that the basic new-born resuscitation practice according to the guidelines was poorly adhered to at 26.5% of the cases observed.

The availability of adequate equipment in all delivery settings is crucial. Neonatal resuscitation using basic equipment and skills has been shown to be feasible and effective in resource-limited settings (Janet *et al.*, 2018). Equipment needed for resuscitation should be available at every delivery area and routinely checked to ensure the equipment is functioning properly (Wyckoff, Aziz & Escobedo, 2015). Reusable neonatal resuscitation equipment must be reprocessed between uses to avoid infection. Reprocessing guidelines designed for neonatal resuscitation equipment in low-resource settings include selected components of the following process: decontamination, disassembly, cleaning, sterilization/high-level disinfection, reassembly, function testing, and storage (PATH, 2015).

In Kenya, neonatal mortality has exhibited the slowest rate of decline among all early childhood mortality rates according to Kenya National Bureau of Statistics (KNBS, 2015). Kiptui (2017) reports that in Kenya, 24% of neonatal deaths occur due to birth asphyxia. Pumwani maternity hospital recorded an 8.5% (2142) neonatal mortality in 2017 and 3330 in 2018. Although this is lower than the national and global average it is quite high for a hospital that is well endowed with some of the best medical resources in the country. Due to high numbers of neonatal deaths resulting from asphyxia, there is need to find out the level of compliance of nurses to National

resuscitation guidelines. Generally, previous studies have focused on resuscitation in adults. However, neonates differ considerably from adults as different levels of knowledge and skills are required for neonatal resuscitation. Indeed Lindback *et al.* (2014) recommend that further studies exploring the underlying causes behind the lack of adherence to the neonatal resuscitation guidelines should be conducted in order to improve compliance and increase the possibility of fulfilling Millennium Development Goal (MDG) 4 by 2015. This study therefore sought to establish facility related factors determining compliance to National Neonatal Resuscitation Guidelines among nurses at Pumwani Maternity Hospital.

LITERATURE REVIEW

The goals of neonatal resuscitation are to prevent the morbidity and mortality associated with hypoxic-ischemic tissue (brain, heart and kidney) injury and also to re-establish adequate spontaneous respiration and cardiac output. Neonatal resuscitation can be divided into 4 categories of action: basic steps, including rapid assessment and initial steps in stabilization, ventilation, including bag-mask or bag-tube ventilation, Chest compressions and Administration of medications or fluids (Chadha, 2010). Anticipation, adequate preparation, accurate evaluation, and prompt initiation of support are critical for successful neonatal resuscitation. At every delivery there should be at least one person whose primary responsibility is the neonate. This person must be capable of diagnosing and initiating resuscitation, including administration of positive-pressure ventilation and chest compressions. According to Opiyo *et al.* (2008), effective neonatal resuscitation could reduce this burden of disease but the training of health-care providers in low income settings is often outdated. Preparedness is vital to successful neonatal resuscitation. Because it is not possible to predict perfectly which babies will need resuscitation, a person who can assess the newly born infant and initiate resuscitation should be present at all births; additional personnel with the skills to perform a complete resuscitation, including endotracheal intubation, should be immediately available (Niermeyer *et al.*, 2016).

A Japanese study by Kunikata *et al.* (2017) indicated that only 35% of institutions used continuous positive airway pressure systems frequently, and expert neonatal resuscitation doctors attended all deliveries in only 6% of training centers. In addition, only 71% of training hospitals had brain therapeutic hypothermia facilities. Not all obstetric hospitals/clinics had pulse oximeters, and only a few used manometers frequently. Some midwife clinics did not keep warming equipment, and few midwife clinics were equipped with pulse oximeters. Trevisanuto

et al. (2016) assessed the availability of equipment for neonatal resuscitation in a large sample of delivery rooms in Vietnam, exploring regional differences. Results showed that the equipment classified as "essential" by the WHO guidelines and HBB algorithm was not available in a considerable portion of the surveyed hospitals. Almeida *et al.* (2008) study aimed to evaluate the availability of the resources required for neonatal resuscitation in delivery rooms of public hospitals in Brazilian state capitals. Appropriate equipment for pulmonary ventilation was available for more than 90% of the 125 resuscitation tables.

