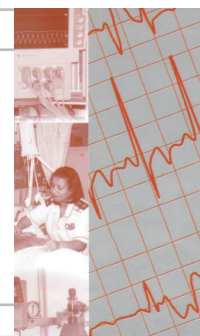


The critical care nursing workforce in Western Cape hospitals – a descriptive survey



**Department of Critical Care, Groote Schuur Hospital and University of Cape Town
Rencia Gillespie, CCN**

**Division of Nursing and Midwifery, Faculty of Health Sciences, University of Cape Town
Una Kyriacos, MSc, CCN, Senior Lecturer
Pat Mayers, MSc Psych, Senior Lecturer**

Background. A global shortage of registered nurses (RNs) has been reported internationally, and confirmed in South Africa by the National Audit of Critical Care services. Critical care nurses (CCNs) especially are in great demand and short supply.

Purpose. The purpose of this study was to quantify the nursing workforce and compare it with requirements of critical care units (CCUs) in hospitals of the Western Cape province as at 1 January 2005, and to quantify potential recruits from nursing education institutions.

Design. A descriptive survey conducted on site in CCUs of the private and public sector hospitals of the Western Cape, using a structured questionnaire.

Results. Data were obtained from questionnaires (96.5% return rate) from 77 of the 80 CCUs surveyed in 35 hospitals (12 public; 23 private). Intensive care units (ICUs) and high-care units (HCUs) were classified in the questionnaire. Findings revealed: 39 adult ICUs (12; 27), 2 paediatric ICUs (public), 14 neonatal ICUs (4; 10), 13 adult HCUs (11, 2), 1 paediatric HCU (public), 3 neonatal HCUs (public) and 5 high-dependency units (HDUs) for adults (public), with 720 functional unit beds in total (359; 361). A registered nurse/ventilated patient ratio of 1:1 was used in 5.26% of public sector units but in all private sector units. Of the 768 nurses of all categories in public sector units 118 (15.4%) were trained CCNs and 289 were RNs (37.6%). In private sector units 204 (38.1%) of 535 nurses were trained CCNs and 204 (38.1%) were RNs. According to a consensus-driven method developed in Australia to measure the required number of ICU nurses, the Western Cape has a deficit of 72% and 80% RNs respectively in public and private sector CCUs, amounting to an actual total shortage of 2 711 RNs. Data from 7 educational institutions revealed that during 2004, 300 undergraduate nurses and 80 postgraduate CCNs graduated.

Conclusion. The current supply of nurses does not meet the needs of CCUs in the Western Cape, and the number of educators and clinical mentors is inadequate.

The link between an effective health system, the achievement of goals to improve the health and wellbeing of the global population and a sufficient workforce capacity in critical care units (CCUs) has been explored in the developed world.^{1,2} However, the staffing requirements in CCUs in a developing country such as South Africa are under-researched. In addition, the challenges facing critical care nurses (CCNs) in a developing country may be different. Until there are adequate data about the need for and supply of workforce capacity in South African CCUs the link between an effective health service and the achievement of goals to improve the health of the population cannot be determined.

This paper reports a study to inform health policy makers by exploring nursing workforce requirements compared with the demands of the CCUs in hospitals in the Western Cape province. The study was conducted between 1 January and 31 December 2004 in public and private sector hospitals with CCUs and in nursing educational institutions.

Literature review

Workforce capacity in critical care units

A shortage of all categories of nurses within the health services is recognised as a global crisis.¹⁻³ The

International Council of Nurses (ICN) has identified the global shortage of registered nurses (RNs) in particular as a crucial issue. An international survey in 2001 reported a widespread shortage of CCNs.⁴

Critical care service delivery in both the public and private health care sector is dependent on a team of specially trained staff, the majority of whom are nurses. The provision of an adequate nursing workforce is guided by norms applicable to specialised areas such as critical care, supported by recommendations for specific nurse/patient ratios.^{3,5} The World Federation of Critical Care Nurses (WFCCN)'s Position Statement on the Provision of Critical Care Nursing Workforce states that careful planning is required to ensure an appropriate balance of staff skills and attributes to allow for safe, effective care and a learning environment for novice CCNs when developing a nursing workforce.⁵

Factors that contribute to determining staffing needs⁶⁻¹⁰ include:

