



## National audit of critical care resources in South Africa – unit and bed distribution

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*Objective.* To determine the national distribution of intensive care unit (ICU)/high care (HC) units and beds.

*Design and setting.* A descriptive, non-interventive, observational study design was used. An audit of all public and private sector ICU and high care units in South Africa was undertaken.

*Results.* A 100% sample was obtained; 23% of public and 84% of private hospitals have ICU/HC units. This translates to 1 783 public and 2 385 private beds. Only 18% of all beds were HC beds. The majority of units and beds (public and private) were located in three provinces: Gauteng, KwaZulu-Natal and the Western Cape. The Eastern Cape and Free State had less than 300 beds per province; the remaining four provinces had 100 or fewer beds per province. The public sector bed:population ratio

in the Free State, Gauteng and Western Cape was less than 1:20 000. In the other provinces, the ratio ranged from 1:30 000 to 1:80 000. The majority of units are in level 3 hospitals. The ICU bed:total hospital bed ratio is 1.7% in the public sector compared with 8.9% in the private sector. The ratio is more when the comparison is made only in those hospitals that have ICU beds (3.9% v. 9.6% respectively). In the public and private sector 19.6% beds are dedicated to paediatric and neonatal patients with a similar disparity across all provinces. Most hospitals admit children to mixed medical surgical units. Of all ICU beds across all provinces 2.3% are commissioned but not being utilised.

*Conclusion.* The most compelling conclusion from this study is the need for regionalisation of ICU services in SA.

Intensive care is a relatively young discipline with the first units emerging after the polio epidemic in Europe in the 1950s. There are no published data on the availability or distribution of intensive care resources in South Africa. Unit size and distribution are poorly described in the developing world. In the USA, it is suggested that intensive care is an expensive and scarce tertiary care service that paradoxically consumes approximately 1% of the GDP.<sup>1</sup> There is a dearth of suitably trained nursing and medical staff which impacts negatively on intensive care unit (ICU) outcome.<sup>2</sup> A similar pattern is described in Europe.<sup>3</sup> Direct extrapolation to the situation in South Africa is not possible, given the fact that health care provision in SA is characterised by an emphasis on primary health care, a vastly lower budget and the dichotomy that exists between the public and private health care sectors. Critical care practitioners believe that there are deficiencies in the provision of critical care services in SA. Given the limited resources in the public sector, it is essential that the planning of the distribution and quantity of ICU beds be guided by objective data.

For these reasons a study was conducted in 2004 - 2005 to determine the nature of existing ICU resources in SA.

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The purpose of the study was to identify hospitals with and without ICU facilities and to determine the national distribution of units, the nature of medical and nursing staff support, the extent to which these units were compliant with South African Bureau of Standards and Critical Care Society of Southern Africa (CCSSA) standards and lastly to identify referral patterns between hospitals. This paper addresses the first objective.

### Method

The study protocol was approved by the ethics committees of all South African universities, the Department of National health, the MECs for health in all provinces, the Surgeon-General of the South African Defence Force, the directors of all private sector hospital groups and the CEOs of all hospitals. A structured questionnaire was sent to every hospital that has ICU facilities in both public and private sectors in SA. These were faxed or e-mailed depending on available resources at the site. The questionnaire was completed by the medical director, nursing manager or the nursing service manager. Completed questionnaires were faxed/e-mailed back to a single data collection site where two researchers collated the data. The designation of level of hospital, type of unit and number of hospital beds was determined by the site. Units were defined as ICUs or high care units (HCUs) as determined by the institution. Population statistics were elucidated from Statistics SA. The methodology used in this study is described in a separate paper.<sup>4</sup> Descriptive statistics were used to analyse the data.

1311



**Results**

A 100% sample of all ICUs and HCUs in both the public and private sector was obtained.\*

Within the public sector 23% of the hospitals have intensive care/high care facilities (92/396 hospitals) compared with 84% in the private sector (216/256 hospitals). This translates to 1 783 beds in the public sector and 2 385 beds in the private sector (Table I). The private sector represented 57% of all beds (2 385/4 168). Only 18% of all beds (754/2168) were high care beds of which 202 (5%) were located in regular wards.

