

## “Safe anaesthesia” for the South African rural obstetric patient in KwaZulu-Natal

A Theron\*\* and CC Rout<sup>b</sup>

<sup>a</sup>King Edward VIII Hospital, Durban, South Africa

<sup>b</sup>Department of Anaesthesiology, University of KwaZulu-Natal, Durban, South Africa

\*Corresponding author, email: dr\_theron@mweb.co.za

**Background:** The South African National Committee for Confidential Enquiries into Maternal Deaths has shown that anaesthesia-related maternal deaths continue to increase at district hospitals. This has been attributed to substandard anaesthesia care and resuscitation. This study investigated the anaesthesia practices, work circumstances, support structure and access to training by doctors involved in obstetric anaesthesia in KwaZulu-Natal district and regional hospitals.

**Method:** This was an observational study, which included 48 district and regional hospitals offering operative obstetrics in KwaZulu-Natal. Separate questionnaires were given to medical managers and doctors providing obstetric anaesthesia.

**Results:** The authors assessed 254 doctors' questionnaires. Ninety-eight per cent were full-time appointments and 75% had been employed for less than five years. Almost all of the doctors routinely used spinal anaesthesia, 96% used uterine displacement and 77% measured blood pressure every 1–2 minutes. Appropriate vasopressors were used by 98% of the doctors to treat post-spinal hypotension.

Thirteen per cent (32 of 254) of the doctors “frequently or always” performed or assisted with surgery after anaesthetising the patient.

Only 22% (54 of 248) of the doctors had an anaesthetic-trained nurse as usual assistance. Thirty per cent (35 of 115) of the doctors in the district hospitals reported feeling insecure or having experienced difficulties during general anaesthesia.

Nine per cent (22) of the doctors reported not having after-hours supervision and 53% (134 of 253) did not receive any structured training at their base hospitals.

**Conclusion:** The majority of doctors provided safe obstetric anaesthesia according to the indicators used. The unsafe practice of administering anaesthesia and then performing other theatre duties, thus leaving the mother without dedicated medical supervision, must be stopped. Efforts should be made to improve the supervision and support of district hospital doctors. Resources to optimise safe practices need to be improved.

**Keywords:** district and regional hospitals, obstetric anaesthesia, supervision, training opportunities

### Introduction

Spinal anaesthesia is the most commonly used technique for Caesarean section anaesthesia in district and regional hospitals in South Africa.<sup>1–3</sup> However, there is a misconception,<sup>1</sup> largely among doctors without specialist anaesthetic training, that spinal anaesthesia is without complications. Many doctors who are employed to work unsupervised in district hospitals do not have the skills required to provide safe general anaesthesia when complications arise. Anaesthesia-related maternal deaths in South African district hospitals continue to increase, associated with substandard anaesthesia practices and inadequate resuscitation.<sup>1–3</sup>

This paper reports on further aspects of a large questionnaire-based study exploring obstetric anaesthesia at district and regional hospitals in KwaZulu-Natal. Previous findings reported in the *Southern African Journal of Anaesthesia and Analgesia*<sup>4</sup> were those of inexperienced doctors at district hospitals providing obstetric anaesthesia without adequate supervision or support. Four specific target groups who would potentially benefit from support and training were identified, namely interns, foreign graduates, more experienced practitioners (with more than five years' experience) and doctors providing anaesthesia on a sessional basis. The current paper addresses the obstetric anaesthetic practices at district and regional hospitals, the circumstances under which the doctors included in the previous paper worked, the availability of support and supervision in these hospitals, and whether or not additional anaesthetic training opportunities were available.

### Method

As previously described,<sup>4</sup> institutional ethical review and permission were obtained from the KwaZulu-Natal Department of Health. A questionnaire were distributed in June 2011 to medical managers at provincial district and regional hospitals identified as providing an operative obstetric service. Human resource information was current in 2011, and the caseload statistics were from 2010.<sup>4</sup>

The questionnaire for the doctors was distributed either through medical managers or heads of the clinical units, or directly when email addresses were provided. It asked about the details of doctors' level of training and experience, their role in providing obstetric anaesthesia, current practices, the supervision and the availability of structured anaesthesia training at the institutions, and anaesthesia training opportunities elsewhere. The authors reported on human resources and the caseload and experience of doctors at regional and district hospitals in the earlier publication.<sup>4</sup>

All doctors are expected to provide obstetric anaesthesia at the district hospitals, when required. Therefore, all of them were included in the study, but only those working in anaesthetic departments at regional hospitals were included. The possibility of a low response rate from the doctors was taken into consideration. Therefore, 33% (16/48) of the hospitals were selected for site visits following stratified random selection. Hospitals were stratified according to level (district or regional),

