

Research

Prevalence of Musculoskeletal Pain in Critical Care Nurses and the Impact of Specialty Critical Care Beds

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ABSTRACT

Background: Musculoskeletal (MSK) injuries are an ongoing issue for nurses, particularly for those working in critical care units globally. The use of specialty critical care beds has been identified as a way to mitigate injuries and improve nursing care. However, information on prevalence of MSK pain amongst critical care nurses in Zambia and the use of specialty critical care beds in low-income countries is limited.

Aim: The aims of this service evaluation were to identify and explore the types of MSK pain reported by nurses, determine the prevalence of MSK pain in critical care nurses in one setting in Zambia and assess the perceived effectiveness of the implementation of specialty critical care beds in a tertiary hospital critical care unit in Zambia.

Methods: A self-reporting questionnaire which was adapted from a similar study was used. Ethics and local hospital approval was given to conduct this service evaluation. Quantitative datasets were analyzed using descriptive statistics and thematic analysis was used to analyze qualitative responses.

Results: Out of 40 nurses, 36 (90%) returned questionnaires. Many respondents (n=26) reported some form of MSK pain. The majority (n=34) reported the introduction of new critical care beds improved nursing care. Both the quantitative and qualitative data complimented each other, and two key themes were identified: prevention of staff injury and patient safety.

Conclusion: This study confirmed high prevalence of MSK amongst critical care nurses and found the use of specialty critical care beds can help to reduce pain and improve nursing care provided to critically ill patients.

Keywords: critical care nurses, critically ill patients, low-income country, musculoskeletal pain, qualitative, Zambia

INTRODUCTION

Globally, the high prevalence of musculoskeletal (MSK) pain reported by nurses has been a longstanding concern (Frieria et al., 2021). In many low-income countries (LICs), the situation is compounded by limited regulations on manual handling, as highlighted by the World Health Organization (WHO) (2024). Without established preventative occupational health services, healthcare workers face greater risks, including MSK pain due to unsafe patient handling practices, which also heightens the risks to patients.

In Zambia, formalized critical care nurse education has occurred for just over a decade (Carter et al., 2020; Macey et al., 2024). With the program being relatively new and with a restricted time allocation, the content is focused on the core principles of critical care. Also, there is a lack of regulations relating to safe patient handling practices and training requirements, although without preventative regulations and training the risk to nurses of acquiring an MSK injury is higher (Macdonald & Oakman, 2024). The situation is not unique to Zambia, and the WHO (2021) has recognised the need to protect, safeguard, and invest in the healthcare workforce. They identified an international need to strengthen occupational safety and health measures to enable healthcare professionals to work within safe work environments and meet their full potential (WHO, 2021).

BACKGROUND

The Covid-19 pandemic resulted in donations of medical equipment to LICs, however, adequate training and support has been identified as an ongoing cause for concern (Hoekstra et al., 2023; WHO, 2024a). The critical care unit (CCU) in Zambia where this service evaluation took place, was offered an international donation to replace the standard hospital beds with specialty critical care beds. Prior to this, critically ill patients were nursed on standard hospital beds which required manual 'cranking' to change the height, head and foot positions, which as Celik et al (2018) point out often leads to staff injury when moving or repositioning patients. The new specialty beds were introduced in mid-2022, with all staff in the unit initially trained by a team of local trainers who had undergone a 'train the trainer' course provided by the manufacturer. Trainers were then required to provide ongoing training and bedside mentorship to their peers. Approximately one year later this service evaluation took place.

A critical review of the literature identified limited research on the use of specialty critical care beds in this setting. However, evidence was found from high-income countries (HIC), where it has long been recognised that the introduction and appropriate use of specialty critical beds facilitate the delivery of safe care, in an environment where many patients are unconscious or unable to help themselves (Aleid et al., 2021; Sun et al., 2021). Use of a specialty critical care bed has potential benefits to patients including positioning to prevent a range of complications, such as the development of pressure ulcers, the inability to position patients for neurological protection, the development of ventilator associated pneumonia (VAP) and improved safety when delivering naso-gastric tube feeding (Bayrak et al., 2021; Chanthawatthanarak et al., 2020).

In the light of this research, it is accepted that correct use of specialty critical care beds could reduce the risk MSK injury and pain amongst nurses (Richardson et al., 2019). However, Aleid et al (2021) point out that MSK pain amongst critical care nurses is multi-factorial and therefore, there is no one cause or

solution. Beattie et al (2022) point out that in LICs, factors such as limited training, high patient numbers, low nurse ratios, together with variable and limited availability of manual handling equipment, exacerbates the risk of MSK with nurses finding themselves having to carry out unsafe handling practices to deliver care, need to be recognised. It is important to note that nurses in LIC have also been identified as being at increased risk of fatigue leading to injury (Macey et al., 2022; Kasa et al., 2020).

