ICU pressure sores in spinal patients – an observational single centre evaluation

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Abstract

Background: Spinal patients in the intensive care unit (ICU) have a high risk of developing pressure sores due to immobilisation and other factors such as wearing cervical collars. We aim to assess the prevalence of pressure sores in critical care spinal patients in the department as part of an audit. This will help construct and implement necessary changes to improve the service.

Methods: Electronic hospital notes, DATIX and DCIQ databases were accessed. We analysed retrospective observational data for decubitus sores such as occipital, sacral, chin, clavicle, hips, taken over a four-and-a-half-year period, during which there was varied manual handling guidance. Information was cross-referenced between databases and subsequently analysed.

Results: 97 spinal patients were included. Just over 1 in 7 of these patients (n=15; 15.5%) developed grade 2 or above pressure sores in ICU. Admission age, days spent in hospital and days in ICU were significantly different between those who developed ICU pressure sores and those who did not ($P < 0.05$, $P < 0.001$, $P < 0.001$ respectively). Time on advanced respiratory support was also significantly greater in those with pressure sores ($P < 0.001$).

Conclusion: Spinal patients on the ICU have a significant risk of developing pressure sores and clinicians should be aware of this risk, particularly for patients spending prolonged periods on bed rest. Whilst pressure injuries can be hard to prevent, reducing occurrence in spinal patients would be mutually beneficial and thus we plan to re-audit this in 2 years' time after implementation of manual handling guidelines.

Introduction

Pressure sores are a prevalent and serious complication that can occur during hospitalisation or rehabilitation and are caused by various factors. These include immobility, pressure, friction or shear forces, medical devices, and moisture[1, 2]. The National Pressure Injury Advisory Panel (NPIAP) recently updated their definition of a pressure injury to "localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device"[3]. Patients with mobility issues, loss of sensation, cognitive impairment, and nutritional deficiencies are at a higher risk of developing pressure injuries as a secondary complication[4].

The treatment of pressure sores incurs significant NHS expenditure, with an estimated cost of £531 million annually[5]. Patients with spinal injuries, particularly those in intensive care, are at an increased risk of developing pressure sores[6], especially when immobilised using medical devices such as cervical collars[7, 8]. Reported prevalence is limited in the literature, although according to estimates, the global pooled magnitude of pressure sores in spinal cord injury (SCI) patients is 32.36% (95% CI: 28.21–36.51)[9].

Preventing pressure sores can be a challenging task in spinal patients on the ICU[10], particularly in an already stretched health service. However, the NHS "Stop the Pressure" campaign seeks to improve

the quality of life for patients by offering a framework for the avoidance and prevention of pressure wounds. A poster published by the campaign[11] aims to educate on pressure sore staging and adheres to the National Pressure Ulcer Advisory Panel[12] grading system, a tool widely recognised by stakeholders for assessing pressure sores.

Prior research has explored the relationship between cervical immobilisation and skin breakdown[13, 14], showing a link between their use and the development of pressure sores. In a more general critical care context, pressure sores appear to be a common and problematic concern[15, 16, 17].

The aim of this study is to assess the prevalence of pressure sores in spinal patients in the ICU at our hospital, as well as analyse factors related to the development of these pressure injuries to facilitate a comprehensive audit of the service. This will enable us to formulate recommendations for any necessary changes in the management of critical care spinal patients at the hospital with the ultimate goal of improving the service provided.

Methods

The Reporting of Studies Conducted Using Observational Routinely Collected Health Data (RECORD) Statement[18] was followed throughout the development and production of this observational evaluation.

Our evaluation took place at the University Hospital of Wales (UHW) located in Cardiff, United Kingdom. The hospital has a specialised spinal surgery department consisting of eight consultants and is the main tertiary care provider in South Wales and surrounding areas for spinal trauma.

DATIX® and DCIQ® databases were accessed to search for any reported incidences of inpatient pressure damage in critical care between January 2018 and August 2022. A search was then undertaken to develop a separate dataset for the total number of spinal patients admitted to hospital critical care during this time.

Patient identifiers, either NHS numbers or hospital numbers, were cross-referenced from the critical care spinal patient database with those listed on the pressure sore databases to develop a numerator in terms of the number of spinal patients reported to have sustained decubitus ulcers.

Our inclusion criteria involved any pressure sores existing over bony prominences in the body. This included but was not limited to the sacrum, occiput, heels, chin, and clavicle. In accordance with the NPUAP criteria[12] for grading pressure sores, we decided to only include pressure sores that were categorised as grade 2 or above.

Exclusions were made for reported pressure sores caused by intubation such as the lips, tongue, and mouth and those that did not occur over bony prominences, since we wished to evaluate incidences of pressure ulcers in spinal patients in critical care with relation to their injuries. See Table 1 for a breakdown of the criteria.