**Table 1:** Operating theatre practices by doctors at the district and regional hospitals

Operating theatre practices	Never		Rarely		Frequently		Always		Incomplete answers	
	District (n = 133)	Regional (n = 121)								
	n (%)									
Administer anaesthesia and resuscitate neonate	17 (13)	31 (26)	60 (45)	64 (53)	47 (35)	23 (19)	5 (4)	0	4 (3)	3 (2)
Administer anaesthesia and assist with surgery	78 (59)	113 (93)	35 (26)	6 (5)	13 (10)	0	4 (3)	0	3 (2)	2 (1.6)
Administer anaesthesia and perform surgery	90 (68)	110 (91)	28 (21)	5 (4)	9 (7)	4 (3)	4 (3)	0	2 (1.5)	2 (1.6)
Administer anaesthesia, and perform or assist with surgery and resuscitate the neonate	82 (62)	114 (94)	39 (29)	5 (4)	8 (6)	0	1 (0.8)	0	3 (2)	2 (1.6)

and whether or not they were urban or rural (defined as greater than 50 km from the two tertiary hospitals in Durban and Pietermaritzburg). The medical managers or anaesthetic unit heads were contacted at the visited hospitals, and accredited continuing medical education activity was arranged, during which data collection occurred. The doctors' questionnaires were completed prior to the lectures and discussion. All the selected hospitals accepted the offer of a visit, except one where a video conference was preferred. Once again, a questionnaire were sent out prior to the meeting and a request made that it was completed and returned.

The background to the study was explained to the doctors. Written informed consent was obtained at the time of the hospital visits. Electronic or postal return of the questionnaires was taken as implicit consent. The doctors' completed questionnaires were anonymous. Identification of the individual hospitals or doctors was not permitted, according to a prior agreement with the KwaZulu-Natal Department of Health.

Questionnaires completed by the interns at regional hospitals were excluded, as these junior doctors are meant to work under the close supervision of specialists. On completion of the data collection and analysis, a complete report was handed to the KwaZulu-Natal Department of Health.

## Results

Two hundred and sixty-six questionnaires were completed. Two hundred and fifty-four questionnaires were used for this analysis. Twelve were completed by interns and therefore excluded. There was a 79% response rate from the visited hospitals (145 of 187). The denominator derived from the managers' staffing data (a 100% response rate was received from the managers) and this group represented 55% of all received doctors' responses. One hundred and twenty-one additional questionnaires were completed from the hospitals that we did not visit. In this regard, it was impossible to determine the correct denominator owing to poor compliance by the managers. The respondents included 38 community service medical officers (CSMOs), 157 medical officers (MOs), two general practitioners (GPs), 29 specialists (five from rural regional hospitals), and 28 registrars (all from the Durban and Pietermaritzburg metropolitan areas). Ninety-two per cent (35) of the CSMOs were employed at rural district hospitals. Sixty per cent (93) of the MOs were employed in district hospitals and 40% (64) in regional hospitals.

Ninety-eight per cent (248 of 254) of the respondents were full-time employees. Seventy five per cent (190 of 254) indicated that their current employment was for less than five years and

44% (111 of 254) for less than 12 months.

Ninety-seven per cent of the respondents indicated using spinal anaesthesia for the majority of their Caesarean sections. One reported using epidural anaesthesia. Seven respondents did not answer the question.

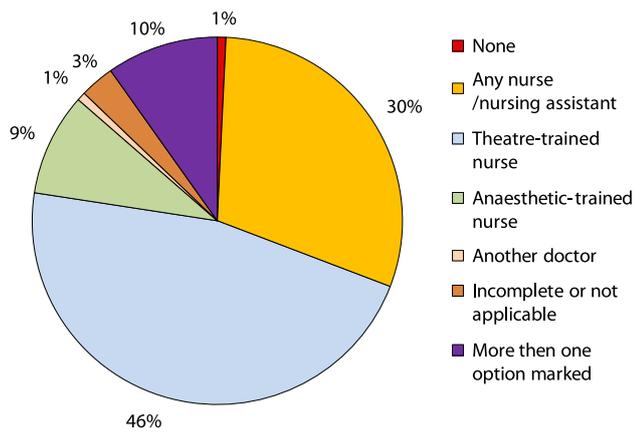
Ninety-six per cent (233 of 243) of the doctors reported using some form of uterine displacement. Of those who had not, nine were from district hospitals, four of these were from one hospital and three from one other. Seventy-seven per cent (188 of 244) of the doctors measured blood pressure (BP) every 1–2 minutes, 15% (37) every three minutes, and 8% (19) every five. Ten doctors did not answer the question.

