

Obstetric anaesthesia at district and regional hospitals in KwaZulu-Natal: human resources, caseloads and the experience of doctors

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Abstract

Objectives: Suboptimal treatment as a result of lack of basic skills in anaesthesia and resuscitation contributes significantly to the continuing increase in anaesthetic-related maternal deaths in South Africa. This study aimed to determine the number of doctors providing obstetric anaesthesia at district and regional hospitals in KwaZulu-Natal, their level of experience and caseload, and to identify specific groups that could be targeted for support and training.

Design: This was a prospective open cohort observational study of obstetric anaesthetic services in KwaZulu-Natal, which considered the human resources, caseloads and the experience of doctors.

Setting and subjects: Two separate questionnaires, directed independently to medical managers and doctors providing operative obstetric services, were sent to 48 district and regional hospitals in KwaZulu-Natal. One third of the hospitals, selected by stratified randomisation, were visited to improve response rates.

Outcome measures: Medical managers were asked for caseload and staffing data. Doctors were asked for details of their qualifications, experience and their current workload.

Results: Thirty-eight (a 79% response rate) medical managers and 266 doctors (an estimated response rate of 65%) completed questionnaires. Community service medical officers (CSMOs) at rural district hospitals constituted 27% of full-time staff. CSMOs at all responding district hospitals were expected to provide obstetric anaesthesia independently. Foreign medical graduates provided obstetric anaesthesia in 71% (27/38) of hospitals and constituted 27% of full-time staff at rural district hospitals. Twenty-four doctors (all foreign-trained) reported no anaesthesia training during their internship. District hospitals were more reliant on part-time (sessional) appointments. Fifty-eight per cent of all (22/38) hospitals reported that a number of sessional appointments provided obstetric anaesthesia. In October 2010, 58% (22/38 active during the month) of sessional appointments at district-level hospitals administered only one obstetric anaesthetic, whereas all 15 sessional appointments who were active at regional level administered two or more. Only 24% of responding doctors had more than five years' experience in their current employment. Only 3% of responding doctors working in rural hospitals had a Diploma in Anaesthesia, compared to 26% in urban hospitals. Only one doctor with more than five years of employment history and a Diploma in Anaesthesia worked at district level.

Conclusion: This study highlights the lack of training and experience of doctors in obstetric anaesthesia and documents workload patterns at district hospitals. It also identifies specific target groups for future support and training.

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Introduction

Substandard care remains a leading avoidable factor in many maternal deaths, particularly those due to anaesthesia, the majority of which are associated with a lack of skills in basic anaesthesia and resuscitation.^{1,2} Lamacraft highlighted a situation in which doctors with no prior obstetric

anaesthesia experience were appointed and expected to provide unsupervised obstetric anaesthesia care in the Free State.^{3,4} The fourth *Confidential enquiries into maternal deaths in South Africa* report of 2010² expressed the hope that the increased intern training in anaesthesia from two weeks to two months would reduce obstetric anaesthesia-related mortality. This was not fulfilled as reflected in the

subsequent and latest 2012 report which continues to show a rising trend.¹

The number of documented deliveries by Caesarean section has doubled since 2001, increasing the anaesthetic workload, and thus the number of anaesthesia-related complications and deaths. The most common causes of death following spinal anaesthesia were the poor treatment of well-recognised complications of spinal anaesthesia, e.g. hypotension and/or high motor block.^{1,2,5} Half of the deaths due to general anaesthesia were due to difficult and failed intubation. Suboptimal treatment and a lack of basic skills in anaesthesia and resuscitation were again identified as key problem areas by the National Committee on Confidential Enquiries into Maternal Deaths.^{1,2}

KwaZulu-Natal has the largest number of deliveries within South Africa, with over 50% occurring at district hospitals. Between 2008 and 2010, KwaZulu-Natal had 15 anaesthesia-related deaths at district hospitals, three at regional, and two at tertiary, hospitals.¹ In order to correct identified inadequacies of care at district and regional level, a first step is to establish the number of doctors involved in obstetric anaesthesia, their caseloads and prior training and experience.

