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Organizational structures and early mobilization practices in South African public sector intensive care units—A cross-sectional study

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Abstract

Rationale: Understanding current early mobilization practice of patients in intensive care unit (ICU) is critical to the design and implementation of strategies to facilitate its application in a diverse population of critically ill patients encountered in public sector hospitals.

Aim: To evaluate the organizational structures of South African public sector hospital ICUs and to describe early mobilization practices in these units.

Methods: A cross-sectional survey was done in participating public hospitals from eight provinces in South Africa. Convenience sampling was done. Data collected included hospital and ICU structure, adult patient demographic and clinical data, and mobilization activities done in ICU over the previous 24 hours prior to the day of the survey.

Results: A total of 29 ICUs from 13 participating hospitals were surveyed resulting in 205 patient records. Majority of the surveyed ICUs were “open” type (n = 16; 55.2%). A standardized sedation scoring system was used in 18 units (62.1%) and only two units (6.9%) had an early mobilization protocol in place. Mean age of the patients surveyed was 43.5 (±17.7) years and 148 (72.2%) patients were on mechanical ventilation. Primary reasons for admission to ICU included traumatic injury (n = 86; 42%) and postoperative care (n = 33; 16.1%). Mobilization activities performed in the previous 24 hours included turning the patient in bed (n = 88; 42.9%), marching on the spot (n = 9; 4.4%) and walking (n = 10; 4.9%). Out-of-bed mobilization was done in only 40 (19.5%) patients. The most common barriers to early mobilization included patient

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AUTHOR CONTRIBUTIONS

C.T., H.v.A., and V.N. participated in the design of the study. C.T. was responsible for the data collection and data management. C.T. and H.v.A. participated in the performance of statistical analysis. All the authors participated in the write up and final editing of the article.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

ETHICS STATEMENT

Ethical clearance for this study was obtained from the University of the Witwatersrand Human Research Ethics Committee (Medical) (REF: M150927). Each questionnaire contained information on the study and participation was anonymous and voluntary for unit staff. Waivers of consent were obtained from all participating hospitals’ Institutional Review Boards to access patients notes.

AVAILABILITY OF DATA AND MATERIALS

All data and materials are available and are with the first author.

unresponsiveness (n = 50; 24.4%) and hemodynamic instability (n = 42; 20.5%). The type of ventilation was found to have a significant positive relationship with out-of-bed patient mobilization (P = .000).

Conclusions: A small proportion of patients attained their highest level of mobilization in ICU. The type of ventilation influenced early mobilization practices in public sector ICUs in South Africa.

Keywords

adverse effects; critical care; early mobilization; organization; trends

1 | INTRODUCTION

Immobilization, which is considered to be a typical critical care management strategy, is associated with patients presenting with intensive care unit (ICU) delirium, impaired exercise capacity, poor functional outcomes, and poor quality of life (QOL).[1–9] Besides immobilization, the critical illness of the patient has many devastating consequences, which include the development of profound neuromuscular weakness, and psychological and cognitive disturbances that may result in long-term functional impairments and a reduction in QOL.[10–12]

The early mobilization of critically ill patients, although not a new strategy, is an ICU intervention that is beginning to receive significant attention by ICU multidisciplinary team members as its positive impact on patients' outcomes (including improvements in peripheral and respiratory muscle strength, reductions in shortness of breath, improvements in QOL after hospital discharge, shorter duration of delirium spells, improved functional recovery and lastly, reduced hospital length of stay [LOS]) is now being reported.[7,8,13–15] However, not all research on early mobilization report improved patient outcomes,[16–18] therefore it is important to investigate what structural and organizational ICU factors might impact the practice of early mobilization of patients and translate into positive clinical outcomes after implementation.

Understanding whether and how the early mobilization of patients in ICUs is currently performed by physiotherapists or any other members of the ICU team is critical to the design and implementation of strategies to improve on its application in the diverse population of critically ill patients found in public sector hospital ICUs.[4,19] There is variability in the reported interventions adopted for early mobilization such as in the description of activities performed, the progression of these activities, and the frequency of its application.[20–23] A low incidence of out-of-bed mobilization activities (10%–33%) for patients on mechanical ventilation or non-invasive ventilation, is reported by researchers in Australia and New Zealand, Germany, Brazil, Switzerland, and the United States.[3,24–28] Based on these findings, there remains a paucity of evidence to explain why evidence supporting the early mobilization of patients in ICU is not being translated into practice,[29] as only a small percentage of patients are being mobilized out-of-bed.

The organizational characteristics of ICUs seem to be related to the differences in variability of practice of early mobilization and reported patient outcomes among hospitals.[30] Considering the complexity of the implementation of early mobilization, individual, group, and organizational readiness is particularly relevant in the ICU setting as multidisciplinary teams work together to provide patient care, with some individuals working across the organization.[9] On this background, the authors were prompted to investigate the structure and organizational practices in South African public sector hospital ICUs and to describe early mobilization practices of adult patients in these units.

2 | METHODS

2.1 | Study design and study setting

A cross-sectional survey design was used. Prior to commencement of the study, permission was sought from the Provincial Departments of Health through application made to the South African National Health Research Database online submission system (https://nhrd.hst.org.za/). Eight of the nine provinces (Gauteng, Western Cape, KwaZulu Natal, Free State, Eastern Cape, Mpumalanga, Northern Cape, and Limpopo) provided consent for the study to be conducted in their respective provinces. After obtaining consent from each province through the online system, the Chief Executive Officers or the Directors of Clinical Services of the eligible hospitals within each of the eight provinces were contacted for permission. Thereafter, ethical clearance to conduct the study was obtained from the University of the Witwatersrand's Human Research Ethics Committee (Medical; REF: M150927).