Ninety-eight per cent of the doctors indicated the use of an appropriate vasopressor as a first-line agent to treat post-spinal hypotension, 55% (140) used ephedrine and 35% (89) phenylephrine. Doctors were asked to mark only one, but 7.5% (19) indicated both ephedrine and phenylephrine as first-line agents.

Table 1 shows the role of doctors in the operating theatre. Doctors were asked how often they both administered anaesthesia and performed other tasks in theatre, e.g. performed or assisted with surgery and/or resuscitated the neonate, while leaving the patient in the care of non-medical personnel, i.e. nursing personnel of various level of training. They could indicate "never", "rarely", "frequently" or "always". The majority answered "never" to most of the scenarios, but 6.8% (17 of 250) of the doctors ticked the box indicating "frequently" or "always" in the context of both administering anaesthesia and then operating on a patient. Thirteen of these worked in district hospitals.

3.6 per cent (9 of 249) of the doctors frequently administered anaesthesia and performed or assisted with surgery, and resuscitated the neonate. All of them worked in district hospitals. Of those doctors who "always" performed or assisted with surgery, two indicated monitoring BP only once every five minutes. Another two doctors who responded "frequently" indicated the same level of monitoring. Thirty per cent (75 of 247) administered anaesthesia and resuscitated the neonate "frequently" or "always". Once again, the majority (52 of 75) of these were district hospital doctors, while 19% (23 of 121) of the regional hospital doctors stated that they frequently had to do this.

Variations of combined practices (with the exception of providing anaesthesia and only helping to resuscitate the neonate) were reported by 13% (32 of 254) individual practitioners from 15



**Figure 1:** Anaesthetic nursing assistance in the district hospitals' operating theatres

different hospitals. The reported number of full-time employed doctors was equal to or less than five in four of the hospitals represented by these doctors. These practitioners consisted of eight CSMOs, 23 MOs and one GP. Six of the doctors were from the previously mentioned four hospitals. One of these four hospitals was visited, and two MOs therefrom participated in the study. Twenty-six doctors performing or assisting with surgery were from hospitals that employed six or more doctors. Four were from regional hospitals. At six of the hospitals where doctors often performed a combined role in theatre, more than 10 full-time doctors were employed.

Of the 32 doctors involved in variations of single-operator situations, 10 conducted more than 10 cases per month, 10 6–10 cases a month, seven 2–5 cases and five less than two.

Overall, 21% (54 of 254) of the doctors were assisted by a trained anaesthetic nurse. Thirty-six per cent (91) were assisted by a trained theatre nurse and 32% (81) by any available nurse or nursing assistant. Figure 1 demonstrates theatre assistance within the district hospitals, where it can be seen that only 9% (12) of the doctors were assisted by a trained anaesthetic nurse, 46% (62) by a trained theatre nurse and 30% (40) by any available nurse or nursing assistant. One doctor provided anaesthesia without any assistance.

Table 2 demonstrates the feelings of insecurity or difficulties experienced by the doctors who administered obstetric anaesthesia at district hospitals in the previous month. Of the 35 doctors in the "frequent" and "always" groups for general anaesthesia, five provided anaesthesia for less than two Caesarean sections in the previous month, 11 for 2–5 cases, nine for 6–10 and 10 for more than 10.

Table 3 demonstrates the doctors' supervision during working hours and after hours. Eight per cent (22) of the doctors reported that there was no supervision after hours. Sixteen of these were from district hospitals. Four doctors, all from district hospitals reported having no supervision during the day.

Structured anaesthesia training had only been received by 47% (119) of the doctors at their hospitals. Of the remainder, who had not received any training, 84% (113 of 134) worked in rural hospitals, mostly at district level; 25% (34 of 134) were CSMOs and 68% (91 of 134) MOs. Twenty-one per cent (19) of these MOs had more than five years' experience in anaesthesia. Fifty doctors indicated that they had received structured training in anaesthesia elsewhere, 78% (39) of whom were from regional hospitals.