A questionnaire-based study was conducted between June and October 2011 to establish the numbers of doctors providing obstetric anaesthesia at district and regional level in KwaZulu-Natal, their level of experience, encountered challenges and perceived training needs. This paper presents caseload and personnel data (numbers, experience and prior training) from the study. The goal was to identify specific groups of doctors to be targeted for future support and training.

Method

Following an institutional ethical review and permission from the KwaZulu-Natal Department of Health, questionnaires were sent in June 2011 to medical managers at provincial district and regional hospitals at which an operative obstetric service was provided, as indicated on the KwaZulu-Natal Department of Health website. This questionnaire asked for the number of doctors working in the hospital in 2011, how many were involved in obstetric anaesthesia, and the caseload statistics for maternity services for 2010. In addition, October 2010 was taken to be an index month to make a more detailed record of all deliveries, Caesarean sections and the type of anaesthetic used in each case.

A separate questionnaire was sent to doctors employed at these hospitals. This was achieved either through the medical managers or heads of the clinical units, who distributed the questionnaires themselves, or directly when e-mail addresses were provided. This questionnaire asked for details of the level of training and experience of doctors and their role in providing obstetric anaesthesia. All doctors employed at the time of the study were included at the district hospitals, but only those working in the

anaesthetic department were included at the regional hospitals. Because a low response rate from doctors was anticipated, the protocol determined that 33% (16/48) of hospitals should be selected for site visits. Hospitals were stratified according to level (district or regional), and if they were urban or rural. For the purpose of this study, "rural" was defined as greater than 50 km from the two tertiary hospitals in Durban and Pietermaritzburg. A third of the hospitals were then randomly selected for visits, the medical managers or anaesthetic unit heads contacted, and an accredited continuing medical education (CME) activity arranged in conjunction with data collection from the managers and doctors according to prior agreement. All the selected hospitals accepted the offer of a visit, except for one where a video conference was preferred.

The background to, and motivation for, the study, were provided in letters to the hospitals, as well as verbally before the CME activity in hospitals that were visited. Written informed consent was obtained at the time of the hospital visits. Electronic or postal return of the questionnaires was taken to constitute implicit consent. Doctors' questionnaires were anonymous. Publication of the identification of individual hospitals was not permitted, by prior agreement with the KwaZulu-Natal Department of Health.

Questionnaire returns from hospitals that were not visited were actively pursued telephonically or via e-mail from medical managers and unit heads until the end of October 2011.

Results

Of the 48 hospitals, 12 were regional (six rural, and six urban, according to the study definition), and 36 were district (two urban and 34 rural).

Thirty-eight of the 48 medical managers responded to the questionnaire, equating to a response rate of 79%. Two hundred and sixty-six doctors responded (133 from the district, and 133 from the regional, hospitals). One or more doctors' responses were received from 65% of the hospitals (31/48). The visited hospitals yielded a 100% response rate from the medical managers and 79% (145/183) (denominator-derived from medical managers' staffing figures) from the doctors (114 from the district, and 31 from the regional, hospitals). This represents 55% of all received doctors' responses. There were fewer responses from the hospitals that were not visited: 69% (22/32) from medical managers and 121 from doctors. Ten rural district hospital managers did not respond.

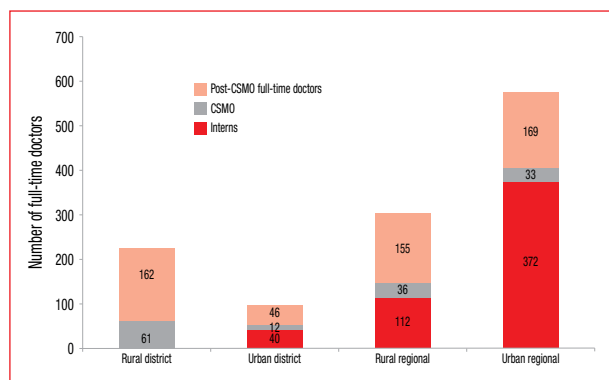
Medical managers

The human resource data provided by medical managers are shown in Table I. In the 24 (71%) rural district hospitals that responded, 35% of doctors were employed on a part-time (sessional) basis. The equivalent percentages for urban district, rural regional, and urban regional, hospitals, were 1%, 23% and 22% respectively.