In both public and private sectors, the majority of units and beds were located in three provinces: Gauteng (GP), KwaZulu-Natal (KZN) and the Western Cape (WC) (Figs 1 and 2), representing 86% (3 246/4 168) of all beds. The Eastern Cape and Free State had less than 300 beds per province, while the remaining four provinces had 100 or fewer beds per province.

The population distribution significantly affected the bed:population ratio. The public sector bed:population ratio in the Free State, Gauteng and Western Cape was less than 1:20 000 (Fig. 3). In the other provinces, the ratio ranged from 1:30 000 to 1:80 000.

The majority of units are in level 3 hospitals, but significant numbers of beds exist in level 1 hospitals in the Free State and KwaZulu-Natal (Fig. 4).

The ICU bed:total hospital bed ratio is 1.7% in the public sector compared with 8.9% in the private sector (Fig. 5). The ratio is more when the comparison is made only in those hospitals that have ICU beds (3.9% v. 9.6% respectively).

There are very few beds dedicated to paediatric and neonatal patients (19.6%, 815/4 168 beds) in the public and private sector with a similar disparity across all provinces (Fig. 6). Most hospitals admit children to mixed medical surgical units.

Of all ICU beds across all provinces 2.3% (95/4 168) are commissioned but not being utilised because of lack of staff or equipment (Fig. 7).

**Discussion**

This study has identified major differences in currently available ICU facilities in the public sector compared with

\*Public hospital results are reported by province with the South African Defence Force shown separately. Private hospital results are reported as groups representing respectively the three largest private hospital groups, the smaller hospital groups combined and the independent private hospitals combined. The results of the private hospital groups are presented in a blinded random order to ensure anonymity.

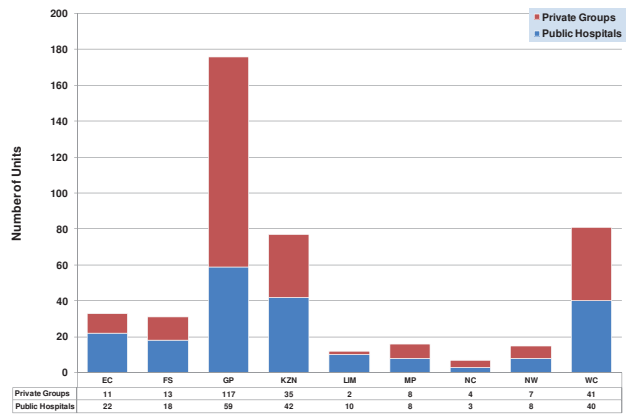


Fig. 1. Provincial distribution of units.

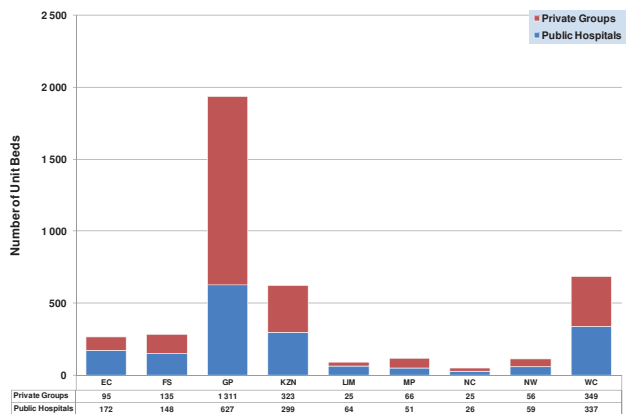


Fig. 2. Provincial distribution of public and private unit beds.