2.2 | Participants and sampling method

There are far fewer ICUs in the public sector than in the private sector in South Africa (SA). According to Naidoo and colleagues, an analysis of ICU beds in 2008 and 2009 showed that there was a total of 4719 ICU beds in the healthcare sector in SA.[31] Seventy-five percent (3533) of ICU beds were reported to be in the private sector and 25% (1186) in the public sector, with the majority located in three provinces namely Gauteng (49%), KwaZulu-Natal (14%), and Western Cape (15%).[31] There are a total of 92 public hospitals with at least one ICU from a total of 396 hospitals in SA.[31] A total of 25 (27%) public hospitals in SA with ICUs that were categorized as being on the central/quaternary, tertiary, and provincial/regional levels were contacted to participate in the study. The distribution of hospitals contacted was: Eastern Cape (n = 4), Free State (n = 3), Gauteng (n = 7), Kwazulu Natal (n = 4), Limpopo (n = 2), Mpumalanga (n = 2), Northern Cape (n = 1), and Western Cape (n = 2) provinces. Only 13 hospitals (with a total of 29 ICUs) responded and gave their institutional approval. Convenience sampling was used for the participating hospitals as only those that provided consent could be included in the study. Patients whose information was collected for the survey were consecutively sampled from the adult patients who were in ICU on the day of the survey at each hospital. Paediatric and neonatal ICU patients were not included in this survey.

2.3 | Data collection procedure

A survey questionnaire was developed using information obtained from two of the point prevalence studies conducted in Australia and New Zealand, and Germany.[24,27] The study specific questionnaire consisted mostly of closed-ended with few open-ended questions. Prior to implementation, the study specific questionnaire was sent to three experts in the field of critical care to ensure content validity and face validity. Suggested changes were implemented, and the final version of the questionnaire was recirculated to the experts to obtain agreement on content. After final approval was received from the experts, the questionnaire was created online using the REDCap electronic data capture tools hosted at University of the Witwatersrand (https://redcap.core.wits.ac.za/redcap/index.php?action=myprojects).

Data collection was done by one person (CT) in each of the 13 hospitals at a pre-arranged time. The researcher met with ICU staff on different days (according to their preference) during the period of June to December 2016. On the day of the survey, information about the hospital and the organization and structure of each included ICU was obtained from the nursing head of shift and/or the physiotherapist in charge of the unit through an informal interview with the researcher (CT). Information sought included type of hospital, number of adult ICUs in the hospital, name of surveyed ICU, description of the ICU, bed capacity, average monthly patient admissions over the past 3 months, ratio of ICU staff to patients, frequency of multidisciplinary ward rounds, type of beds and chairs used in the unit, availability of clinical guidelines for patient management, availability of mobility equipment, type of patients admitted in the unit, staff which were routinely involved in mobilization of patients and which procedures, if any, were implemented in the ICU to promote early mobilization. The type of ICU was defined as “open” or “closed.” “Closed” ICUs were defined as those that required patient transfer to or mandatory patient co-management by an intensivist and “open” ICUs as units where patient care was provided by a variety of doctors. For the purposes of this survey, rotational physiotherapist was defined as someone that works in ICU on a temporary basis for a short duration of time (3-4 months) and is also responsible for patient care in other wards and ICUs of that same hospital. Permanent physiotherapist was defined as someone that is permanently attached to a specific ICU but is also responsible for patient care in other wards or ICUs of the same hospital. Lastly, specialist physiotherapist was defined as someone that is permanently attached to a specific ICU and is not responsible for patient care in any other ward or ICU of that same hospital.

The variables for which data were collected by the researcher from patients’ ICU charts and files included demographic (age, gender) and clinical information (admission diagnosis, cause of condition, reason for ICU admission, number of days in ICU, number of days on mechanical ventilation, Acute Physiology and Chronic Health Evaluation (APACHE) II score, Sequential Organ Failure Assessment (SOFA) score and comorbidities) and mobilization practices performed on patients in ICU by clinical staff in the previous 24 hours of their ICU stay. Activities screened for and recorded by the researcher included (a) remained in bed with treatment mostly in a supine position, (b) turned in bed during treatment, (c) passive range of motion exercises, (d) active-assisted exercises, (e) active

exercises, (f) sitting up in bed, (g) sitting up over the edge of the bed, (h) sitting out-of-bed in a chair, (i) standing upright next to the bed, (j) stepping (marching) by the bed side, and (k) walking away from the bed side. The ICU physiotherapist was interviewed firstly regarding their workload and secondly to clarify reasons for why some patients may not have been mobilized in the 24-hour period prior to the survey. Potential barriers which were listed in the questionnaire were mentioned when physiotherapists were interviewed and the reasons for these barriers which were not included in the questionnaire were recorded under "other." The last section of the survey questionnaire recorded the adverse events that occurred as a direct result of patient mobilization.

2.4 | Data analysis

The data obtained was nominal, ordinal, and ratio in nature. Data were captured from REDCap onto a Microsoft Excel (2016 Version) spread sheet. The IBM Statistical Package for Social Sciences (SPSS version 25.0; IBM Corp, Armonk, New York) for Windows was used to analyse the data. Descriptive statistics were used to present the data. Continuous variables were summarized as means and standard deviations for normally distributed data or medians and interquartile ranges for data that were not normally distributed. The Shapiro-Wilk test was used to test for normality of data distribution. Categorical variables were summarized as frequencies and percentages. Chi-square and Fisher's Exact tests were used to test the relationships between categorical data. A two-tailed *P*-value ≤.05 was deemed statistically significant. Bonferroni correction is an adjustment applied to *P*-value that is supposed to be applied when two or more statistical analyses have been performed on the same sample of data. The Bonferroni correction approach used in the study is the one of dividing the per analysis alpha rate be the number of statistical analyses performed. All qualitative interview data obtained from open-ended questions during the informal interviews were summarized into themes. Items within each theme were summarized using frequencies and percentages. These data were then analysed in a descriptive rather than an interpretative manner since the data were supplementary to the quantitative data and were too shallow for an in-depth qualitative analysis.