Table I: Total numbers of full- and part-time (sessional) appointments in each hospital group

Hospitals	Total part-time doctors (median, range)	Total full-time doctors (median, range)
Rural district	122 (5, 0-14)	223 (9, 2-24)
Urban district	1 (1, 0-1)	98 (49, 22-76)
Rural regional	89 (15, 12-18)	303 (60, 13-70)
Urban regional	164 (26, 10-62)	574 (85, 46-164)

Doctors at regional hospitals include both specialists and medical officers



CSMO: community service medical officers
 Post-community service medical officers refers to all full-time medical officers of various levels and specialists at regional hospitals

Figure 1: Distribution of full-time doctors according to rank

Figure 1 shows the breakdown of full-time doctors according to level of hospital and rank, i.e. interns, community service medical officers (CSMOs), and all doctors post-CSMO. The apparent anomaly of interns at a district level is owing to their inclusion in a tertiary teaching complex rotation through a district hospital with appropriate supervision. CSMOs constituted 27% of full-time staff at responding rural district hospitals, all of whom were required to provide independent obstetric anaesthesia by their medical managers. CSMOs constitute 12%, 12% and 6% of full-time staff at urban district, rural regional, and urban regional, hospitals, respectively.

Table II: Doctors with a Diploma in Anaesthesia, compared to total full-time doctors and post-CSMO doctors

Hospitals	No of DAs	Total full-time doctors	% DA/total	Total post-CSMO doctors	% DA/post-CSMO doctors
Rural district	6	223	2.7	162	3.7
Urban district	5	98	5	46	10.9
Rural regional	18	303	6	155	11.6
Urban regional	52	574	9	169	30.8

CSMO: community service medical officers, DA: Diploma in Anaesthesia

Table III: 2010 caseload at the responding hospitals

Categories of responding hospitals	Number of responding hospitals	Total Caesarean sections (median, range)	Total deliveries (median, range)
Rural district	24/34	11 526 (413, 27-1 427)	48 021 (1 896, 431-4 254)
Urban district	2/2	2 309 (1 155, 853-1 456)	8 482 (4 241, 2 704-5 778)
Rural regional	6/6	10 889 (1 302, 930-4 399)	33 128 (5 127, 2 400-10 622)
Urban regional	6/6	17 802 (2 946, 2 006-4 128)	48 315 (7 123, 6 990-12 559)

Specialists in anaesthetics were only employed at the regional hospitals. At the rural regional hospitals, 5.8% (9/155) of the post-CSMO doctors were full-time anaesthesiologists. At the urban regional hospitals, 12.4% (21/169) of the post-CSMO doctors were full-time anaesthesiologists.

Table II shows the total number of doctors with a Diploma in Anaesthesia, compared to the number of full-time and post-CSMO doctors in the different categories of hospitals.

Thirty-three responding hospital managers reported employing part-time staff (the number varied from 1-62), and 22 of the 38 hospitals (58%) relied upon part-time staff to provide obstetric anaesthesia as part of their duties. The number of part-time (sessional) appointments providing obstetric anaesthesia in each of the latter hospitals ranged from 1-9 (a median of 4).

Foreign medical graduates provided obstetric anaesthesia in 27 of 38 (71%) hospitals, of which 18 were district and nine regional. The number of foreign doctors ranged from 1-8 (a median of 3) in these hospitals. Foreign graduates constituted 27% (61/223) of full-time doctors at the rural district hospitals.

At district level, 21 of 26 (81%) responding hospital managers required all their doctors to provide obstetric anaesthesia when necessary. Neither of the two urban district hospitals required this, nor three rural hospitals that had at least 20 medical staff, either full-time or part-time. Despite the expectations of the rural district managers, only five of 24 (21%) required obstetric anaesthesia skills or experience as a prerequisite when appointing medical officers.

One regional hospital required all doctors to provide obstetric anaesthesia and 6 of the 12 required CSMOs to provide independent obstetric anaesthesia care.