According to the WHO (2007), 'task shifting' means the re-distribution of tasks among health care teams. Due to shortages of physician anaesthetists this often means critical care nurses have an extended role which adds to an already heavy workload increasing the risk of fatigue and injury. Kasa et al (2020) and Tefera et al (2021) argue that workload is a potential cause of MSK injury particularly when nurses are required to 'task shift', which is a common practice among doctors and nurses in LICs in Sub-Saharan Africa.

As Nemera et al (2024) found in their Ethiopian study, there is insufficient evidence regarding MSK in LIC and research is urgently needed. There is some evidence on the prevalence of MSK amongst nurses working in CCU in LIC (Aleid et al., 2021), although it is acknowledged that inadequate manual handling can also have wider implications for service delivery (Sun et al., 2021). Adverse consequences reported increased sick leave and decreased work efficiency due to staff shortages, which may lead to a higher risk of burnout, reduced quality of life from chronic injuries and pain, and higher economic costs resulting from suboptimal care provided by overstretched staff (Sun et al., 2021; Van Hoof et al., 2021).

In consequence, it is a cause for concern, that while there are international standards designed as a mandate for employers to provide occupational health and safety procedures, in practice there is often inadequate prevention, absence of worker protections, and a failure to provide compensation should injury occur (LaDou et al., 2018). The situation is difficult to address as obtaining accurate data on occupational injuries and other occupational health issues are more problematic in LIC due to under-reporting in official records (Abdalla et al., 2017; Appiagyei et al., 2021). Therefore, this service evaluation was seen as a first study designed specifically to ascertain the effectiveness in changes in equipment on nurses working in critical care in one unit in Zambia.

AIM

The aims of this service evaluation project were to:

- identify and explore the types of MSK pain reported by nurses in one CCU in Zambia;
- determine the prevalence of MSK pain in critical care nurses in one setting in Zambia;
- assess the perceived effectiveness of the implementation of specialty critical care beds in one tertiary hospital CCU in Zambia.

METHOD

Research design

A service evaluation approach was chosen as it allowed for structured processes to be used to identify the reported prevalence of MSK and to assess the effectiveness of the specialty critical care beds. Service evaluations are used to measure whether an existing service that has no set standards meets service provision requirements (Moule et al., 2016). This is an accepted strategy to generate local evidence-based datasets which can be used to inform local decision-making and clinical practice (NHS, 2024).

Setting and sample

The CCU where this service evaluation was conducted is a leading tertiary referral hospital in Zambia. The unit consists of 10 beds with the ability to provide invasive ventilation, with an additional ten step-down beds. As the national referral hospital, the CCU provides service to a population of 20 million people, and as a result, the unit admits a wide variety of specialties for both adults and children. Management had welcomed the donation of specialty critical care beds and wanted to ascertain nurses' perception of their effectiveness.

The study sample included Registered Nurses, and Registered Critical Care Nurses (RCCN) who worked in the CCU at the time of the service evaluation study. Exclusion criteria were Non-Registered Nurses such as Students Nurses, Doctors and Physiotherapists working in critical care.

Data collection

The study used a self-reporting questionnaire which was adapted from a similar study (Monk & Colson, 2019; LINET, 2019). The questionnaire was adapted as part of the approvals process to make sure it was context specific for this different hospital setting. The adapted questionnaire was initially piloted in the CCU with a small group of nurses, however, following analysis of pilot data, no changes were seen as necessary. In consequence, in November 2023, a hard copy questionnaire was circulated to nurses working in the CCU. To gain maximum participation, total population sampling was used. To protect participants confidentiality and anonymity, no names or individual identifiers were used, and numbers were given to returned questionnaires. Questionnaires were returned in sealed envelopes and posted into a box in the nurse in charge's office.

Data analysis

Datasets were uploaded to Microsoft Excel; the data was mainly nominal and ordinal therefore, descriptive statistics were used to analyse the raw data generated. This allowed for identification of prevalence, patterns and trends (Naeem & Ozuem, 2023; Xu & Zammit, 2020). The limited size of the data set reflected the small numbers of nurses working in the CCU, therefore, for some variables it was not possible to determine statistical significance (Clark et al., 2021). The quantitative datasets have been presented in tabular format. Open ended questions were coded and then analysed using thematic analysis (Creswell & Creswell, 2022). Patterns were found on the basis of understanding the meaning of keywords used by participants, this was followed by theme development (Flick, 2017). These steps enhance the rigour of the evaluation process. The open text questions have been themed and then used in the discussion to clarify the results.