Oloyede and Udo (2016) carried out a study identify the quantity and quality of equipment available for basic neonatal resuscitation in some health facilities in southern Nigeria. It was found that equipment for basic neonatal resuscitation was grossly deficient in some health facilities in southern Nigeria: Only three (11.5%) facilities had bag and mask and radiant warmer, respectively, while only five (19.2%) had radiant warmers. Heerden *et al.* (2016) explored and describe the existing situation regarding neonatal resuscitation in a district hospital, South Africa. There were recurrent themes of lack of essential emergency equipment and stock needed for neonatal resuscitation. Meetings were held to address these challenges, but the procurement process was very slow. The maintenance of equipment was inadequate, for example equipment would be available but was not serviced and maintained and was therefore not operational.

METHODOLOGY

The study adopted a cross-sectional survey design to in- cooperate qualitative and quantitative research methods. The study was conducted in Pumwani maternity Hospital. The study targeted nurses working at Pumwani Maternity Hospital. Pumwani maternity Hospital was started in 1926 by charitable organization. It was handed over to the Municipal council now Nairobi county in 1944.The word Pumwani is derived from a Swahili word "pumua" which means to breath and relax . *save the cradle (*2010*).*It is in Nairobi county Kamukunji constituency Starehe ward. It has a bed capacity of 350 cots and beds. This institution is preferred because it is the largest maternity hospital in the country recording 1500 deliveries average per year and neonatal mortality at 20 per 1000 births. It has 143 nurses working as per the year 2017. Males are 15 and 128 are females. It is centrally located and mainly serves the low income communities. As at January, 2018, the facility had 148 nurses. Slovin's formula was used to arrive at a sample of 108 nurses.

A semi-structured questionnaire with closed and open ended questions was used to collect data. An observation checklist was also used to collect data. In this study, the observation checklist was used to observe facility related factors specifically the equipment and resources necessary for neonatal resuscitation. Descriptive statistics such as frequencies, percentages, mean and standard deviation was used to analyze quantitative data. Qualitative data was organized into pertinent themes and then analyzed using descriptive statistics. Chi-square tests were used to establish relationships and test the study hypothesis. The above tests were conducted using SPSS version. Findings were presented in form of tables and figures.

RESULTS

A total of 99 nurses working at Pumwani Maternity Hospital participated and completed their questionnaires for the study.

Compliance to National Neonatal Resuscitation Guidelines

Findings in Table 1 show that the highest compliance was seen in performing chest compressions where 97% (14) of the respondents complied with recommended procedures. The lowest compliance was seen in epinephrine administration where only 36.4% (5) of the respondents were in compliance.

Table 1 Compliance to National Neonatal Resuscitation Guidelines

	Complied		Did not comply	
	n	%	n	%
Stimulation	9	58.6	6	41.4
Suctioning	6	38.4	9	61.6
Chest compressions	14	97	1	3
Provision of oxygen	7	45.5	8	54.5
Use of bag and mask	8	53.5	7	46.5
Epinephrine administration	5	36.4	10	63.6

Participants who complied to 3 or less of the items in Table 1 above were classified as having low compliance while those who complied to 4 or more of the items were classified as having high compliance. Figure 1 shows that 8(54.9%) of the respondents had high compliance to the National Neonatal Resuscitation.
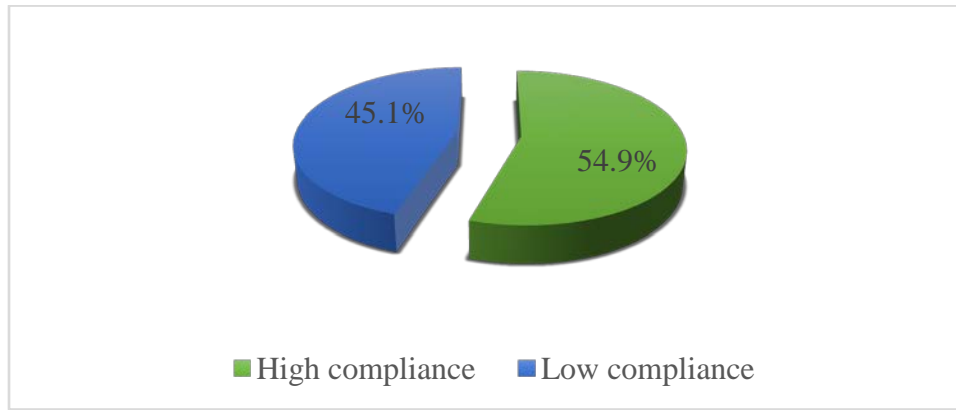
Figure 1 Compliance to National Neonatal Resuscitation Guidelines