Doctors were asked about challenges (equipment problems, drug availability, referral problems, lack of blood products and personnel) in their setting. Table 4 compares doctors' responses at

**Table 2:** Doctors at the district hospitals who reported feeling insecure or who had experienced difficulty during general and spinal anaesthesia for Caesarean section

	Spinal anaesthesia (n = 124)			General anaesthesia (n = 115)		
	n	%	95% CI	n	%	95% CI
Never	39	31.5	23-40	48	42.0	33-51
Rarely	77	62.0	52-70	32	28.0	20-37
Frequently	6	4.8	2-10	11	9.6	2-17
Always	2	1.6	0.2-6	24	21.0	14-29

CI: confidence interval

**Table 3:** Anaesthesia supervision at district and regional hospitals during and after hours

Anaesthesia supervision	Supervision during day hours				Supervision during after hours			
	District (n = 133)		Regional (n = 121)		District (n = 133)		Regional (n = 121)	
	n	%	n	%	n	%	n	%
None	4	3.0	0	0.0	16	12.0	6	5.0
Medical officers	80	60.0	1	0.8	83	62.0	1	0.8
Medical officers with added qualifications	33	25.0	2	1.5	19	14.0	3	2.5
Specialist on site	2	1.5	85	70.0	0	0.0	5	4.1
Specialist per telephone	4	3.0	23	19.0	8	6.0	84	69.0
More than one option marked	8	6.0	8	6.6	5	4.0	19	16.0
Unanswered	2	1.5	2	1.5	2	1.5	3	2.5

**Table 4:** Problems relating to obstetric anaesthesia, as reported by doctors at the district and regional hospitals

Problems	District (n = 133)	Regional urban (n = 102)	Regional rural (n = 19)
	n (%)	n (%)	n (%)
Equipment problems	57 (43)	65 (64)	9 (47)
Drug availability	33 (25)	21 (18)	3 (16)
Referral problems	68 (51)	21 (18)	3 (16)
Lack of blood products	72 (54)	40 (40)	7 (37)
Lack of personnel	61 (46)	40 (40)	12 (63)

district, and regional urban and regional rural hospitals. Equipment problems were quite common, and most evident at regional urban hospitals (64%). Referral problems (51%), and lack of blood products (54%) and personnel (46%) were pertinent to district hospitals. Regional rural hospitals experienced the most difficulties with personnel numbers (63%).

### Discussion

The results of this study provide a snapshot view of obstetric anaesthesia practices, expressed by the doctors who completed the questionnaire. Although the findings only reflect the experience of those doctors who completed the questionnaire, the use of random sampling for hospital visits conferred a degree of validity for other hospitals in KwaZulu-Natal.

A high proportion of the doctors reported appropriate standards of care, as assessed by the use of spinal anaesthesia, uterine displacement, appropriate BP measuring practices and appropriate vasopressors, which is in contrast with the latest South African National Committee for Confidential Enquiries into Maternal Deaths (NCCEMD) report,<sup>2</sup> in which it is suggested that substandard practices are widespread. However, the NCCEMD report is a national audit of mortality and there may be variations in standards of care between provinces. The NCCEMD only reviews cases where patient management has already failed. Some of the respondents in our study might have been subject to acquiescence bias and have chosen options from the questionnaire that they felt we would like to see.

Doctors administering anaesthesia for Caesarean section, as well as performing or assisting with the surgery and/or having to resuscitate the neonate (Table 1) was an unsafe practice that caused considerable concern. Our survey revealed that 6.8% of respondents provided both anaesthesia and surgery to patients, compared to 11.4% in the study by Lamacraft et al. in the Free State.<sup>5</sup> However, the proportion of practitioners who participated in various combined roles in theatre (13%) was more than that reported by Lamacraft et al. This may be because in the latter study, a specific question was not asked with regard to doctors performing anaesthesia and then assisting with the surgery (doctors were only questioned on whether or not they performed the surgery), and therefore the extent of the problem may have been underestimated at the time.

It is difficult to ascertain why this unacceptable practice of doctors being involved in the anaesthesia, surgery and resuscitation of the neonate still occurs.<sup>1-3,6,7</sup> The argument that it is necessary because of inadequate staffing levels is unlikely to be the reason in regional hospitals as anaesthesia and obstetrics should function as separate departments and the overlapping of duties should never occur. Also, sufficient staff (where six or more full-time doctors are employed)

should be available in the district hospitals (9/15 hospitals reported this practice in this study) to provide a second on-call roster for the provision of a dedicated physician anaesthetist. The belief that this practice is necessary in emergency cases in order to save lives cannot be tested as data are not available documenting the number of lives saved by this practice in order to make a comparison with the anaesthetic deaths known to be associated with it (seven in the 2008-2010 report).<sup>2</sup> This combination of roles in theatre may be the choice of the individual doctor ("I have always performed it this way") or imposed by management ("This is the way it has to be carried out in our circumstances"). Both of these views represent a normalisation of deviance<sup>1,8</sup> that is being passed on to successive generations of CSMOs and junior doctors, adding the dimension of unsafe techniques to inexperience. This situation may not be unique to the province of KwaZulu-Natal,<sup>5</sup> and the cycle of perpetuation needs to be broken.