3 | RESULTS

3.1 | Hospital and ICU structure

Of the 13 hospitals, a total of 29 ICUs participated and consisted of mixed ICUs and specialized ICUs (Figure 1). The specialized ICUs included those catering for medical, surgical, trauma, neurosurgical complaints, acute spinal cord injuries, cardiothoracic problems, and burn injuries. The majority of the ICUs were general ICUs (n = 11; 37.9%). The median bed capacity of the units was 7 (IQR = 5-9) beds with median monthly patient admission rates of 35.5 (IQR = 30-75) patients (Table 1). The nurse-to-patient ratio across the units varied, with some units reporting a nurse-to-patient ratio of 1:1 (n = 19; 65.5%), some a ratio of 1:2 (n = 7; 24.1%), and a minority of units reporting ratios of 1:3 and 1:4 (n = 2; 6.9%; n = 1; 3.4%) respectively. The number of physiotherapists covering the units ranged from one to five. The physiotherapist-to-patient ratio ranged across units from 1:1 to 1:12, depending on the ICU bed capacity. Majority of the units (n = 15; 51.7%) reported that they had a permanent physiotherapist that covered their unit.

3.2 | Demographic details of patients in the units on the day of the survey

Across the 29 ICUs, 205 patients were surveyed. Table 2 summarizes the demographic information of patients in ICU on the day of the survey. The median age of the patients was 39 (IQR = 30-58) years, and majority were males (n = 135; 65.9%). The median duration of ICU stay was 5 (IQR = 3-9) days. The method of ventilation for the majority of patients was via endotracheal tube (n = 109; 53.2%). The most common indications for admission to ICU included traumatic injury (n = 86; 41.9%) and postoperative care (n = 54; 26.3%). The common causes of traumatic injury were road traffic accidents (n = 39; 19%), assault (n = 19; 9.3%), gunshot wounds (n = 15; 7.3%), stab wounds (n = 11; 5.4%), and falling off a horse (n = 1; 0.5%). The most common surgical procedures carried out for patients admitted to the units were laparotomy (n = 52; 25.4%) and craniotomy (n = 21; 10.2%). The most common comorbidities were hypertension (n = 46; 22.4%), diabetes mellitus (n = 24; 11.7%), renal disease (n = 23; 11.2%), and smoking (n = 23; 11.2%). The APACHE II and/or SOFA scores were not consistently recorded for all patients in the participating ICUs.

3.3 | Current mobilization practices

Table 3 summarizes the types of activities that were performed with patients in the 24 hours prior to the survey. For those with an ICU LOS of less than 48 hours, 41 (80.4%) patients were turned in bed in the previous 24 hours whilst only three (5.9%) patients walked away from the bedside. For those with an ICU LOS of more than 48 hours, 123 (79.9%) were turned in bed in the previous 24 hours, while only 7 (4.5%) of the patients walked away from the bedside. Out-of-bed mobilization, which included activities starting from sitting on the edge of the bed and progressing to walking, was achieved by 7 (13.7%) of the patients with an ICU LOS of less than 48 hours. Out-of-bed mobilization was achieved in 33 (21.4%) of the patients with an ICU LOS of more than 48 hours.

The barriers to mobilization reported by staff are summarized in Table 4. The most common barriers were patients who were unresponsive (n = 50; 24.4%) and those with hemodynamic instability (n = 42; 20.5%) (Table 4). Other reasons why physiotherapists decided not to mobilize patients out-of-bed mostly included medical contraindications and patients who were agitated and confused. Adverse events related to mobilization included dizziness (n = 3) and fatigue (n = 2). Other adverse events reported included desaturation (n = 1), low temperature (n = 1), reduction in mean arterial pressure (n = 1), postural hypotension (n = 1), and inability to sustain position (n = 1).

3.4 | ICU culture to promote early mobilization

Table 5 summarizes the ICU activities and/or procedures used to facilitate early mobilization. All the surveyed ICUs indicated that they had discipline-specific unit rounds every day but only 21 units (72.4%) reported that multidisciplinary ward rounds were held in their units. All ICUs reported that nurses and physiotherapists were responsible for patient mobilization, while six units (20.7%) reported that doctors also assisted in the early mobilization activities. Only two units (6.9%) used a standardized outcome measure to assess patients' mobility status.

Figure 2 represents the clinical protocols available in participating public sector hospital ICUs. Staff from all units indicated that they had clinical protocols in their units. The most commonly reported protocols were the spontaneous breathing trial protocols and the sedation vacation protocols reported in 25 (86.2%) of the units. Only two (6.9%) of the units reported that they had an early mobilization protocol in their unit. The most commonly reported protocols under "others" were enteral feeding (n = 11; 37.9%) and infection control (n = 10; 34.5%) protocols.

3.5 | Equipment Availability for Early Mobilization of Patients

The types of equipment available in the units to facilitate early mobilization are presented in Table 6. All the ICUs surveyed indicated that they had electronic beds in their units but manually adjusted beds were also available in 6 (20.7%) of the units. The availability of portable ventilators was limited to 16 (55.2%) units. Only 12 (41.4%) units reported that they had hoists readily available in the ICU to facilitate early mobilization. Walking frames and transfer boards were reported to be available in only 2 (6.9%) of the units.