Facility-Related Factors

Facility related factors in this study included equipment and training of nurses. Majority 64.9% (61) indicated that they had been trained on neonatal resuscitation. However slightly above half 50(52.6%) indicated that they had not been trained on neonatal resuscitation since they began working.

Table 2 Respondents Training on Resuscitation

	Yes		No	
	n	%	n	%
Trained on neonatal resuscitation	61	64.9	33	35.1
On- the job training on resuscitation	45	47.4	50	52.6

The majority 93.9% (93) of respondents indicated that they could use more training to perfect my skill in neonatal resuscitation. Likert scale was between 5-3 consecutively.

Table 3 Respondents Need for More Training

Response	Frequency	Percent (%)
Strongly agree	79	79.8
Agree	14	14.1
Uncertain	6	6.1
Total	99	100.0

There was a significant relationship ($\chi2$=37.767, df=16, p=0.002) between training and compliance. Findings in Table 4.38 show that 85.7% of nurses who had been trained had high compliance. Nurses who had been trained were 18 times likely to comply as shown in Table 4.

Table 4 Association between Training and Compliance

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	37.767[a]	16	.002
Likelihood Ratio	30.144	16	.017
Linear-by-Linear Association	1.434	1	.231
N of Valid Cases	99		

Slightly above half 54.8% (52) rated the availability of equipment as good while 40 (42.1%) indicated that it was fair.

Table 5 Availability of Resuscitation Equipment

Response	Frequency	Percent (%)
Very good	13	13.7
Good	39	41.1
Fair	40	42.1
Poor	3	3.2
Total	95	100.0

Findings in Table 6 shows that there was a significant relationship ($\chi2=17.378$, df=8, p=0.026) between availability of equipment and compliance. Further analysis showed that 85.7% (6) of respondents who indicated that availability of equipment was good had high compliance. The odds ratio showed that respondents who indicated that availability of equipment was good were 18 times more likely to comply than those who indicated that availability of equipment was poor.

Table 6 Association between Availability of Equipment and Compliance

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.378[a]	8	.026
Likelihood Ratio	15.230	8	.055
Linear-by-Linear Association	1.493	1	.222
N of Valid Cases	99		

Availability of resuscitation equipment was also assessed using an observation checklist. Findings in Table 7 show that all necessary equipment was available and in good condition except for clock with timer in seconds and warmed towels which were unavailable.

Table 7 Equipment Observation Checklist

Item	Availability	Condition
Firm, padded resuscitation surface	Yes	Good

Source of medical oxygen	Yes	Good
Clock with timer in seconds	No	N/A
Warmed towels	No	N/A
Stethoscope	Yes	Good
Suction catheters	Yes	Good
Positive pressure ventilation device	Yes	Good
Feeding tubes for gastric decompression	Yes	Good

There was no significant relationship ($\chi 2$=11.374, df=12, p=0.497) between functionality of equipment and compliance

Table 8 Association between Functionality of Equipment and Compliance

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.374[a]	12	.497
Likelihood Ratio	11.811	12	.461
Linear-by-Linear Association	.023	1	.879
N of Valid Cases	99		

DISCUSSION

The study sought to determine facility related factors determining compliance to National Neonatal Resuscitation Guidelines among nurses at Pumwani Maternity Hospital. The study found that majority 64.9% (61) indicated that they had been trained on neonatal resuscitation. However slightly above half 52.6% (50) indicated that they had not been trained on neonatal resuscitation since they began working. The vast majority 97.3% (93) of respondents indicated that they could use more training to perfect their skill in neonatal resuscitation. Slightly above half 54.8% (52) rated the availability of equipment as good. Majority 61% (58) indicated that resuscitation equipment had good functionality.

