Research

Preparedness of Western Cape advanced life support providers to provide clinical stabilisation and intensive care for neonatal interfacility transfers

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Abstract

Introduction

The Western Cape is a province in South Africa – known for the port city of Cape Town – surrounded by the Indian and Atlantic oceans. The transport of high-risk neonates between neonatal intensive care units in the Western Cape of South Africa is performed by advanced life support (ALS) providers. The implications of this practice have not been documented. This study will evaluate the preparedness of ALS providers to undertake intensive care of critically ill neonates during interfacility transfers.

Methods

Data collection was performed using a questionnaire with a response rate of 81% (n=145). The data analysis encompassed descriptive statistics using tables and figures. Inferential statistics was done using the chi-square test with a significance reported for $p < 0.05$. Reliability was determined using Cronbach's alpha.

Results

The respondents highlighted that their initial ALS training was not adequate to prepare them for managing critically ill neonates. This view was expressed by the greater majority (n=63, 43.4%) when asked about their combined neonatal theory and practical training notional hours of their curriculum which focussed on managing critically ill neonates.

Conclusion

There is an urgent need to improve the training programs of ALS providers with regards to neonatology. Numerous factors affecting the preparedness of ALS providers to manage critically ill neonates have been highlighted.

Keywords:

advanced life support (paramedic) training programme; emergency medical care; pre-term neonates; neonatal inter-facility transfer; critically ill neonate; patient safety

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Introduction

The clinical management and transportation of high-risk, critically ill neonates (newborn babies less than 28 days old) require emergency care providers who are competently skilled to perform clinical interventions safely (1). The ideal composition of the neonatal transfer team includes physicians (neonatologists or paediatric intensivists), critical care nurses with specialist training in neonatology, clinical technologists and emergency care practitioners (2). The impact of such teams is seen in first world countries and is reflected in the significantly lower neonatal mortality (3).

According to the Western Cape Department of Health, South Africa (4) there has been impetus to improve emergency medical services (EMS) in the form of replacement and modernisation of the ambulance fleet, technological upgrading of communication centres, as well as expansion and strengthening of the staff complement. However, the same report also highlighted that there was a lack of professional development and training, particularly in the area of improvement of quality of care by advanced life support (ALS) providers in the Western Cape province (4). A lack of practitioner development and training had been identified by the World Health Organization as the main threat to patient safety (5). Furthermore, a recent South African study found that 'time delays, equipment problems, adverse events and a lack of skills' may be some of the factors contributing to the increasing neonatal mortality (6). This study aimed to evaluate the experience of and preparedness of ALS providers in the Western Cape province to undertake intensive care of critically ill neonates during interfacility transfers.

Methods

This quantitative, non-experimental design sought to provide a descriptive analysis of the preparedness of current emergency care providers to manage critically ill neonates. The target population comprised a total of 2715 ALS providers across South Africa, using the Health Professions Council of South Africa (HPCSA) registers (7). However, since the study was limited to the Western Cape province, the study population comprised 179 ALS providers, consisting of government and private sector ALS providers.

Study setting

The study was carried out in the Western Cape province, South Africa.

Sampling strategy

Purposive sampling was used, and all ALS providers working in the pre-hospital environment in private and provincial EMS, as well as those working in the aero-medical environment in the Western Cape province were invited to participate.

Sample

From a total of 179 ALS providers, in both the government and private ALS providers working at the time of the study, the number of responders and final sample comprised 145 participants, yielding a response rate of 81%.

Data collection

This study utilised a survey (questionnaire) as the data collection tool. The questionnaire contained general questions relating to the objectives of the study. The majority of the questions were closed-ended.

Key findings that emerged from the data analysis related to:

- training (or more accurately, the lack thereof)
- the frequency of ALS providers managing critically ill neonates
- the most frequently utilised ALS technical neonatal skills/procedures
- the degree to which qualifications and operational experience played a role in the preparedness of ALS providers to clinically stabilise and to provide intensive care to neonates
- ALS providers' confidence level pertaining to neonatal clinical exposure
- The need for neonatal specialised equipment

Permission to conduct the study was obtained for both the government and private EMS from their respective gate-keeper research committees. Hardcopies of the participation consent forms and questionnaires was then distributed to the various operational managers to distribute to all their respective ALS staff for voluntary participation. The collected data was analysed using the computer program SPSS v 24 IBM Corp, Amronk, NY.

None of the data distributions were normal and therefore non-parametric analysis was used. The median and interquartile ranges were explored to measure variations in the multiple data sets. The significance of crosstabulations between categorical variables was done by interpreting the p-values obtained from the chi-square test.

Construct validity

The researcher kept the research aims and objectives in mind during the development of the survey instrument. After completion, construct validity testing was done by the researcher presenting the research proposal to the academia of the Durban University of Technology Department of Emergency Medical Care and Rescue.