3.6 | Factors associated with mobilization activities

Table 7 summarizes factors that had a relationship with mobilization activities performed with patients in public sector hospital ICUs. Factors that were found to have a positive significant relationship with out-of-bed patient mobilization after Bonferroni correction was type of ventilation which included tracheostomy and non-invasive ventilation ($P = .000$).

4 | DISCUSSION

This cross-sectional survey of ICUs in South African public sector hospitals showed that a younger population of patients are admitted secondary to traumatic injuries caused by road traffic accidents or assault mainly. In reference to early mobilization practices, very few patients are being mobilized out of bed during their ICU admission. The reasons for low out of bed mobilization practices in these patients included unresponsiveness and hemodynamic instability. Type of ventilation was found to have a positive significant relationship with out-of-bed patient mobilization in this study.

Patients admitted to ICUs in public sector hospitals in SA perform a range of mobilization activities during their stay. The majority of these activities are performed in bed and therefore the incidence of out-of-bed activities was low (19.5%), with only 10 (4.9%) of the patients walking away from the bedside. Similarities were found between the results of the current study and those reported by other point prevalence studies and prospective observational studies on the early mobilization of patients in ICU.[3,24–28] Low incidences of out-of-bed mobilization, with a range of 10% to 33%, were reported in all the point prevalence studies which have been conducted to date.[24–28] This shows that early mobilization is not being fully implemented as a component of standard patient care in all patients who are eligible, thus illustrating the gap that exists between research evidence and the implementation of this evidence in daily clinical practice.

The low incidence of out-of-bed mobilization for patients ventilated through artificial airways was noted in the current study. This might be the reason why the percentage of

patients who were mobilized out-of-bed was lower. In agreement with these findings, others reported the incidence of out-of-bed mobility for those on mechanical ventilation to be significantly lower compared to out-of-bed mobility activities for those who were breathing spontaneously.[3,24,25,27,28,32] Mobilizing patients on mechanical ventilation requires knowledge of how to operate the ventilator by the mobilizing team, proper handling, and fixing of the attachments and engagement of team members which includes the nursing staff. There is a minimum number of people required for the safe out-of-bed mobilization of a ventilated patient. A minimum of two people has been recommended for out-of-bed mobilization of a patient for the guarding of vital lines and attachments.[33,34] All these factors might influence the rate of mobilization of ventilated patients. Besides the type of airway, out-of-bed mobilization was found to be most prevalent in the current study in patients who had been in the ICU for more than 48 hours compared to those patients who had been in the ICU for a shorter period, although the difference was not significant. Brock et al[1] reported that predictors of out-of-bed mobilization include a longer ICU LOS, male gender, and a Glasgow coma scale of above 10. Berney et al[24] similarly reported that the ICU LOS for most of the patients who had an artificial airway in situ and who participated in out-of-bed mobilization activities was more than 48 hours. The low incidence of out-of-bed mobilization for patients who stayed for a shorter length of time in the ICU may possibly be explained by the higher use of sedation during this time period and that patients may be more unstable from a cardiovascular system point of view.[25,27] This notion is supported by the results of this study which showed that one of the barriers reported for early patient mobilization was hemodynamic instability.

The most cited barrier to out-of-bed mobilization in the current study was unresponsiveness, which was not as a result of sedation. The high prevalence of trauma in the cohort might be the reason why the majority of the patients were not mobilized out-of-bed, the main reason being their unresponsiveness and raised intracranial pressure (ICP) experienced during the 24 hour period prior to the day of the survey. The majority of these patients had sustained head injuries and they were in the unit for either neuroprotection or postoperative care after a craniotomy had been done. Increased ICP has been reported to compromise early mobilization in patients with traumatic brain injury as exercise is associated with further increases in cranial pressure.[35] However, there are published guidelines that can be used for safe mobilization of neurosurgical patients, with minimisation of adverse events.[36,37] The early mobilization of neurosurgical patients requires close monitoring and continuous adjustments in respect of the type and intensity of exercise prescribed, with the patient's clinical condition being continuously monitored.[38] This barrier is also a modifiable one as mobilization should not only be implemented in patients who are responsive. Strategies to overcome this barrier include training of the staff to have the knowledge and skill to handle unresponsive patients and availability of equipment to assist in the lifting and transfer of such patients.

Although not statistically significant in the current study, more out-of-bed mobilization occurred in "closed" ICUs compared to "open" ICUs. "Closed" ICU settings may more readily result in the standardization of practice since all decisions related to patient management are mainly made by one intensivist and his/her team members. The knowledge and attitude of the intensivist towards early mobilization becomes a key component in a

"closed" ICU as the intensivist serves as the champion leader in the implementation of such interventions in the unit.[39] This shows the complexity associated with the implementation of early mobilization as standard patient care, as it is dependent on multiple factors that require interprofessional communication for successful implementation. This is a modifiable barrier to early mobilization, and correct strategies can be put in place to overcome it. One of the best strategies implemented in the ICU is to improve communication through multidisciplinary ward rounds, where best patient management is discussed by the whole team. Multidisciplinary rounds allow for the real-time and in-person exchange of information, making the goals and plans for the care for each patient clear to everyone.[40] This is an important mechanism for effective communication and coordination in patient care.[41] Effective communication and standardization of practice can also be improved through use of clinical protocols and guidelines in the unit. All of the participating units in SA had clinical protocols in place. These included mechanical ventilator weaning, patient sedation, and spontaneous breathing trial protocols. Only two ICUs had an early mobilization protocol in place. Results from a survey conducted in France, Germany, the UK, and the United States showed that ICUs with an early mobilization protocol were reported to automatically initiate early mobilization programmes upon the admission of the patient into the unit, whilst ICUs without early mobilization protocols in place often required a physician's order to start the treatment.[42]