Availability of equipment ($\chi 2$=17.378, df=8, p=0.026) and training ($\chi 2$=37.767, df=16, p=0.002). This finding is similar with findings of Trevisanuto *et al.* (2016) whose results showed that the equipment classified as "essential" by the WHO guidelines and HBB algorithm was not available in a considerable portion of the surveyed hospitals. Heerden *et al.* (2016) also found recurrent themes of lack of essential emergency equipment and stock needed for neonatal resuscitation. The finding is also similar to that of Monebenimp *et al.* (2012) who found that there is a need to reinforce the capacity of health care providers by training in WHO ENC course with emphasis

on providing skills on resuscitation in order to reduce the burden of neonatal intra partum-related deaths.

CONCLUSION

Compliance to National Neonatal Resuscitation Guidelines among nurses at Pumwani Maternity Hospital is not sufficiently high to reduce the neonatal deaths to almost zero. Not all nurses used the National Neonatal Resuscitation Guidelines and those who use them did not use them to a great extent. Among the facility related factors, availability of resuscitation equipment and training were significant. Majority of nurses were dissatisfied with the availability of resuscitation equipment. Although all nurses were highly educated and trained, there was no on-the-job training on neonatal resuscitation. The County Government of Nairobi should ensure that the resuscitation rooms are fully equipped at all times and maintain functionality of equipment through regular checkups.

REFERENCES

Almeida, M. F. B. de, Guinsburg, R., Costa, J. O. da, Anchieta, L. M., & Freire, L. M. S. (2008). Material and human resources for neonatal resuscitation in public maternity hospitals in Brazilian state capitals. *Sao Paulo Medical Journal*, *126*(3), 156–160. https://doi.org/10.1590/S1516-31802008000300004

Bhatnagar S. (2014). Neonatal resuscitation. *Journal of neonatal surgery*, *3*(3), 43.

Chadha IA. Neonatal resuscitation: Current issues. Indian J Anaesth [serial online] 2010 [cited 2020 Jul 31];54:428-38. Available from: http://www.ijaweb.org/text.asp?2010/54/5/428/71042

Chikuse, B. , Chirwa, E. , Maluwa, A. , Malata, A. and Odland, J. (2012) Midwives' adherence to guidelines on the management of birth asphyxia in Malawi. *Open Journal of Nursing*, **2**, 351-357. doi: 10.4236/ojn.2012.24052.

Ezenduka, PO Ndie, , EC& Oburoh, ET (2016). Assessment of knowledge, attitude, and practice of nursing management of birth asphyxia in federal medical centre Asaba, Delta State-Nigeria. *Clinical Nursing Studies*, *4*(2), 21–27. https://doi.org/10.5430/cns.v4n2p21

Janet, S., Carrara, V. I., Simpson, J. A., Thin, N. W. W., Say, W. W., Paw, N. T. M., … McGready, R. (2018). Early neonatal mortality and neurological outcomes of neonatal resuscitation in a resource-limited setting on the Thailand-Myanmar border: A descriptive study. *PLOS ONE*, *13*(1), e0190419. https://doi.org/10.1371/journal.pone.0190419

Kenya National Bureau of Statistics (KNBS)(2015). Kenya Demographic and Health Survey 2014. Retreived from https://dhsprogram.com/pubs/pdf/fr308/fr308.pdf

Kiptui, M. (2001). *Effect of Maternal Education on Infant and child mortality in Rural Kenya* (Doctoral dissertation, University Of Nairobi).

Kunikata, T., Morita, K., Sakurai, H., Kakei, H., Honda, M., Wada, M., … Tamura, M. (2017). Status of and problems concerning neonatal resuscitation in Japan in 2015. *Pediatrics International*, *59*(2), 163–166. https://doi.org/10.1111/ped.13089

Lindbäck, C., Ashish, K. C., Wrammert, J., Vitrakoti, R., Ewald, U., & Målqvist, M. (2014). Poor adherence to neonatal resuscitation guidelines exposed; an observational study using camera surveillance at a tertiary hospital in Nepal. *BMC pediatrics*, *14*(1), 1-7.