Internal validity

All eligible ALS providers in the Western Cape were included, thus avoiding any potential biases related to selection which may have compromised the study results. Furthermore, a pilot

study was conducted with 10 eligible ALS providers in order to validate the survey instrument and obtain unbiased feedback. These volunteers were similar to the target population of the main study and the researcher approached each one individually, explaining the nature and importance of the study. The results of the pilot study were excluded from the final data analysis. However, the valuable feedback provided by the pilot test was used to ensure maximum user-friendliness and accurate data capture in the final questionnaire which was used for mass dissemination.

External validity

In South Africa, all ALS training institutions have to comply with and are audited by the HPCSA in terms of curriculum/assessments for ALS provider students. Therefore, the majority of ALS providers receive similar training across the provinces. This implies that the results of this study can be generalised across most provinces in South Africa, as all ALS providers are registered (HPCSA) to practise the same clinical skill sets.

Ethics

Ethics approval was granted by Durban University of Technology (Ethics clearance number - REC 69/15).

Results

Participants were requested to provide their age and the length of time (in years) that they have been registered as an ALS provider with the HPCSA (Table 1).

Table 1. Biographical data of study participants

Age (years)	
	n=141
Median	34
Interquartile range	27.5–40.5
Maximum	64
Minimum	25
Registration period with the HPCSA as ALS providers (years)	
	n=145
Median	6
Interquartile range	0.75–11.25
Maximum	30
Minimum	0.4

The majority of the participants (n=73, 50.3%) indicated that they were primary response ALS providers. The aero-medical ALS providers (n=6, 4.1%), inter-hospital intensive care unit ALS providers (n=5, 3.4%) and those ALS providers working as both primary response ALS providers and as inter-hospital intensive care unit ALS providers (n=5, 3.4%) were the

participants who would be the most likely to transport critically ill neonates on a regular basis (total n=16, 10.9%).

More than a third of the participants (n=56, 38.6%) indicated that their in-hospital and pre-hospital clinical practical blocks had provided inadequate practical exposure during their initial ALS neonatal practicum phase (p<0.001). Another group of participants (n=63, 43.4%) expressed that their combined ALS neonatal theory hours and practical hours had been inadequate to prepare them to deal with critically ill neonates (p<0.001) (Table 2).

Table 2. Initial ALS neonatal training practicum phase (in-hospital and pre-hospital), as well as ALS neonatal theory and practicum (combined)

Initial neonatal practicum phase (in-hospital and pre-hospital)		
	Frequency	%
Excellent	8	5.5
Adequate	37	25.5
Fair	16	11
Inadequate	56	38.6
Extremely inadequate	9	6.2
Neutral/undecided	19	13.1
Total class hours and practical hours devoted to neonatal critical care		
	Frequency	%
Excellent	4	2.8
Adequate	34	23.4
Fair	14	9.7
Inadequate	63	43.4
Extremely inadequate	5	3.4
Neutral/undecided	25	17.2

After their initial training, ALS providers are encouraged and also required by law to improve and maintain their clinical skills (8). Only a small group (n=16, 11%) completed both the neonatal advanced life support and paediatric advanced life support courses, while the majority (n=74, 51%) had received no additional training pertaining specifically to neonates/paediatrics (Figure 1).

A small group of participants (n=5, 3.4%) being ALS providers working on neonatal intensive care unit ambulances indicated that they were exposed to managing critically ill neonates on a daily basis. However, the other participants indicated that they dealt with critically ill neonates once in 3 months (n=32, 22.1%), followed by those who dealt with them only once a month (n=27, 18.6%). There was no relationship between the frequency with which the ALS providers managed critically ill neonates and the EMS sector (private or public) in which they worked (p=0.156).

Figure 1. Additional neonatal/paediatric training post ALS provider qualification

Respiratory complications (respiratory distress, 75.2%) were recorded as the most frequent reason for EMS transportation of critically ill neonates and birth asphyxia (9%) featured as the least prominent reasons (Table 3).

Table 3. The most common diagnostic reason why critically ill neonates are conveyed by EMS

Diagnostic reason	Frequency	%
Respiratory distress	109	75.2
Dehydration and diarrhoea	59	40.6
Preterm	53	36.6
Sepsis	27	18.6
Congenital abnormality	19	13.1
Birth asphyxia	13	9.0
Pre-term and acute respiratory distress syndrome	6	4.1
Hyaline membrane disease	2	1.4
Hypoxic-ischaemic encephalopathy	2	1.4
Meconium aspiration syndrome	2	1.4
For scans, investigations and surgery	2	1.4
Necrotising enterocolitis	1	0.7
Upgrade ambulance to higher level of care	1	0.7
Not enough exposure – unknown	2	1.4
Nothing noted	1	0.7
(Multiple responses were allowed)		

Only 9.7% (n=14) of the respondents indicated 'strongly agree' when asked whether they had at their disposal the necessary specialised monitoring equipment and the condition of such

equipment in terms of functionality and cleanliness ($p < 0.001$). Such specialised equipment is vital for the monitoring and care, as effectively, the transferring ALS provider and his/her method of transportation (either by road or flight) should serve as an identical fully equipped intensive care unit, in order to maintain the intensive continuum of care rendered to the critically ill neonate.