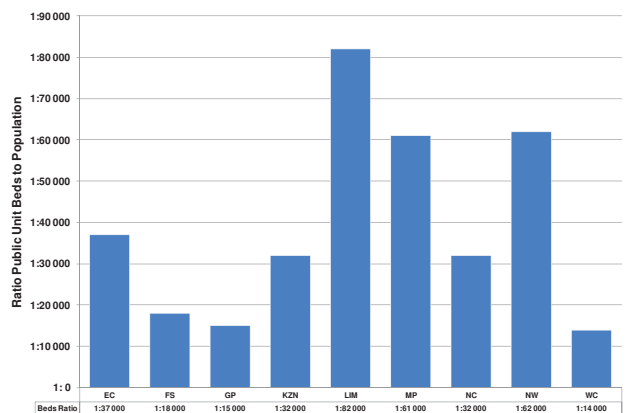


Fig. 3. Ratio of public unit beds to population.

**Table I. Public and private bed designation**

|         | ICU   | ICU/HCU | HCU | HCU in wards | Total |
|---------|-------|---------|-----|--------------|-------|
| Public  | 723   | 500     | 380 | 180          | 1 783 |
| Private | 1 299 | 892     | 172 | 22           | 2 385 |
| Total   | 2 022 | 1 392   | 552 | 202          | 4 168 |

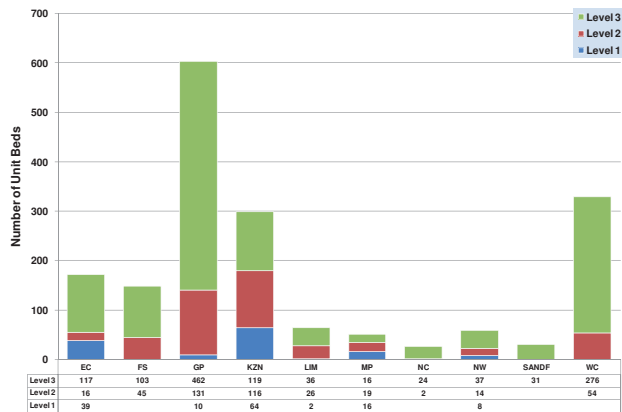


Fig. 4. Number of unit beds.

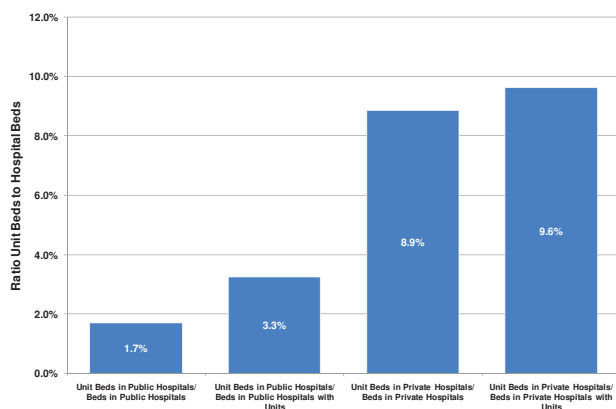


Fig. 5. Comparison of public v. private bed ratios.

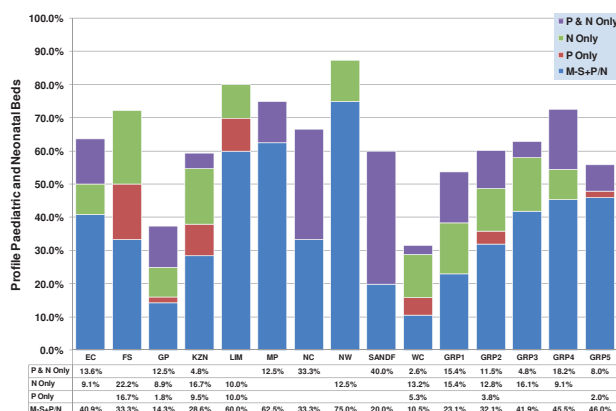


Fig. 6. Distribution of paediatric and neonatal beds.