Ethics approval

In accordance with Zambian requirements, approval to complete this service evaluation was gained from the Hospital Management team. Nevertheless, as this evaluation was carried out by an international team, full ethics approval to conduct this service evaluation was given by Birmingham City University, Faculty of Health, Education & Life Sciences Ethics Committee (Reference: 11865). This was then submitted to the hospital Senior Medical Superintendent, Head of Department and the Chief Nursing Officer for the Critical Care unit, who then also approved the approach for this evaluation.

RESULTS

At the time of the study, the unit had 40 nurses working on the CCU, and 36 (90%) questionnaires were returned. The majority of respondents were registered nurses (n=30;83%), with fewer registered critical care nurses (n=6;17%). Most respondents had worked in critical care for less than 10 years (n=26;72%) (Table 1).

Table 1: Number of years working in critical care (n=36)

Years of experience	n (%)
< 1 year	8 (22%)
1-2 years	8 (22%)
3-5 years	10 (28%)
6-10 years	3 (8%)
11-15 years	2 (6%)
16-20 years	1 (3%)
21-25 years	4 (11%)

Eight out of 36 respondents (22%) reported no musculoskeletal (MSK) pain, and all were nurses with less than three years of CCU experience. In the remaining responses, 26 nurses reported some form of MSK back pain (Table 2). Most of the participants (n=20;56%) reported back pain alone while some reported back and knee pain, back and wrist pain, back and hip pain, back, neck and the other a combination of locations (Table 2). Additionally, one nurse reported shoulder pain and one wrist pain; neither reported any back pain.

Table 2: Location of MSK Back Pain

	Back pain alone	Back & knee pain	Back & wrist pain	Back & hip pain	Back, neck and hip pain	Back, neck, shoulder, wrist, and hip pain
Number	20	2	1	1	1	1

Participants were asked about whether 'using an electric profiling critical care bed improves care provided to patients, with the introduction of specialty critical care beds largely perceived as beneficial by respondents, with respondents reporting perceived improvements in patient safety (94%), time management (80%), and reduced patient turn time (72%) (Table 3). Positioning patients to prevent VAP (a component of patient safety) received an even higher positive response rate of 97% (n = 35), and 94% (n = 34) agreed that these beds improved patient safety.

The open text questions were used to enable participants to clarify or expand the answers that they gave, and therefore, covered a range of key points. Overall, these comments were positive, with a clear indication that there were benefits to using these new specialty critical care beds. Initially six themes were identified from within the dataset. Several of the comments fitted into more than one theme and therefore, each quote was carefully considered during the reduction phase of the thematic analysis resulting in a final development of two key themes, prevention of staff injury and patient safety. As is the practice in some qualitative reporting, the themes are reported as part of the discussion.

Table 3: Evaluation of the use of specialty critical care beds

Questions	Criteria	n (%)
Since using the new electric profiling critical care bed, I feel care on the ICU has improved?	Absolutely	12 (33%)
	Yes	21 (58%)
	Maybe	2 (6%)
	Somewhat	0
	Not really	1 (3%)
Do you think since the introduction of the new electric critical care profiling beds:		
Musculoskeletal (i.e., Back pain) issues have improved?	Yes	27 (75%)
	No	5 (14%)
	No response	4 (11%)
Mental Health (i.e., work-related stress) has improved?	Yes	22 (61%)
	No	12 (33%)
	No response	2 (6%)
Time Management improved?	Yes	29 (80%)
	No	2 (6%)
	No response	5 (14%)
Patients turn time reduced?	Yes	26 (72%)
	No	7 (20%)
	No response	3 (8%)
Patient Safety improved?	Yes	34 (94%)
	No	0
	No response	2 (6%)
Positioning of patient to prevent ventilator associated pneumonia (VAP) improved?	Yes	35 (97%)
	No	1 (3%)
	No response	0
Nurses' perception of chest care improvement, such as improved oxygenation, recovery of saturations post suctioning, VAP, secretion management.	Yes	35 (97%)
	No	0
	No response	1 (3%)

DISCUSSION

This service evaluation sought to identify and explore the types of MSK pain reported by nurses in one CCU in Zambia and assess the effectiveness of the implementation of specialty critical care beds in one tertiary hospital CCU in Zambia. The response rate of 90% (n=36) was deemed an excellent response rate (Clarke et al., 2021). The datasets complemented each other, with the open-ended questions providing clarification for some of the quantitative responses from the questionnaire. Therefore, the discussion has been written using an integrated format.