- the type of service (critical care), including levels of care⁸ provided by the designated unit, for example an intensive care unit (ICU), a high-care unit (HCU) or a high-dependency unit (HDU), or categories of ICUs¹⁰
- the patient population served, for example age and gender, and admission types and indications⁹
- service provision within designated geographical areas served by the critical care services⁷
- the demand for critical care, including the profile of an ICU patient, severity of illness, and the demand from both within and outside the hospital, as well as admissions and refusals or unmet demand⁹
- acceptable staffing norms^{8,10} including the availability of support staff
- actual numbers of staff currently available, particularly nursing staff⁷
- potential new recruits, especially nurses, and
- indicators of service delivery and outcome measures such as mortality and length of ICU stay, quality of life indicators such as quality of life scores, cost-effectiveness of the service, and benefit estimates and cost of care.⁹

In the UK British nurses have increasingly been voicing their concern over the use of non-registered staff in critical care areas, and the roles and tasks that they are undertaking.³ This has been described as one of the biggest challenges currently facing CCNs. The situation is mirrored in South Africa.

Effective health care system

Sufficient workforce capacity is required to enable health systems to function effectively.¹ Studies by Zondagh⁶ and the British Association of Critical Care Nurses (BACCN)³ found that the safety and quality of patient care is directly related to the number and skill mix of direct care nursing staff, and several

international studies have found that insufficient staffing results in increased errors and patient risk.^{3,6,11} Adverse events increase the costs of a service that already carries significant expenditure related to the required resources, both human and technical.^{11,12} Adverse events also decrease the quality of life of the clients of a health care service.¹² Policy alone will not achieve positive change, but requires effective leadership and stakeholder involvement.^{1,2}

Achievement of health goals

The absolute shortage of health personnel, particularly in sub-Saharan Africa, is the main obstacle to achieving goals to improve the health and wellbeing of the global population such as the Millennium Development Goals.¹ The actual shortage of RNs working in CCUs, and in particular the shortage of CCNs, has not been adequately quantified in the South African context, other than preliminary data from the National Audit of Critical Care,⁷ nor have the factors been explored that contribute to supply of and demand for nurses, in effect a workforce analysis, and needs assessment.

Purpose

The purpose of the study was to quantify the existing nursing workforce of the CCUs of hospitals in the Western Cape Province as at 1 January 2005 and to compare this with the requirements of ICUs defined by recommended staffing norms, and then to estimate the actual number of nurses needed using a workforce planning method. In addition, the supply of RNs and CCNs from the educational institutions was investigated. The focus of the study was limited to staffing issues for ICUs such as the profile of the service, staffing norms, workforce analysis, training, and recruitment and retention of nurses.

Methods

Study design

Quantitative research methodology employing a descriptive survey was used.

Study population and sampling

The study population comprised all hospitals in the Western Cape province ($N = 35$), public and private, having CCUs of various descriptions and combinations ($N = 80$), that is, ICUs, HCUs and/or HDUs for adult, paediatric and/or neonatal patients, and selected nursing education institutions. On the basis of local and international criteria,^{10,8} as well as current thinking and practice, units were categorised as ICUs, HCUs and HDUs.

An ICU was defined as a designated hospital area specifically equipped to provide level 3 care

for critically ill patients, capable of providing comprehensive critical care including complex multi-system life support such as mechanical ventilation, renal replacement therapy, inotropic support and invasive cardiovascular monitoring. Level 3 patients need advanced respiratory support alone (endotracheal intubation and mechanical ventilation), or basic respiratory support with support of at least two organ systems, including support for multi-organ failure.⁸

An HCU was defined as a designated area that provides level 2 care for acutely ill patients, capable of providing a high standard of general intensive care, including basic cardiovascular monitoring. This definition includes single-organ support units. Level 2 patients need more detailed observation or intervention including support for a single failing organ system, or postoperative care, and include those 'stepping down' from higher levels of care.⁸

A further category of unit was identified by the researcher as an HDU for ill adult patients at level 1 of care needing acute ward care, with additional support and advice from the critical care team.⁸ These units tend to provide a focused service and minimal invasive monitoring, for example renal transplant units.