Considering the cohort of patients in this survey, the indications for ICU admission were mainly traumatic injury, postoperative care and acute respiratory failure in descending order. Cohorts that were investigated in Australia and New Zealand, Germany, and the United States consisted of patients with medical and surgical conditions.[24,26,27] Trauma constitutes approximately 25% of the emergency workload at most public hospitals in SA where there is limited capacity for rehabilitation and ICU facilities are lacking.[43] The results of the current study show that traumatic injuries are generally sustained as a result of road traffic accidents or interpersonal discord, and/or intentional injury, and occur mostly among young men, which is similar to other reports.[43–45] The absence of early mobilization protocols, delirium assessment protocols, and the use of physical function assessment tools in the participating ICUs, as well as the type of patient seen in these units might explain the low level of out-of-bed mobilization reported. All of the stated factors have an influence on early mobilization practice and must be considered when formulating clinical practice guidelines and protocols for early mobilization which can be successfully implemented in low- and middle-income countries.

Patients were mobilized out-of-bed in units which had permanent physiotherapy cover. This is also classified as a modifiable barrier as it emanates from the organizational structures of each institution. Possible advantages of having a permanent physiotherapist in ICU is that it promotes standardization of practice, improvement in knowledge of the physiotherapist in ICU related matters, and sustainability of intervention programs. It is known that high staff turnover rates result in unsustainable interventions as in the case of early mobilization programmes.[46,47] Creation of static posts in the ICU for physiotherapists may result in greater availability of champion leaders who become key persons in the provision of patient care and should be advocating for early mobilization through their re-training of other colleagues.[48] Moreover, the presence of a specialist physiotherapist was found to be

associated with early mobilization being delivered at the right time when a patient was awake, medically stable, and procedure-free.[46] However, there is a need to look at what is feasible in a South African public healthcare sector context in terms of human resources and the practicality of having a static position in these hospitals for senior ICU physiotherapists. If it is not feasible to have static positions for physiotherapists, then clinical rotations can be organized in such a way that there is always one physiotherapist who is familiar with the unit and who can assist with the training of a new physiotherapist with regards to unit protocols.

Other modifiable barriers to out-of-bed mobilization found in this survey included the shortage of resources, such as manpower and equipment, to promote the early mobilization of patients. This was found to be a commonly reported barrier by staff in the participating ICUs in public sector hospitals in SA. In most units, there was a shortage of competent staff to safely perform out-of-bed patient mobilization as this is a highly demanding task that requires extensive time to plan for its execution, enough members of staff with the relevant clinical skills and the availability of suitable equipment.[29,49,50] Increased numbers of staff in ICU or the introduction of a new staff member dedicated to ICU mobilization and with access to mobilization equipment, may improve the rates and levels of active exercise therapy and out-of-bed mobilization of patients in public sector SA ICU settings.[46,47,51]

This study had some limitations. The study design itself, a cross-sectional survey, has been reported to be a limitation[24] since it may not represent actual clinical practice. In one-day surveys, or prevalence or cross-sectional study designs, seasonal selection bias cannot be ruled out. However, an attempt was made to reduce such bias through recruiting a large number of ICUs from different provinces. The cross-sectional design of the survey limits the identification of causal association although it allows for the identification of relationships among the variables. Since this study had a cross-sectional design, the type of patients who were admitted to the units during the days over which the survey extended might have contributed to the low rate of early mobilization activities recorded.

Furthermore, the sample was limited as not all provinces gave permission for the study to be conducted. In fact, some of the hospitals in provinces where Department of Health permission was obtained, did not grant permission for the study to be conducted. Data was gathered through the review of patient ICU charts and files and on what came out of discussions with the attending nurse or physiotherapist that clarified the mobilization practices already executed and the reasons why some patients had not been mobilized during the previous 24-hour period. The reliance on self-reporting of staff and the documentation of the information by the clinicians in question, may have introduced an element of bias in the answering of questions assessing early mobilization practices as some information might not have been written down or only physiotherapist-performed mobilization was reported and documented. Also, the documentation in the patient charts and files on the nature of the physiotherapy management varied within the ICUs as there did not seem to be a standardized way of reporting physiotherapy assessments and management across the participating hospitals. This contributed in some instances to incomplete information obtained.

There is a need to conduct further research into the area of early patient mobilization in public sector hospital ICUs in SA through the application of a prospective study design, which offers greater opportunities to observe clinical practice. It is recommended that ICUs engage in plan-do-study-act (PDSA) models[33] to highlight early patient mobilization as standard care in their units. Three ICU early mobilization quality improvement projects were summarized utilizing the Institute for Healthcare Improvement framework of PDSA.[33] The results of the study showed that instituting a planned, structured ICU early mobility quality improvement project can result in improved outcomes and reduced costs for ICU patients across healthcare systems.[33] The application of a PDSA model in ICUs would provide for tests for change on a small scale which could then be escalated to either the whole hospital or nationwide. The implementation of a PDSA model may highlight the strategies which work and those which do not work related to early patient mobilization in SA public sector hospital ICUs. The use of this model may result in sustainable early mobilization practices being introduced into ICUs and it can then be adopted as the standard of care.