Overall, the introduction of specialty critical care beds was largely perceived as beneficial by respondents, reporting perceived improvements in patient safety, time management, and reduced patient turn time. Additionally, almost all agreed that these new critical care beds enhanced positioning to prevent ventilator-associated pneumonia (VAP) and improved chest care.

Theme 1: Prevention of Staff Injury

This first theme, prevention of staff injury, was the strongest with clear links to the quantitative dataset. The findings fit with the Global Burden of Disease report (Frieria et al., 2021), which identified low back pain as increasing and a leading cause of disability, particularly in LIC. Internationally for healthcare professionals MSK injuries originating from manual handling comprise a significant organizational, employee, and societal burden (Richardson et al., 2019; Abdul Halim et al., 2023). It is accepted that this was a one-point intervention conducted in one large regional CCU, however, the data indicates that Zambia may have similar problems to other countries (WHO, 2024). As indicated in the results, a high proportion of nurses participating in this evaluation had experienced MSK pain, with back pain specifically identified as having the highest incidence. This is supported by Tefera et al. (2021) Ethiopian study which identified 76% (n=313) of critical care nurses reported back pain. They identified that potential causes included lack of manual handling equipment; moving and handling training; critical care education; regular exercise and high stress. In this service evaluation, manual handling was identified as one of the main physical challenges and reported the beds had helped '*It has reduced my back ache*' (Respondent 15) was a typical response.

Given the type of patients admitted to CCU, critical care nurses spend a large proportion of their time in delivering direct patient care which includes patient mobility and patient re-positioning (Vendittelli et al., 2016). As with many other LICs, Zambia has a critical shortage of nurses and in particular critical care nurses therefore, prevention strategies to reduce occupational MSK injuries are urgently needed (Frieria et al., 2021). One the advantages of the beds, is that one reported that for the first time '*No straining when providing nursing care*' (Respondent 4). Thus, on the CCU where this service evaluation took place the use of the new specialty critical care beds was the first step in reducing the burden of staff injury.

The shortage of nurses means patient repositioning is an ongoing risk factor with many instances one nurse alone, or with a student nurse moving patients. Student nurses may not have had any orientation or training in the safe handling and care of a critically ill patient or the use of specialty critical care beds. Therefore, they are at risk throughout their careers, this issue has been recognized for over two decades (Karahan & Bayraktar, 2004). At the start of this service evaluation, the specialty critical care beds had

been in place for approximately 1 year, however, the ongoing training of staff and orientation of new staff was unclear, and as Meaney et al. (2019) point out a single training on new equipment does not necessarily lead to retention of knowledge and therefore changes in practice. This fits with Şimşek et al (2019) who identified a lack of knowledge on how to use specialty critical care beds could defeat the purpose of using them, with a challenge of the added bed features not being used. Their findings were supported by Al-Johani and Pascua (2019) who argued that manual handling programs and the use of specialty critical care beds is an essential component of strategies to prevent MSK injuries to staff and patients.

The findings of this service evaluation revealed that since the introduction of the new specialty critical care beds, the difference in MSK was clear to respondents. This is an important finding as there is so little published evidence in LICs on MSK pain amongst healthcare workers. Aleku et al (2021) argue that in the absence of evidence it has to be accepted that the prevalence and incidence of MSK pain is likely to have been underestimated.

Another point to consider was when respondents had acquired an MSK injury resulting in ongoing pain, they reported that their pain had reduced since the introduction of the specialty beds. For example, one respondent reported: *'It has reduced my back ache'* (Respondent number 15). Others made similar comments, supporting this finding, reporting that: *'...the beds have helped a lot on reducing MSK... and my [MSK] pain has reduced...'* (Respondent 9)

For nurses who still have many years to work and need to work, this was a welcome finding, as for the first time, their MSK was not exacerbated by manual handling. In a country with a critical shortage of nurses and limited welfare support this is an important point, as Nemera et al (2024) argues that there is an annual loss of nurses from the workforce due to workplace injuries including MSK. They go onto argue that this must be addressed and the introduction of aids such as specialty beds can form a positive move in the prevention of injury and as this current study shows and a reduction on the impact of MSK on nurses' practice.