Units were further categorised according to the age of patients generally admitted. Neonatal units (ICU or HCU) care for babies from birth to 28 days, paediatric units are for babies and children from 1 month to 14 years of age, and adult units are for all ages above that.

Public and private sector hospitals that met the criteria for this study were identified from the *Hospital and Nursing Yearbook of Southern Africa*.¹³ Private hospital details were further compared with the 2005 Hospital Association of South Africa (HASA) membership list.

The exact number of units per hospital was not known before the study, and one of the objectives was to establish this number. These numbers were obtained telephonically from the nurse manager of each hospital.

Educational institutions (7) included those that offered RN and/or CCN training. The total target population (80 units; 7 educational institutions) was studied. Respondents within each unit and educational institution were identified by key contact persons within the health sector who attended a preparatory workshop and were briefed about the study. The 80 unit respondents were ICU nursing managers or unit managers, and the 7 respondents from the educational sector were nurse educators.

Ethical considerations

Ethical approval was obtained from the Research Ethics Committee of the University of Cape Town as well as the research committee/hospital board of each hospital. Anonymity of respondents and institutions and confidentiality of data were maintained and informed consent was obtained from each respondent.

Data collection and analysis

A pilot study established the validity and reliability of the questionnaire, as it was a new instrument. The literature guided the design of the instrument. Changes were made to increase face and construct validity. Data collection included gaining access to respondents, delivery and collection of questionnaires from research sites. Data were verified by respondents in instances where data were not clear or legible before descriptive statistical analysis was undertaken. Data were summarised and frequency tables applied for analysis and interpretation. Data for the public and private sector institutions are presented separately.

Main findings

Description and number of CCUs and bed status

Critical care services are clearly in demand in both the public and private sector hospitals of the Western Cape. Eighty units were available within the 35 hospitals (12 public; 23 private), including ICUs and HCUs for adults, paediatric patients and neonates, as well as HDUs for adults (Fig. 1). Of these, 77 units (38; 39) and 7 (4; 3) educational institutions provided data, a 96.5% return rate.

The private sector had more adult ICUs (27; 12) and neonatal ICUs (10; 4) than the public sector. The public sector had more adult HCUs (11; 2), adult HDUs (5; 0), paediatric ICUs (2; 0), paediatric HCUs (1; 0) and neonatal HCUs (3; 0) than the private sector. The units had 720 (359; 361) functional unit beds, i.e. commissioned beds available for daily use, but dependent on staffing and adequate equipment, particularly monitoring facilities. All private sector units were managed as open units, whereas the majority (78.9%) of public sector ICUs were managed as closed units. The distribution of functional beds within the public sector units was 180 ICU beds, 116 HCU beds

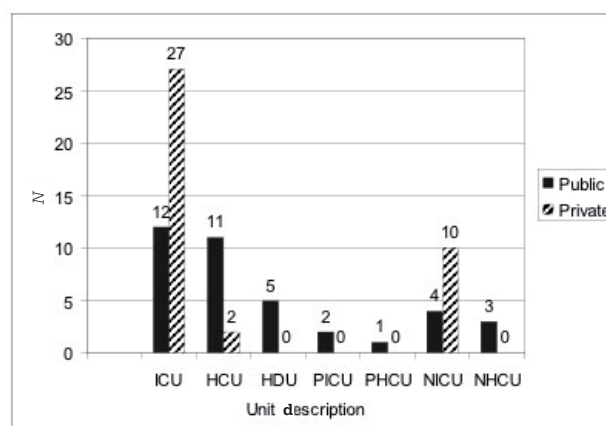


Fig. 1. Distribution of units in public and private health care sectors (ICU = adult intensive care unit; HCU = adult high-care unit; HDU = adult high-dependency unit; PICU = paediatric intensive care unit; PHCU = paediatric high-care unit; NICU = neonatal intensive care unit; NHCU = neonatal high-care unit).

and 63 HDU beds. In the private sector there were more ICU beds (314) but far fewer HCU beds (20) and no HDU beds.

Patient admissions by number and diagnostic category

Obtaining patient admission data was problematic owing to the lack of data capturing systems in both sectors, but despite the limitations, trends in patient admissions in the public and private sector units were similar in number, but differed by age group and diagnostic category (Table I).