Table 1: A table to show our criteria of inclusion and exclusion.

Criteria	Inclusion	Exclusion
Timescale	Reported incidences of pressure sores between January 2018 and August 2022	Any pressure sores reported before or after the stated timescale

Participant	Spinal patients admitted to critical care at the hospital during the stated timescale	Any patients admitted to critical care that were not listed as spinal patients and those who were still admitted to hospital at the time of this study.
Categorisation of pressure sores	Grade 2 or above in accordance with NPUAP & EPUAP guidance for reporting pressure sores	Pressure sores classed as grade 1 or below
Location of pressure sores	Any decubitus pressure sores over bony prominences of the body such as sacrum, occiput, heels, clavicle, neck	Pressure sores that were not over bony prominences such as lips, tongue, mouth

Demographic information, type, and level of spinal injury, as well as information relating to the specific pressure sores were extracted from the hospital systems and anonymised by allocating each patient a number. We then entered the data into a Microsoft® Excel® (version 2302) spreadsheet. IBM® SPSS® (version 27) software was subsequently used to conduct statistical analysis.

For those identified as having pressure sores, hospital notes were retrieved from archives to cross-check information with the databases and to find out how they were managed.

Ethical approval was not required as this study was classed as an audit/service evaluation.

Results

Overview of the Data

Over the four-and-a-half-year period (55 months), 102 patients on the spinal database were identified as having been admitted to critical care during their admission. 2 were excluded due to being misreported as spinal patients and 3 were excluded due to still being in hospital at the time of conducting this evaluation. Therefore, a total of 97 critical care spinal patients were included. 73.1% were male (n=71) and 26.8% were female (n=26).

Ages on admission to hospital ranged from 16 to 84 with a mean average of 50.15 years old (SD = 19.46).

The mean total number of days spent in hospital for the whole spinal patient group was 86.12 days (SD = 143.92) and ranged from 1 to 869 days. The mean days spent in critical care was 16.32 (SD = 25.09), ranging from 1 to 172 days. There was no significant difference in days spent in hospital and days spent in ICU between males and females (independent sample t-test; p=0.963 and p=0.225 respectively).

The number of days from initial admission to critical care admission ranged from 0 to 26 days. Reasons for the variation in number of days included factors such as patients being transferred from surrounding hospitals, patients admitted following surgery and patients who had deteriorated requiring critical care.

Causes of Admission

The most common causes of admission were road traffic accidents (RTAs) (n=36; 36.7%), closely followed by falls (n=35; 35.7%). Where notes were unclear or unavailable relating to cause of

admission, this was categorised as “other” (n=19, 19.4%). Spinal abscesses accounted for 5.1% (n=5) and cycling accidents accounted for 3.1% (n=3).

Of the available data for level of injury (n=79) and taking into account polytrauma, 50.5% (n=49) had at least one injury to the cervical spine, 27.8% (n= 27) had at least one injury to the thoracic spine, 24.7% (n=24) had at least one injury to the lumbar spine and 5.15% (n=5) had at least one injury to the sacral spine. 18.6% (n=18) were classed as “other”.

Pressure Sores

Analysis of the 97 spinal patients admitted to critical care showed that 15.5% (n=15) developed grade 2 or above pressure sores, equating to just over 1 in 7.

There was a statistically significant difference in mean number of days spent in hospital and critical care (both $P < 0.001$) between the pressure sore patients and the patients who did not develop pressure sores. Mean age was also significantly greater in the pressure sore patient group ($P < 0.05$).

Additionally, the spinal patients who developed pressure sores on ICU spent longer on average on advanced respiratory support in the critical care unit ($P < 0.001$).

A full breakdown is shown in Table 2 for the comparative data.

Table 2: Data relating to days in hospital, days in ICU, admission age and days on advanced respiratory support where ICU pressure sore status is the dependent

Non-pressure sore patients (n=82)	Pressure sore patients (n=15)	Statistical test	Significance
Mean total days in hospital			
63.18 days (SD=102.07) Range: 1 - 554	211.53 days (SD=248.63) Range: 19 - 869	Independent sample t-test	$P < 0.001$ 95% CI (73.57, 223.13)
Mean days in ICU			
10.06 days (SD=9.26) Range: 1 - 41	50.53 days (SD=48.35) Range: 9 - 172	Independent sample t-test	$P < 0.001$ 95% CI (29.08, 51.87)
Mean age on admission			
48.49 years (SD=19.65) Range: 16 - 84	59.27 years (SD=16.08) Range: 26 - 83	Independent sample t-test	$P < 0.05$ 95% CI (0.10, 21.46)
Mean days on advanced respiratory support in ICU			
7.05 days (SD=8.34) Range: 0 - 37	34.47 days (SD=28.80) Range: 0 - 98	Independent sample t-test	$P < 0.001$ 95% CI (19.91, 34.93)

4 patients had more than one grade 2 or above pressure sore. 6 patients had an occipital pressure sore, 5 patients sacral pressure sores, 3 had chin pressure sores, 2 had a pressure sore in the collar

area (either clavicle or lower neck/shoulder area) and one had a hip pressure sore. Full details can be found in Table 3.