5 | CONCLUSION

Low rates of early patient mobilization, especially out-of-bed activities, were found in SA public sector hospital ICUs. The use of early mobilization guidelines or protocols and the use of standardized outcome measures to assess patients' mobility status were not common practice. The shortage of resources, such as manpower and equipment, to promote the early mobilization of patients was found to be a general characteristic of the ICUs in these hospitals. The type of patients managed in the units on the days that this survey was conducted may offer an explanation for the low incidence of out-of-bed mobilization of patients. There is a need to improve the implementation of early mobilization of ICU patients, when appropriate, as standard patient care in SA public hospitals. Description of variations in organizational structures of units and hospitals may better contextualize these working environments, aid in analysis of relevant barriers and ensure implementation of successful early mobilization practice as standard of care.

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Abbreviations:

APACHE II	Acute Physiology and Chronic Health Evaluation II score
ARO	Mactive range of motion
ICU	intensive care unit
IQR	interquartile range
PDSA	Plan-do-study-act
PRO	Mpassive range of motion
SA	South Africa
SOFA	Sequential Organ Failure Assessment

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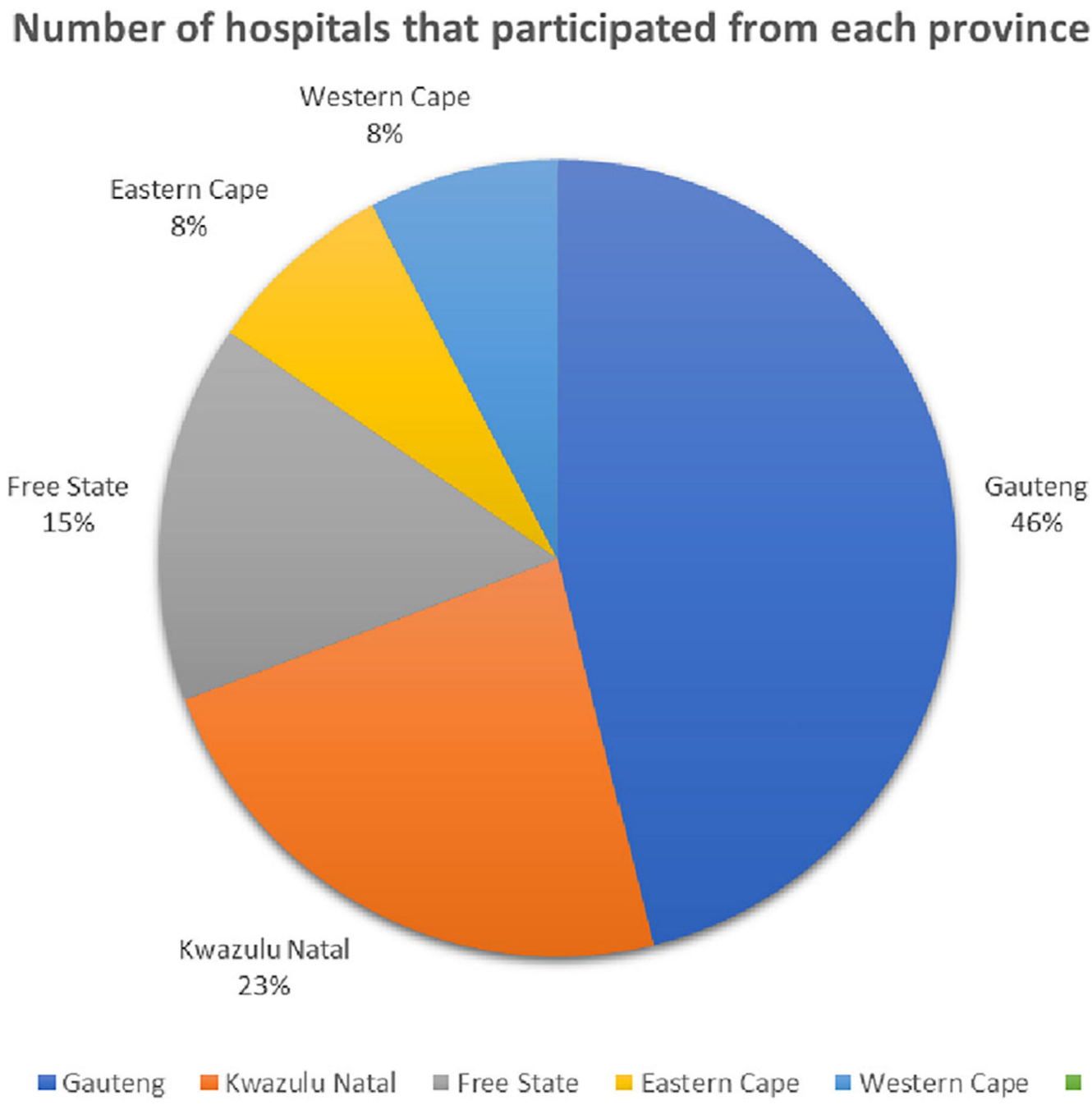

FIGURE 1.
Distribution of the hospitals that participated in the survey from each province