the private sector. It is generally accepted that the proportion of ICU beds should be between 5% and 12% depending on the level of care offered by the hospital.<sup>5</sup> Designated tertiary or quaternary hospitals require a higher proportion of beds because of the therapeutic interventions and the complications associated with such care. The public sector is well below this range while the private sector is well within the range. In emerging countries it may be argued that the proportion of

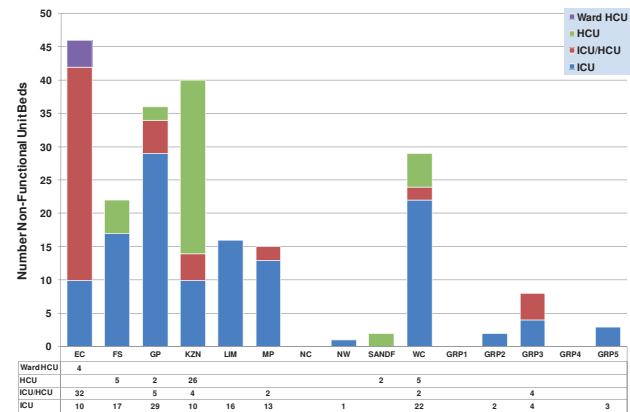


Fig. 7. Number of non-functional unit beds.

ICU beds should be lower. Such decisions must be based on evidence of current and future needs.

The preponderance of public sector ICU services in three provinces is mirrored by the private sector which negates the theoretical possibility of using private sector facilities for public sector patients. This historical inequity will undoubtedly result in lack of services to large parts of the country.

The current practice of having HCUs in wards is unacceptable, contrary to the guidelines as outlined by the CCSSA and must be remedied as a matter of urgency. This practice increases the risk of morbidity and mortality since it is impossible to offer the appropriate level of care and prevent the risks of intensive care practice in an uncontrolled environment. It is surprising to note the relatively lower proportion of HCU beds as compared with ICU beds. High care is viewed as a step-down facility for those who have recovered from intensive care, or alternatively a pre-emptive step that can prevent exposure to ICU for a significant proportion of patients. The current situation will inevitably result in greater ICU utilisation that increases cost but more importantly increases risk to the patient as a result of unnecessary ICU exposure.<sup>6</sup> It is also disturbing to note the large proportion of beds in level 1 public sector hospitals. Safe and effective intensive care practice requires dedicated medical and nursing staff,<sup>7</sup> both of which are a scarce resource even in tertiary hospitals.<sup>8</sup>

There is a major deficiency in dedicated paediatric and neonatal ICU services. Children cannot be nursed in multidisciplinary adult intensive care units.<sup>9</sup> Future plans must consider preferential development of appropriate paediatric facilities. Such a strategy must also address the lack of trained nurses and doctors who represent an integral part of care.<sup>7</sup>

The large number of non-functioning beds in some provinces offers the opportunity for rapid institution of services at these sites if due attention is paid to existing difficulties. While deficiencies in equipment are common, the lack of suitably trained medical and nursing personnel demands immediate attention.



By far the most compelling conclusion from this study is the need for regionalisation of ICU services in SA.<sup>10</sup> The immense difference in services across the different provinces makes a strong argument for integration and regionalisation. The rationale is based on the fact that such disparities across different regions in the country cannot be remedied cost-efficiently by the commissioning of new services at these sites. Rather the system should be redesigned to offer services within regions and not be limited by provincial boundaries. Regions must be determined by existing ICU services. Integration predicates a referral system within each region that ensures access to the appropriate level of care. In such a system, patients will be referred to hospitals that have the capacity to deal with all aspects of care and will not be limited to ICU services.

Lastly, effective intensive care practice requires the use of admission and discharge criteria, effective protocols and guidelines for practice, and a dedicated team approach to care. Short-, medium- and long-term goals must be identified by all role players if this scarce and expensive resource is to be allocated appropriately.

A limitation of this study was the lack of assessment of the demand for ICU facilities or for an evaluation of ICU outcome. The authors believe that such an exercise is essential but could not be achieved within the scope of this study. Two further studies are in progress to address these questions.

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