Theme 2: Patient Safety

For countries such as Zambia, where there is a high incidence of complex patients requiring total patient care from trauma including traumatic brain injuries (Mwala et al., 2015; Siame et al., 2025). The increased ease in position changing for comfort and pressure ulcer prevention in this study was seen as a positive benefit for patients reducing the risk of pain in movement. Respondents reported that they were able to provide *'better care'*, as the use of the specialty beds had reduced time per activity with less staff needed to move or turn a patient. As another reported when describing turning beds with the help of the specialty critical care beds, for the first time when moving a totally dependent patient: *'Patient's upper limbs are no longer in pain. It's really helping patients from stress of being pulled and hurting them'* (Respondent 3).

They went on to state that they felt less stress in terms of managing their workload in terms of time and resources available and as they were not causing pain: *'Lessens the stress on the staff ... more comfortable for patients'* (Respondent 16).

These are important considerations because, as Zabin et al (2023) point out nurses experiencing stress are more prone to make errors. Therefore, in addition, to the direct benefit cited above, there is an indirect benefit to patient safety with the reduction of errors caused by occupational stress. Among the other benefits for patients, the use of specialty critical care beds can enhance the care of patients where there are few physiotherapists, as in many LIC, nurses often must take the lead role in rehabilitation tasks. As Singam (2024) argues early mobilisation is essential for critically ill patients. In this study, the nurses started using the beds to begin mobilisation. As one respondent identified: *'Due to its wide range of positions. It helps with mobilisation in bed. Full lung expansion, pressure point relief and venous return'* (Respondent 1).

This is crucial, as rehabilitation during critical illness is essential, as this facilitates early initiation of early rehabilitation which should help reduce the rapid muscle weakness seen in critically ill patients (Anekwe et al., 2019; Singam, 2024). Two key aspects to patient safety reported by respondents were head of bed elevation and ability to record patient's weight. *'Can accurately measure head elevation and patients' weight. Easy to use compared to standard hospital bed'* (Respondent 17)

Being able to accurately measure head of bed elevation is a benefit for example, in ventilated patients it can reduce the risk of VAP (Lian et al., 2024), reduces the risk of aspiration when delivering enteral nutrition (Doley, 2022), and is part of neurological protection strategies (Burnol et al., 2021). As the beds have a built-in protractor, this allows for accuracy in positioning as previously it was based on observation. However, as Pragnitha et al (2022) point out that using judgement to estimate head of bed elevation is often poor and the use of tools to accurately determine position is essential.

It is a cause for concern that globally up to 38–78% of ICU patients are malnourished, a condition which is associated with poorer outcomes (Lew et al., 2017). Therefore, it is crucial that a patient's weight is assessed on admission and throughout their admission, to identify any changes in weight. Also, this is crucial for safe delivery of invasive ventilation, haemodynamic monitoring and drug calculations particularly in children (McFall et al., 2019; Marron et al., 2025). Therefore, critical care beds with the ability to accurately weigh patients has the ability to improve patient safety.

However, it is important to note that the availability of specialty critical care beds in CCU in LICs is limited (Mwangi et al., 2023). Therefore, it is important to share the findings and to illustrate how investing in this form of technology can have a positive impact on both patients and staff.

LIMITATIONS

This service evaluation was an integral component of the introduction of new specialty critical care beds in one regional CCU in Zambia. Due to the small sample size, generalization is challenging. However, as highlighted in the discussion, the findings align with the limited published research in this area. A further limitation is that this evaluation focused solely on nurses. Therefore, future studies should include other healthcare workers, such as physiotherapists and doctors. However, in this study, it was not possible to include these professional groups due to their limited presence in the unit. Finally, it is

important to acknowledge that this was a one-point intervention based on reported practice, and as a result, it cannot provide detailed evidence on the actual impact on workload, including details such as sickness, absence and the incidence of new MSK injuries / pain, further studies would be required to examine these areas.

CONCLUSION & RECOMMENDATIONS

This service evaluation is the first reported study into use of the specialty critical care beds and the prevalence of MSK pain amongst nurses working in a CCU in one tertiary referral hospital in Zambia. The findings are consistent with other studies in LIC relating to the prevalence of MSK.

The findings illustrate that it is possible to use specialty critical care beds in public hospitals in LIC and where this service evaluation was conducted nurses working in critical care reported a reduction in their MSK pain. However, it is important to point out that the introduction of specialty beds is not a panacea or cure all for the prevention of MSK in healthcare staff. Nevertheless, it can help reduce incidence and support staff who have had previous MSK injuries. Other factors such as ongoing orientation, manual handling policies, training and equipment need to be urgently addressed and delivered on a regular basis.

The primary purpose of a hospital is to do no harm, therefore, equipment such as specialty critical care beds can aid in the delivery of safe effective care. This service evaluation has illustrated the perceived positive impact of specialist equipment for both patients and staff.

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Conflict of Interest information

No conflict of interest identified.