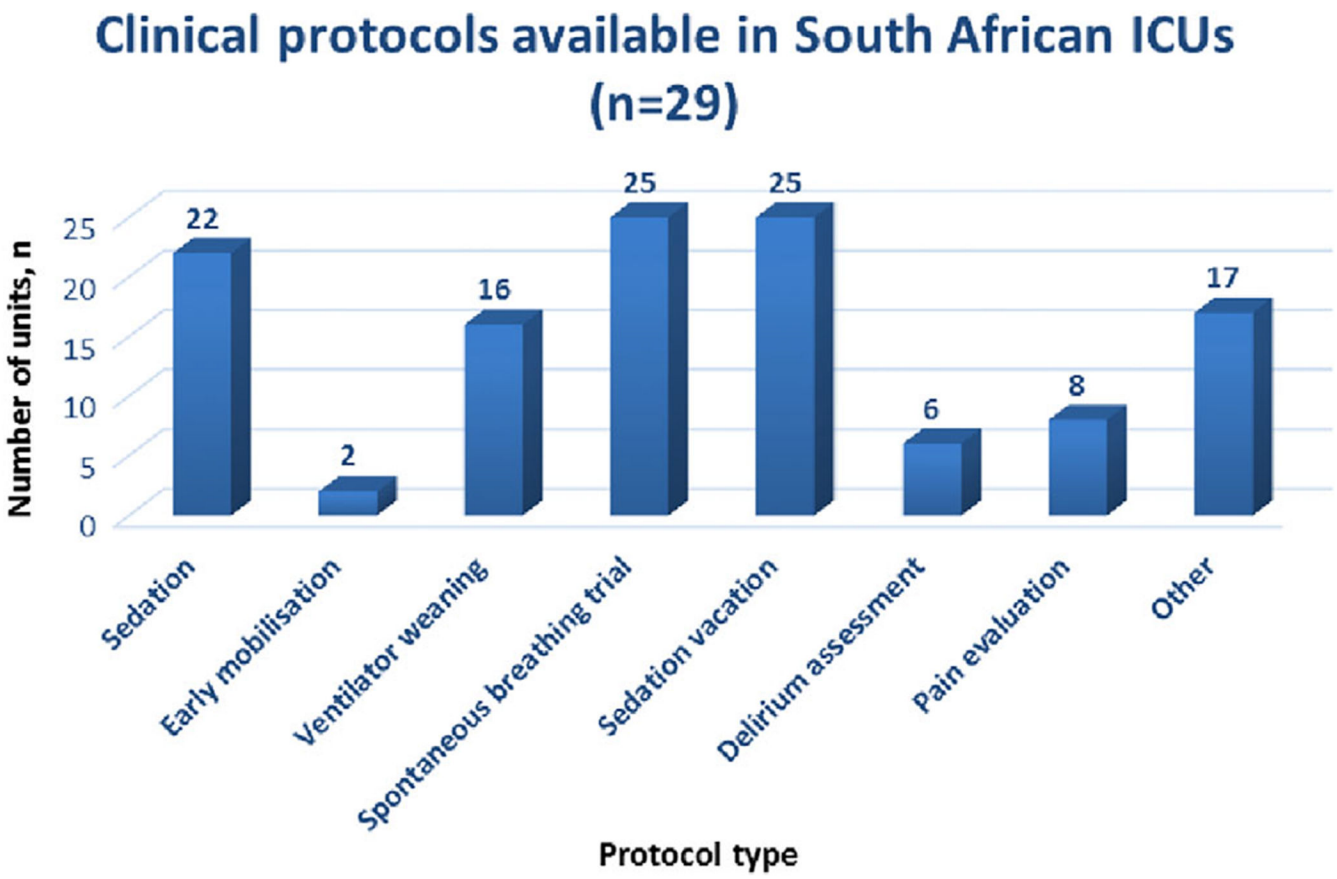

FIGURE 2.
Clinical protocols available in intensive care units (ICUs)

TABLE 1

Description of the South African government hospitals and intensive care unit (ICU) characteristics

Item	Description	Results
Number of hospitals, n		13
Level of hospital, n (%)	Quaternary/Central	7 (53.8)
	Tertiary	5 (38.5)
	Regional	1 (7.7)
Number of ICUs, n		29
Category of ICU, n (%)	General	11 (37.9)
	Trauma	4 (13.8)
	Neurosurgery	4 (13.8)
	Cardiothoracic	3 (10.3)
	Medical	2 (6.9)
	Surgical	2 (6.9)
	Acute spinal cord injury	1 (3.4)
	Burns	1 (3.4)
	Cardiac	1 (3.4)
Type of ICUs, n (%)	Open	16 (55.2)
	Closed	13 (44.8)
Monthly patient admission in ICU, median (IQR)		35.5 (30-75)
Units with permanent physiotherapy cover, n (%)	Yes	15 (51.7)
	No	14 (48.3)
Workload of ICU physiotherapists at each hospital, n (%)	Other ICUs in the hospital	9 (31)
	High care units	11 (27.9)
	Inpatient wards	26 (89.7)
	Outpatients	6 (20.7)
	Hospital clinics	2 (6.9)

TABLE 2

Demographic data of patients surveyed in public hospital intensive care units (ICUs) in South Africa (n = 205)

Description	Results
Gender; n (%)	
Male	135 (65.9)
Female	70 (34.1)
Age, median (IQR) range	39 (30-58)
Airway type; n (%)	
Endotracheal tube	109 (53.2)
Tracheostomy	38 (18.5)
Spontaneous ventilation	58 (28.8)
Number of hours on mechanical ventilation; median (IQR) range	120 (72-240)
Number of days in the unit; median (IQR) range	5 (3-9)
Indications for ICU admission n (%)	
Acute respiratory failure	53 (25.9)
Hypertensive disorders of pregnancy	3 (1.5)
Postoperative Care	54 (26.3)
Trauma	86 (41.9)
Sepsis	9 (4.4)
Referring unit/specialty; n (%)	
Cardiothoracic Surgery	41 (20)
General Surgery	59 (28.9)
Neurosurgery	51 (24.8)
Medical	43 (20.9)
Obstetrics and gynaecology	4 (2.0)
Orthopaedics	3 (1.4)
Neurology	4 (2.0)