Table III shows the 2010 caseload from the responding hospitals according to category. Responding district hospitals reported 13 835 Caesarean sections for that year, and regional hospitals 28 691. The responding district hospital figure represents 61% of the total number (22 733)

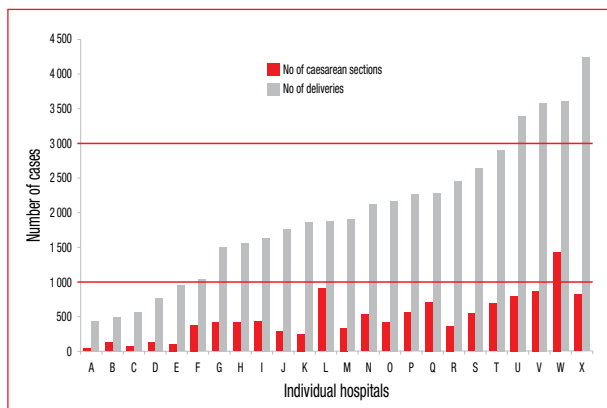


Figure 2: 2010 anonymised caseload at the rural district hospitals

reported to the Department of Health in 2010. Of these, 2 309 (17% of the total for the district hospitals) were from the two urban district hospitals. Corresponding figures for the rural regional, and urban regional, hospitals, were 10 889 and 17 802, which when combined, accounted for 95% of the Department of Health figures (30 213).

Figure 2 shows the caseload for rural district hospitals arranged from lowest to highest number of deliveries. Hospitals A-E had less than a 1 000 deliveries per year, and Caesarean sections numbers ranged from 27-112.

Medical managers were asked to report the caseload for each full- and part-time doctor who provided obstetric anaesthesia for the index month of October 2010. At district level, 38 part-time (sessional) appointments provided obstetric anaesthesia. Fifty-eight per cent (22/38) of them performed only one case. Of the full-time doctors ($n = 171$) at the district-level hospitals, 43% (73/171) administered 2-5, and 30% (51/171) 5-10, anaesthetics, for Caesarean sections during the same period. At the regional-level hospitals, there was little reliance on sessional doctors. Only 15, of a total of 129, were involved in obstetric anaesthesia. Four of them administered fewer than five anaesthetics for Caesarean sections during the index month. Of the 114 full-time doctors, 86 (75%) administered more than 10 obstetric anaesthetics.

Doctors' responses

Responses to questionnaires were received from 12 interns, 38 CSMOs, 157 medical officers, two general practitioners, 29 specialists (only five of these from the rural regional hospitals), and 28 registrars from the Durban and Pietermaritzburg metropolitan areas. The interns who completed the forms rotated in anaesthesia at the regional hospitals. Of the CSMOs, 35 (92%) were employed at the rural district hospitals. Ninety-three (60%) of the medical officers were from the district hospitals and 64 (40%) from the regional hospitals.

The employment history revealed that 97% (259) of respondents were full-time employees. Seventy-six per cent (202/266) had been employed for less than five years, and 44% (117/266) for less than 12 months. Anaesthesia

skills or experience were not a prerequisite at the time of employment for 59% (157/266) of responding doctors.

A Bachelor of Medicine, Bachelor of Surgery (MBCbB) degree or equivalent was the highest qualification held by 83% (221/266) of the responding doctors, Fellowship of the College of Anaesthetists or the equivalent by 12% (31/266), and 5% (13/266) cited other qualifications, e.g. Bachelor of Science, Masters of Business Administration or Fellowship of the College of Family Physicians, in addition to MBCbB, as their highest qualification.

Additional qualifications were held by 123 (46%) respondents. Seventy-eight (29%) had a Diploma in Anaesthesia, the most commonly held other qualification. The remainder consisted of a selection of CMSA diplomas in fields other than anaesthesia.

Of doctors with a Diploma in Anaesthesia, only 10% (8/78) were employed at the rural hospitals, five at the rural regional, and three at the rural district, hospitals. The remaining 90% worked in the urban hospitals, 24 in the Pietermaritzburg complex and 46 in the Durban metropolitan area. Thus, overall, only eight (3%) of all responding doctors who had a Diploma in Anaesthesia practiced in the rural hospitals, compared to 70 (26%) in the urban hospitals. There were 14 medical officers, thus non-specialists or non-registrars, who had a Diploma in Anaesthesia and more than five years in their current employment. Of these, only one worked at district level.

One or more training courses in resuscitation had been attended by 67% of doctors (178/266) in the previous five years, and 48% (86/178) of these had attended two or more courses. The most frequently attended course (125 doctors) was Advanced Cardiac Life Support.