More children (under age 14 years) and neonates (40.2%) were admitted to public sector units than to private sector units (6.95%), and yet the public sector higher educational institutions produced only 3 paediatric and no neonatal CCNs, while 6 neonatal and no paediatric CCNs were trained in the private sector.

Respondents were requested to identify patient admissions in terms of 10 broad diagnostic categories (Fig. 2).

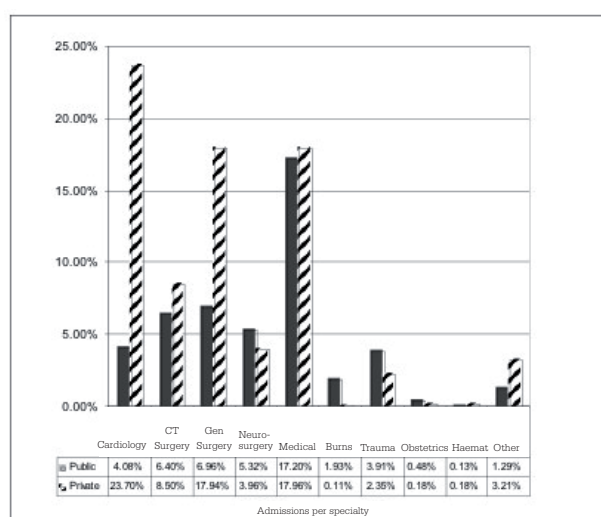


Fig. 2. Overall patient admissions per diagnostic category.

Data were incomplete, and during the verification phase respondents reported that data were not readily available, even from admission books. This limits the reliability of the data but shows some trends: for example, the combined admissions to adult, paediatric and neonatal units in the private sector were mainly for cardiology (23.7%), followed by medical admissions (17.96%), whereas the latter accounted for most of the public sector admissions (17.2%). Patients in

private sector units were admitted for general surgical conditions more frequently than in public sector units (17.94%; 6.96%). More private than public sector patients were admitted for cardiothoracic surgery (8.5%; 6.4%). More public than private sector patients were admitted for neurosurgery (5.32%; 3.96%), trauma (3.91%; 2.35%) and burns (1.93%; 0.11%).

Factors taken into consideration when allocating nursing staff

Scoring systems measuring severity of illness and nursing workload assessment were not used widely despite indications ranging from 36.8% (public) to 100% (private) that both were considered when allocating nursing staff to care for critically ill patients. Nurse/patient ratios were generally used to allocate nursing staff but varied between public and private with regard to numbers and categories of nursing staff. Daily availability of support services for the units ranged from an average of 48% for clinical technologists to more than 75% for physiotherapists and 100% for clerical staff. Medical doctors were more commonly available in the public sector (65.8%) than in the private sector (15.4%) for 24 hours per day. There is an acute shortage of intensivists with only 5 registered intensivists in the Western Cape units. Technology to provide ICU monitoring and organ support facilities were available in most units, but varied between units with regard to specific facilities, and the level of technical expertise per unit is unknown.

Nursing staff

As at 1 January 2005 a total of 1 303 nurses were in full-time employment in the units of the public and private hospitals in the Western Cape, of whom 322 were CCNs (Table II).

A registered nurse/patient ratio of 1:1 for ventilated patients was employed in 5.26% of public sector units and in all of the private sector units. Nurse/patient ratios varied from 1:1 to 2:3 for ventilated patients and 1:1 (ICU) to 1:16 (NHCU) for non-ventilated patients. Of the 768 nurses in public sector units 118 (15.4%) were trained CCNs and 289 were RNs (37.6%), while 204 (38.1%) of the 535 nurses in private sector units were trained CCNs and 204 (38.1%) were RNs.

Workforce planning

An Australian nursing workforce planning method¹⁴ makes provision for 255 registered nurse hours per ICU bed per week, based on the number of nurse hours per

Table I. Patient admissions to units during 2004

Age group of patient	Public sector	Private sector	Sub-total
Adults	13 292 (59.8%)	19 888 (93%)	33 180
Paediatrics	2 244 (10.1%)	369 (1.7%)	2 613
Neonates	6 696 (30.1%)	1 117 (5.2%)	7 813
Total	22 232	21 374	43 606

Table II.