Mendhi, M. M., Cartmell, K. B., Newman, S. D., Premji, S., & Pope, C. (2018). Review of educational interventions to increase traditional birth attendants' neonatal resuscitation self-efficacy. *Women and Birth*. https://doi.org/10.1016/j.wombi.2018.04.016

Niermeyer, S. (2016). Ventilation Remains the Key to Neonatal Resuscitation. *The Journal of Pediatrics*, *171*, 8–10. https://doi.org/10.1016/j.jpeds.2015.12.080

Noor, T., Raza, N., & Haq, G. (2014). Neonatal resuscitation: a knowledge gap amongst obstetrical trainees. A cross-sectional survey amongst medical graduates of Civil Hospital Karachi. *JPMA. The Journal of the Pakistan Medical Association*, *64*(7), 856–9. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/25255607

Oh, J.-W., & Kim, Y. (2016). Knowledge of Infant Cardiopulmonary Resuscitation of Pediatric Ward Nurses. *Indian Journal of Science and Technology*, *9*(41). https://doi.org/10.17485/ijst/2016/v9i41/103853

Oloyede, I., & Udo, P. (2016). An audit of some health facilities and equipment for neonatal resuscitation in south-south Nigeria. *Nigerian Journal of Paediatrics*, *43*(3), 197. https://doi.org/10.4314/njp.v43i3.8

Opiyo, N., Were, F., Govedi, F., Fegan, G., Wasunna, A., & English, M. (2008). Effect of Newborn Resuscitation Training on Health Worker Practices in Pumwani Hospital, Kenya. *PLoS ONE*, *3*(2), e1599. https://doi.org/10.1371/journal.pone.0001599

Otido, S. (2013). *Adherence to newborn resuscitation guidelines in Garissa Provincial General Hospital* (Doctoral dissertation, University of Nairobi).

PATH. (2015). Assessment of Neonatal Resuscitation Reprocessing Equipment Practices | Health Research Program. Retrieved April 3, 2018, from https://www.harpnet.org/resource/assessment-of-reprocessing-practices-for-neonatal-resuscitation-equipment/

Shikuku, D. N., Milimo, B., Ayebare, E., Gisore, P., & Nalwadda, G. (2018). Practice and outcomes of neonatal resuscitation for newborns with birth asphyxia at Kakamega County General Hospital, Kenya: a direct observation study. *BMC Pediatrics*, *18*(1), 167. https://doi.org/10.1186/s12887-018-1127-6

Trevisanuto, D., Cavallin, F., Arnolda, G., Chien, T. D., Lincetto, O., Xuan, N. M., … Moccia, L. (2016). Equipment for neonatal resuscitation in a middle-income country: a national survey in Vietnam. *BMC Pediatrics*, *16*(1), 139. https://doi.org/10.1186/s12887-016-0664-0

Van Heerden, C., Maree, C., & Janse van Rensburg, E. S. (2016). Strategies to sustain a quality improvement initiative in neonatal resuscitation. *African Journal of Primary Health Care & Family Medicine*, *8*(2), 1–10. https://doi.org/10.4102/phcfm.v8i2.958

Woodward, M. A. (2019). *Exploring neonatal resuscitation competencies in residents and recently graduated pediatricians* (Doctoral dissertation).

World Health Organization. (2012). noitaticsuser nrobwen cisab no senilediuG. World Health Organization. https://apps.who.int/iris/handle/10665/75157

Wrammert, J., Zetterlund, C., KC, A., Ewald, U., & Målqvist, M. (2017). Resuscitation practices of low and normal birth weight infants in Nepal: an observational study using video camera recordings. *Global Health Action*, *10*(1), 1322372. https://doi.org/10.1080/16549716.2017.1322372

Wyckoff MH, Aziz K, Escobedo MB, *et al.* Part 13: Neonatal Resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2015; 132:S543.