Two respondents did not provide details of their internship. Twenty-four (9%) had received no anaesthesia training during their internship and 18/24 worked at the district hospitals. All of these were foreign-trained doctors, from both developed and developing countries. Ninety-nine (37.5%) had received two weeks of internship training, 28 (10.6%) two weeks to two months, and 113 (42.8%) two months or more. Of those who had received internship training, 174 (73%) had been trained in obstetric anaesthesia and 134 (56%) had carried out after-hours duties in anaesthesia. Foreign internship training was reported by 66 (25%) doctors, 44 of whom were employed at district hospitals. Of the South African graduates, 146 (55% of 266) received internship training in KwaZulu-Natal and 53 (20% of 266) in other provinces.

Eighty-one doctors (31.5% of 257) had more than six months supervised post-internship experience. Of these, 50 (62%) were employed at urban regional hospitals and 12 (15%) at rural regional hospitals. Eighty-four (33%) doctors had no experience of general anaesthesia for Caesarean sections and a further 51 (20%) had performed less than 10 general anaesthetics for Caesarean sections. Eighty-nine (66% of 135) of these doctors were employed at the district hospitals. Experience of spinal anaesthesia was

more common. One hundred and forty-one doctors (55% of 256) had performed more than 50 spinal for Caesarean sections. Sixty-one (43% of 141) were employed at the district hospitals.

Fifty-five doctors (41% of 133) in the district hospitals reported performing 0-5 cases per month, whereas 104 doctors (78% of 133) in the regional hospitals performed more than 10 cases per month.

Discussion

Response rates are always problematic with questionnaire-based studies. It was disappointing that only 24 (71%) of the 34 rural district hospital managers responded. However, the overall response rate (79%) from the district and regional hospitals provided a fair reflection of circumstances pertaining to KwaZulu-Natal in 2010 and 2011. The 100% response rate from visited, randomly selected hospitals strengthened the data and was a valuable exercise that should be repeated in future studies.

The response rate from individual doctors in the 48 hospitals was less certain as staffing figures change on a monthly, or even more frequent, basis. An estimate of the maximum total number of possible responses, based on informal enquiry and feedback from outreach visits, was between 400 and 420, giving an approximate response rate of 65%, a figure close to the 69% achieved by Lamacraft et al in the Free State survey of 25 level 1 and 2 hospitals in 2005.³

Our findings on the training and experience of doctors reinforce those of Lamacraft et al who called for the implementation of remedial measures.³ If deficiencies in training and experience are to be remedied, an important first step is to identify specific target groups in need of remediation. This has been the broad focus of this paper. Although many audits suffer from the weakness that findings are specific to the population being audited, thereby decreasing external validity,^{6,7} the groups that we identified are not unique to KwaZulu-Natal. Although the relative size of each group varies between provinces, the needs of each group can be addressed at either provincial or national level.

Four groups of doctors who might require different training approaches emerged from the data:

- CSMOs.
- Foreign graduates.
- Practitioners with more than five years' experience.
- Doctors providing anaesthesia on a sessional basis.

The main focus has to be placed on district-level practice, where the largest proportion (72%) of anaesthesia-related maternal deaths occurred from 2008-2010¹, and medical managers expect doctors to provide obstetric anaesthesia, without always making it a specific job requirement for appointment. Regional-level hospitals are better staffed and are organised as multidisciplinary hospitals, with anaesthetic departments that can largely provide their own support and training. This is lacking at district level.

Urban regional hospitals have the most doctors (Table I). Only doctors in the anaesthesia department are expected to perform obstetric anaesthesia. At all levels of care, junior doctors represent a significant proportion of the doctors, highlighting the need for more experienced doctors and supervision (Figure 1). Complications can arise very suddenly in obstetric cases and early recognition of complications and appropriate action are vital to prevent poor maternal and foetal outcomes.