Numbers of nursing staff

	CCNs	RNs	ENs	ENAs	Total
Public sector	118	289	127	234	768
Private sector	204	204	81	46	535
Total	322	493	208	280	1 303

CCN = critical care nurse; RN = registered nurse; EN = enrolled nurse; ENA = enrolled nursing auxiliary.

week, the number of supernumerary (ACCESS) nurse hours per week and industrial award leave cover. These hours were used in determining that 6.7 full-time equivalent (FTE) RNs would be required per ICU bed. For the HCU, 148 RN hours would be required per HCU bed per week and 3.89 FTE RNs would be required per HCU bed. The formula for this calculation was based on ratios of 1 RN:1 ICU patient and 1 RN:2 HCU patients, the use of access nurses (additional nursing staff), leave consideration, a 26-hour nursing day and a 38-hour working week per nurse as worked by a full-time nurse in Australia. A full nursing day adds up to 26 hours to allow for the handover period.¹⁴

When these nurse hours are applied to the Western Cape critical care unit beds using a 24-hour day and a 40-hour working week for a full-time nurse in South Africa, the Western Cape units have a deficit of 72% of RNs in the public sector hospitals, and a deficit of 80% in the private sector, an actual shortage of 2 711 RNs for both sectors.

CCN education and training

CCUs were estimated to have an average turnover of 60 patients per bed during 2004 in both sectors. The number of nurses who graduated in the Western Cape in 2004 (300 undergraduates, 80 postgraduate CCNs) (Table III) was inadequate to meet the demand of the units at the time of the study.

Eighty-two CCNs from both sectors were reported to have left the service for a variety of reasons, but common to both sectors and ranked highest was leaving to work overseas. This was followed by leaving the public service to work in private hospitals and for financial reasons.

Discussion

Clear descriptions of CCUs based on the specific level of care provided and approved nurse/patient ratios could facilitate the process of appropriate funding, equipping and staffing of such units for objective auditing. Critically ill patients should be admitted to the most appropriate unit that has the capacity to provide the required level of care⁸ according to severity of illness⁹ and age-specific need⁷ to ensure optimal patient care and utilisation of scarce resources. Severity of illness provides an indication of the level of skill and knowledge required of the nurse caring for the patient. The higher the score the greater the severity of the patient's condition, which suggests an increased use of advanced technology and equipment, more complex medication regimens, more investigations such as blood gas sampling, and more mechanical ventilation and inotropic support. The actual amount of work a critically ill patient generates can be estimated by means of a nursing workload assessment score, such as the Nursing Activities Score.¹⁵

Manual data capturing systems that reflect minimal health data limit the effective management of an expensive health care service. An electronic database for admission and discharge data, illness severity scores, management and progress details, outcome and resource utilisation data could result in evidence-based patient care and quality assurance. In addition, admission and discharge guidelines could impact on appropriate admissions.

CCUs function more effectively with a dedicated medical director as head of the unit, especially if the director is a critical care specialist.^{8,9} Support staff allow the CCN to provide direct nursing care and

Table III.

Number of student completions for 2004

	Registered nurses	Adult CCNs	Paediatric CCNs	Neonatal CCNs	Total CCNs
Public sector institutions	184 (86 degree, 98 diploma)	61	3	0	64
Private sector institutions	116 (bridging)	10	0	6	16
Total	300	71	3	6	80

CCN = critical care nurse.

appropriately decrease the workload of the nursing staff in the unit, but they do need supervision.⁵

Health care institutions should strive to achieve the recommendations set out by the WFCCN Position Statement on Nursing Workforce Provision⁶ in the interests of all critically ill patients. Nurse-staffing ratios should be applied based on an acceptable nursing workload assessment, which also takes the patient's severity of illness and number and type of interventions required into account.^{3,5,6} The role and scope of practice of all categories of nursing staff in a CCU should be clearly defined within legal parameters.

Given the demand for critical care services for the population of the Western Cape, it will take 9 years to train 300 CCNs annually to reach the deficit target of 2 711 RNs.

Study limitations

Inefficient patient data and personnel management systems for capturing data about the employment of additional staff limited the reliability of some of the study data, specifically regarding the frequency and extent of the use of agency nurses and the number of nurses who worked overtime.