Discussion

This study drew from data on respondents who had been employed in the field for a reasonably long period of time, thus indicating that the responses would be provided from informed (experienced) sources (mean = 8.40 ± 7.21 years). A large group of the respondents had been practising for between 10 and 30 years (n=37, 32.4%). However, the findings of this study show that ALS providers are not updating their currency of knowledge. This augurs poorly for the profession and for healthcare as advancements in technology and technique are evolving at a rapid pace.

Croskerry et al describe competence as achieving and, importantly, maintaining an acceptable level of knowledge and skill (9). The majority of the respondents (n=63, 43.4%) indicated that the combined neonatal theory hours and practical hours during their training had been inadequate to prepare them to deal with critically ill neonates. This corroborates findings from a study conducted in South Africa by Moodley who reported that paramedic graduates felt ill prepared for independent practice due to clinical practice learning objectives not being adequately achieved, also questioning the quality of that care provided by such EMS personnel as a result of this pitfall (10). The infrequency which ALS providers clinically

manage critically ill neonates may inadvertently impact negatively on their level of confidence and technical neonatal skill performance when they are eventually called on to resuscitate a sick neonate (11). The current study reports that only a small group of respondents (n=5; 3.4%) had been exposed to managing critically ill neonates on a daily basis; these are mainly from the neonatal intensive care unit ambulances. According to Perez et al, healthcare workers may fail to retain specialised knowledge and skills if they use such knowledge and skills infrequently in practice (12). The impact of this may have been a high number of technical, clinical and critical adverse events associated with the pre-hospital management and care of neonates, as reported by Hatherill et al (13).

It has been reported that airway-related complications in neonates are common (14). A study by Walla et al determined that approximately 2% of all neonates who do not breathe at birth will require advanced resuscitation (ie. chest compressions, intubation or medications) and may not survive without ongoing ventilation and neonatal intensive care (15). For most ventilated inter-facility transfers, the neonate will already have been intubated in-hospital. This study reports that neonatal respiratory complications (respiratory distress n=109; 75.2%) were recorded as the most frequent reason for ALS transportation, with the use of ventilators recorded as the most frequent technical skill (n=101; 69.7%) performed by ALS providers.

Strengths

This is the first study to focus on ALS providers' preparedness to provide clinical stabilisation and intensive care for neonates during inter-facility transfers with contextual data from participants with prolonged experience in the field in South Africa. The response rate was high and therefore provides comprehensive insight into the current status quo with regards to this special patient population group in the Western Cape EMS inter-facility transport environment.

Limitations

The population was limited to the public and private pre-hospital ALS providers in the Western Cape only. Data from other provinces may reflect differently as each province has unique healthcare challenges in terms of healthcare infrastructure, personal and the topographical landscape, as well as different healthcare disease profiles.

Recommendations

Training and development

There is an urgent need in South Africa to standardise all ALS provider neonatal training programs – both the theory and the practicum components. Special emphasis should also be placed on the transfer process and the subsequent potential

detrimental implications for the critically ill neonate. The ideal would be the establishment of a mentorship programme, supervised by neonatologists.

Neonatal specialised critical care equipment

In order to improve patient safety, the procurement of sufficient specialised neonatal intensive care equipment and disposables, especially for the rural ALS providers, should be prioritised. The manufacturers of medical equipment have realised that specialised critical care equipment which caters for all age groups are extremely beneficial in the pre-hospital environment. Thus, the ideal would be to procure such equipment in order to limit costs.

ALS provider neonatology sub-speciality

ALS providers are highly regarded as resuscitation and airway specialists. However, in order to advance the EMS profession, it is essential that an ALS provider neonatology sub-speciality is created, which would entail additional training and certification at national level. If we do a comparison between EMS and the nursing profession, nursing has evolved to include multiple specialisations (postgraduate 2-year diploma specialisation programs).

Conclusion

This study identified deficiencies in the ALS provider training curricula – in both the theory and the practicum components. There is an urgent need to improve the training programs of ALS providers to enhance their preparedness to provide clinical stabilisation and intensive care for neonates during inter-facility transportation in South Africa.

Competing interests

The authors have no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

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