CSMOs, expected to practice obstetric anaesthesia independently, constituted 27% of doctors at rural district level. These doctors undergo training in consultant-supervised units during their internship, a valuable, albeit short, window of opportunity, that should be utilised to the maximum. Slightly over 50% of doctors who completed this survey trained as interns in KwaZulu-Natal. Thus, improving intern training programmes in KwaZulu-Natal would only benefit a similar proportion within the province. Full benefit would only be obtained from a coordinated effort at national level to provide competency-based training in institutions, whose accreditation is frequently reviewed. Young doctors must be prepared for the expectations placed upon them in district hospitals during their CSMO year. Obstetric anaesthesia, including supervised after-hour duties, when most emergency obstetric cases present, must be a mandatory training requirement during internship in anaesthesia.

Essential Steps in Managing Obstetric Emergencies training has been implemented recently and has shown promise in improving knowledge and skills in managing obstetric emergencies.^{8,9} This type of structured course requires the focused training of facilitators for its implementation, and could be developed to provide the core of competency-based anaesthesia training.⁹

Rural district hospitals rely on foreign doctors. Twenty-seven per cent of full-time doctors are foreign graduates, many of whom are not trained in anaesthesia during their internship. Exposure to anaesthesia at undergraduate level is not directed towards practical competencies or independent practice in a rural setting. Currently, there is no induction programme for foreign graduates who enter the district hospital system. At the very least, there should be a competency assessment for those with limited postgraduate exposure to anaesthesia and a training period equivalent to that of local requirements for training in anaesthesia for those with no postgraduate experience at all.

The recruitment and retention of experienced medical officers, e.g. doctors with more than five years' experience and/or a Diploma in Anaesthesia, and encouragement of specialists to move from metropolitan to more remote areas of the province remains a challenge. Although the Diploma in Anaesthesia seems to have become an entrance requirement for specialist training programmes, it was originally designed for the generalist at district and regional hospitals. Ideally, these practitioners should form the core of training and support to their junior colleagues. Questions

arise: Are there enough of them? How can further training in anaesthesia be made more accessible to the generalist?

Rural district hospitals show the greatest dependence on sessional appointments (35%). However, not all sessional appointments are expected to provide obstetric anaesthesia. This represents a group of doctors with an uncertain background and training, who may have to act as the "occasional" anaesthetist, with very low caseloads, and hence face difficulties in maintaining anaesthesia skills.

Hospitals with less than a 1 000 deliveries per year are a major concern, as the caseloads are too low to enable the acquisition or maintenance of skills for safe operative services. By contrast, are those rural district hospitals with more than 3 000 deliveries per year, where services should be upgraded to those of specialist-based units. Although there are economic, social and political challenges, consideration should be given to re-evaluating the operative obstetric services, reducing the number of small unsustainable units at district level and expanding the number of regional units.

The specific details of which areas of training should be provided, or logistics pertaining to the provision of such training, were not addressed by this paper. The changing practice pattern from general anaesthesia to spinal anaesthesia in South Africa has been highlighted recently. Concern was expressed that there is a misconception that spinal anaesthesia is inherently safe and can be performed without the skills required for general anaesthesia.¹⁰ This change in practice is not unique to South Africa. Various authors have addressed the issue of providing sufficient experience for anaesthetic trainees against a background of reduced numbers of obstetric general anaesthetics. The changing workload pattern has been aggravated by reduced training time associated with increased trainee numbers and reduced working hours in the developed world.^{11,12} The association of maternal deaths following general anaesthesia, together with difficult airways and inadequate senior supervision, is relevant to both developed and developing countries.¹¹⁻¹³ In South Africa, management and the profession have a unique expectation of doctors, with limited anaesthetic training, to provide safe obstetric anaesthesia at district hospitals, with no supervision at all.

This paper highlights the lack of training and experience of doctors in obstetric anaesthesia at district hospitals who have little to poor supervision, illustrates workload patterns and identifies specific target groups for future support and training. Improved intern training is needed, as these doctors will be future CSMOs. The introduction of an induction programme for foreign graduates would be a significant change and would have great potential. The anaesthetic skills and knowledge of the more experienced practitioner also need to be upgraded, so that he or she can train junior colleagues. Lastly, the level of experience of part-time (sessional) appointments should to be examined to determine their training needs.

Conflict of interest

This paper represents the research component of Dr Theron's Master of Medicine (Anaesthesia) at the University of KwaZulu-Natal. Professor Rout is a member of the National Committee for Confidential Enquiries into Maternal Deaths, and was the supervisor of Dr Theron's research project.

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