TABLE 3

Mobilization activities that were performed with patients in the previous 24 hours of their intensive care unit (ICU) stay

Type of activity performed	Patients admitted in ICU for ≤48 hours (n = 51)	Patients admitted in ICU for >48 hours (n = 154)
Remained in bed with treatment mostly in supine position	32 (62.7)	102 (66.2)
Turned in bed	41 (80.4)	123 (79.9)
Passive range of motion (PROM)	16 (31.4)	83 (53.9)
Active assisted range of motion	27 (52.9)	59 (38.3)
Active range of motion (AROM)	27 (52.9)	49 (31.8)
Sat up in a bed	21 (41.2)	54 (35.1)
Sat up over the edge of the bed	7 (13.7)	27 (17.5)
Sat out in a chair	5 (9.8)	21 (13.6)
Stood up next to the bed	4 (7.8)	15 (9.7)
Marched on the spot	4 (7.8)	15 (9.7)
Walked	3 (5.9)	7 (4.5)
Highest level of mobilization that patients achieved		
Turned in bed	20 (39.2)	68 (44.2)
Sat up in bed with the head of bed elevated	14 (27.5)	23 (14.9)
Sat up over edge of bed with feet touching floor	2 (3.9)	11 (7.1)
Sat in a chair	1 (2)	7 (4.5)
Marched on the spot	1 (2)	8 (5.2)
Walked	3 (5.9)	7 (4.5)

TABLE 4

Barriers to early out-of-bed patient mobilization

Reasons for not sitting out-of-bed and walking	Frequency, n (%)
Unresponsive, n (%)	50 (24.4)
Hemodynamic instability, n (%)	42 (20.5)
Sedated, n (%)	20 (9.8)
Physiotherapist's decision, n (%)	19 (9.3)
Multiple orthopaedic injuries, n (%)	9 (4.4)
Unstable spine, n (%)	9 (4.4)
Sedated and Unresponsive, n (%)	6 (2.9)
Patient on dialysis, n (%)	4 (2)
Patient not in ICU, n (%)	4 (2)
Other reasons, n (%)	32 (15.6)
Paralysis of peripheral muscles	1
Medical contra-indications	13
Open wound	4
Agitation	6
Confusion	6
Pus oozing	1
Patient refusal	1

TABLE 5

Intensive care unit (ICU) activities/procedures to facilitate early mobilization

Description	SA (n = 29)
Multidisciplinary ward rounds	21 (72.4)
Discipline-specific ward rounds	29 (100)
Physiotherapist participation in ward rounds	
Always	5 (17.2)
Sometimes	24 (82.8)
Staff members involved in mobilization	
Nurses	24 (82.8)
Physiotherapists	29 (100)
Doctors	6 (20.7)
Activities/procedures which promote early mobilization	
Documentation of patient goals	29 (100)
Setting of daily sedation goals	29 (100)
Utilization of sedation scoring system	11 (42.3)
Presence of a mobility guideline	2 (6.9)
Presence of a resident ICU physiotherapist	0
Assessment of mobility status of a patient	29 (100)
Use of a standardized outcome measure to assess mobility status	2 (6.9)

TABLE 6

Equipment to promote early mobilization in the participating intensive care units (ICUs)

Description	SA (n = 29)
Type of beds	
Manually adjustable beds	6 (20.7)
Electronic beds	29 (100)
Type of bedside chairs	
Standard chair with back and arm rests	12 (41.4)
Adjustable reclining chairs with back and arm rests	17 (58.6)
Adequacy of bedside chairs to ICU bed capacity	
Yes	10 (34.5)
No	19 (65.5)
Availability of transfer and mobilization equipment	
Portable oxygen cylinders	29 (100)
Ambubags	29 (100)
Portable ventilators	16 (55.2)
Walking frame	2 (6.9)
Sliding board	3 (10.3)
Transfer board	2 (6.9)
Hoist	12 (41.4)
Tilt table	4 (13.8)
Standing frame	4 (13.8)

TABLE 7

Factors that had a relationship with mobilization practices of patients in intensive care unit (ICU; n = 205)

Factors	Remained in bed n (%)	Mobilized out-of-bed n (%)	*P*-value
Type of ICU			.035
Open	80 (39.1)	12 (5.7)	
Closed	85 (41.5)	28 (13.7)	
ICU physiotherapy			.045
Permanent physiotherapist	66 (32.2)	23 (11.2)	
Rotational physiotherapist	99 (48.3)	17 (8.3)	
Multidisciplinary ward rounds			.46
No	51 (24.9)	10 (4.9)	
Yes	114 (55.6)	30 (14.6)	
Gender			.21
Female	53 (25.9)	17 (8.3)	
Male	112 (54.6)	23 (11.2)	
Type of ventilation			.000[a]
Endotracheal tube	105 (51.2)	4 (2)	
Non-invasive ventilation	41 (20)	18 (8.8)	
Tracheostomy	19 (9.2)	18 (8.8)	
Indications for ICU admission			.36
Acute respiratory failure	39 (19)	14 (6.8)	
Hypertensive disorders of pregnancy	3 (1.5)	0 (0)	
Posmiddleerative care	42 (20.5)	12 (5.9)	
Trauma	74 (36.1)	12 (5.9)	
Sepsis	7 (3.3)	2 (1)	
Sedation protocols			.016
Yes	139 (67.8)	27 (13.2)	
No	26 (12.7)	13 (6.3)	
ICU duration period			.23
≤48 hours	44 (21.5)	7 (3.3)	
>48 hours	121 (59.1)	33 (16.1)	

[a]Statistically significant Bonferroni corrected *P*-value <.00625.