Conclusions

In the developed world there are adequate data about workforce capacity planning for CCUs. In the developed world the link between an effective health system, the achievement of goals to improve the health and wellbeing of the global population and a sufficient workforce capacity in CCUs has been explored. The challenges facing CCNs in a developing country appear to be different from those in the developed world, given the paucity of published literature on workforce planning in South Africa. In the Western Cape the current supply of nurses does not meet the demand of

the CCUs and can be described as a crisis. More CCNs should be appropriately trained to meet the demands of the health care services and to ensure safe patient care in CCUs. The problem needs to be addressed using a multisectoral approach involving all stakeholders, as the current situation affects not only nurses but the entire health care system. The findings of the study support the recommendations of the International Council of Nurses that a policy-based interventions framework is needed to address nursing shortages as an international collaborative response to a problem that affects health care systems across the world.^{1,2}

Partial funding for this study was provided by the Cape Western Branch of the Critical Care Society of Southern Africa.

1. ICN Report, prepared by Buchan J, Calman L. The Global Shortage of Registered Nurses: An Overview of Issues and Actions. Geneva: International Council of Nurses (ICN) and Florence Nightingale International Foundation (FNIF). <http://www.icn.ch>. 2004; 1-52 (accessed 17 November 2004).
2. ICN/FNIF Report. The Global Nursing Shortage: Priority Areas for Intervention. Geneva, the International Council of Nurses and the Florence Nightingale International Foundation. <http://www.icn.ch>, 2006, 1-60 (accessed 17 January 2006).
3. The British Association of Critical Care Nurses. Nurse-patient ratios in critical care: BACCN position statement. *Nursing in Critical Care* 2001; **6** (2): 59-63.
4. Williams G, Chaboyer W, Thornsteindottir R, et al. Worldwide overview of critical care nursing organizations and their activities. *International Council of Nurses. Int Nurs Rev* 2001; **48**: 208-217.
5. World Federation of Critical Care Nurses. Declaration of Buenos Aires: Position Statement on the Provision of Critical Care Nursing Workforce, 27 August 2005. Received from G Williams 30 October 2005 by personal communication, and available on the World Wide Web <http://www.wfccn.org>, used with permission, 2005.
6. Zondagh C. Safe and adequate nurse staffing. *Nursing Update* 2004; June: 20-24.
7. Critical Care Society of Southern Africa (CCSSA). National Audit of Critical Care in South Africa. Presented by Bhagwanjee S, Scribanté J, at the Annual Congress of the Critical Care Society of Southern Africa, July 2005, Sun City, Bophuthatswana.
8. Department of Health, UK. A Report by the Expert Group: Comprehensive Critical Care: A Review of Adult Critical Care Services. <http://www.doh.gov.uk/nhsexec.compcritcare.htm>, 2000 (accessed 4 November 2004).
9. Cronin E, Nielsen M, Spollen M, Edwards N. UK Audit of Adult Critical Care. <http://www.hcna.radcliffe-oxford.com/adultcritcare.htm>, 2004 (accessed 15 July 2005).
10. South African Society of Anaesthesiologists. *Guidelines for Practice*. 3rd ed. Pinelands, W Cape: SAMA, 1999.
11. Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA* 2002; **288**(16): 1987-1993.
12. Carayon P, Gürses AP. A human factors engineering conceptual framework of nursing workload and patient safety in intensive care units. *Intensive and Critical Care Nursing* 2005; **21**: 284-301.
13. *Hospital and Nursing Yearbook: Comprehensive Health Services Information for Southern Africa*. 44th ed. Pretoria: Pharmaceutical Printers and Publishers, 2004.
14. Williams GF. Nursing workforce standards and planning in Australian intensive care units. *CONNECT: The World of Critical Care Nursing* 2004; **3**(2): 43-47.
15. Miranda D R, Nap R, de Rijk A, Schauffeli W, Iapichino G, and members of the TISS Working Group. Nursing Activities Score. *Crit Care Med* 2003; **31**(2): 374-382.

Write to us!

Readers are invited to send letters to the editor for publication. Scientific letters commenting on published articles, or on a different topic, should include up to 5 references. Letters related to critical care in general are welcome. Send your letters to:

The Editor

SA Journal of Critical Care
wmichell@uctgsh1.uct.ac.za