The importance of the early referral of patients to an appropriate level of care requires the availability of resources and for the referral pathways to be trouble free. This was not reflected in this study (Table 4), as 40% of the doctors in regional urban hospitals had difficulty obtaining blood or blood products and 64% reported equipment problems. Fewer doctors (43%) experienced equipment problems in the district hospitals, but it could be argued that this may have been due to under-reporting by inexperienced doctors who were unaware of the equipment that should have been available.

Other problems experienced included difficulties with referral from district to regional level, which was more of a challenge than referral from regional to tertiary level. Lack of personnel was also widespread. Regional rural hospitals need additional attention. There is a need to uplift these hospitals and to ensure that employment therein is an attractive career option for specialists and MOs.

Doctors at district hospitals had limited or no supervision by senior colleagues (Table 1 and 3), as well as limited support from adequately trained assistants (Figure 1). Similar to the study by Lamacraft et al.,<sup>5</sup> 75% of the respondents in this study had less than five years' experience in their current post and thus were relatively inexperienced. Twelve per cent of the district doctors had no supervision after hours. According to the data by Lamacraft et al.,<sup>5</sup> half of the CSMOs (24.7% of the total group) indicated receiving no supervision, although it was not specified whether this was during working hours or after hours. The number of responses that indicated that no support was given at the regional hospitals, although small, was disturbing, as these hospitals should provide senior assistance at all hours and thus this merits further investigation.

Half of the doctors had not received any structured anaesthesia training at the hospitals in which they were worked. Of these, 14% were "experienced MOs", meant to train and supervise junior doctors. This implies that there is a need for ongoing training programmes and support to be provided to both seniors and junior staff. Alexander et al. had shown in an Australian study on rural doctors showed that continuing professional development, training opportunities, professional support and financial support were priorities.<sup>9</sup> The Remote Vocational Training Scheme encourages GPs in Australia to participate in distance education with remote supervision. Most of these doctors achieve vocational qualifications in general practice and this has been demonstrated to increase the retention of rural doctors. The Joint Consultative Committee on Anaesthesia of Australia and New Zealand runs a 12-month accreditation programme, known as the Maintenance of Professional Standards. This enables GPs to maintain skills and knowledge in anaesthesia, and although voluntary, is required by many hospitals.<sup>10</sup> Rural hospitals in Canada have also recognised the anaesthetic needs of rural communities, and they grant anaesthesia privileges to doctors with 6-12 months of supervised training in anaesthesia.<sup>11</sup>

That less than half the doctors felt insecure or experienced difficulty while administering general anaesthetics should be interpreted with caution (Table 2). Hardly any general anaesthetics were performed at district hospitals. If general anaesthesia was not being performed, associated problems couldn't be experienced, so the figures may underestimate this problem. It is also important to note that only 31.5% of the respondents never felt insecure or experienced difficulty with spinal anaesthesia, so administering this type of anaesthesia is stressful for most doctors.

The role that general anaesthesia skills play in resuscitation and the occasional urgent need to convert spinal to general anaesthesia was a major concern. The combination of a lack of general anaesthesia experience with inadequate supervision and training places obstetric patients at risk. Effective resuscitation is not possible if there is only one doctor in theatre, as immediate surgical delivery of the baby is required if there is to be any chance of success. Only deaths are reported to the NCCEMD, not near misses, so neither the quality nor outcome of resuscitation in survivors is known.<sup>12</sup> It is very important that doctors and hospital management are aware of the minimum requirements for safe obstetric theatre and patients' rights to a safe environment.

## Conclusion

This study demonstrated several problems with obstetric anaesthesia in KwaZulu-Natal. Doctors performed duties in theatre, additional to anaesthetic care of the mother. This practice is universally acknowledged to be dangerous and must stop. There was inadequate assistance in theatre and inadequate support from senior medical staff. Structured training and career

development in anaesthesia were inadequate. Blood and blood products were not universally available. There were problems with referrals from district to higher level hospitals. There were challenges with anaesthesia equipment, particularly in regional hospitals. All of these factors contribute to problems of recruitment and the retention of staff at district and regional hospitals, in addition to a low standard of anaesthesia care.

*Conflict of interest* — Chris Rout is a member of the NCCEMD, and was the supervisor of Dr Annette Theron's research project.

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