12 of the 15 patients (80%) had been admitted with at least one injury to the cervical spine.

Management of these pressure sores varied, with the most common methods documented in the notes as repositioning the patient, use of barrier creams and applying dressings.

Table 3: A detailed breakdown of the 15 spinal patients who developed pressure sores in the critical care unit

Patient	Age on admission	Days in hospital	Days in ICU	Days on advanced respiratory support	Level of spinal pathology	Mechanism of injury	Pressure sores
1	41	869	9	0	Cervical	Fall	G2 Sacral
2	71	111	30	30	Cervical	Fall	G2 Sacral
3	53	97	26	21	Cervical	Fall	G2 Sacral
4	67	125	125	98	Cervical	Fall	G2 Sacral (x2)
5	83	23	23	17	Cervical	Fall	G3 Chin
6	68	78	51	42	Thoracic	RTA	G3 Chin, G4 Occiput
7	58	19	19	16	Thoracic	RTA	G2 Occiput
8	69	128	59	59	Thoracic	Fall	G3 Occiput
9	26	214	33	26	Cervical	RTA	G2 Collar Area
10	59	174	22	20	Cervical, Thoracic	RTA	G3 Occiput
11	56	683	117	46	Cervical, Thoracic, Lumbar	Fall	G2 Chin, G2 Occiput
12	30	60	35	15	Cervical	RTA	G2 Collar Area
13	68	389	172	93	Cervical	Fall	G3 Sacral (x2)
14	66	65	22	22	Cervical, Thoracic	Fall	G2 Hip
15	74	138	15	12	Cervical	Fall	G2 Occiput

Discussion

This study has demonstrated pressure sores to be a significant issue amongst spinal patients, particularly for those spending prolonged periods in critical care at the hospital. With just over 1 in 7

(15.5%) of the critical care spinal patients at this hospital developing pressure sores, it is a concerning factor that must be considered when treating patients with spinal injuries. However, this is a considerably respectable and comparable figure in light of other studies, with one reporting 19.1% of traumatic spinal cord injury patients at a Tanzanian hospital developing pressure sores[19] and another reporting 37.5% of SCI patients developing them in critical care or inpatient rehabilitation[20].

Our data has also shown that those who developed pressure sores in ICU spent longer on average in critical care than those who did not develop ICU pressure sores. Whilst this does not account for whether the difference in time was due to the pressure injuries, it does imply that it may be a risk factor for developing them. Moreover, average age for the pressure sore group was significantly greater than the non-pressure sore group, suggesting that age may also be a risk factor for developing them; a consideration previously reported in the literature[21].

Additionally, our findings indicated that those who developed pressure sores in critical care spent longer on advanced respiratory support, suggesting another possible contributing factor for developing ICU pressure injuries in spinal patients. In cases where patients are on advanced respiratory support, they may also be sedated or unable to reposition themselves, therefore this is a crucial aspect to consider when caring for those with spinal injuries on ICU as part of risk stratification.

With most of the critical care spinal patients who developed pressure sores in our department suffering with cervical spine injuries, collars will have commonly been used. Cervical collars have shown to be a risk factor in the literature for pressure sore development in patients, with one hospital reporting 9.7% of patients developing collar pressure sores and a 3.7 times greater risk for those wearing cervical collars in ICU compared to those not on ICU[22]. Another observational study indicated 78.4% of 342 trauma patients in a hospital emergency department developed pressure sores after removal of extrication collars and headblocks[8] although this is less comparable to our study.

Most of the pressure sores we identified were treated using barrier creams and dressings, along with either encouraging repositioning or undertaking manual repositioning where patients were sedated. These methods are all recommended as suitable techniques by the National Institute for Health and Care Excellence (NICE) pressure ulcer guidelines[23]. In certain cases, educating patients on the risks may be useful in helping to reduce pressure sore incidence when recovering from spinal injuries[24, 25] by way of encouraging repositioning and recognising the early signs. This may be beneficial on the critical care unit for those patients able to mobilise and communicate, however patients undergoing acute treatment who may be immobilised or intubated rely on their clinicians and carers to assess likelihood of developing these injuries. This is also important to consider in patients with sensory and motor deficits who may not be able to notice the signs or act independently.

Although it is important to recognise and manage risk factors, pressure sores will inevitably occur in hospital environments. Where possible we should aim to prevent them in critical care departments to avoid unnecessary suffering in already seriously ill patients. Taking early preventative measures can help to either reduce incidence or predict risk of developing these types of injury to allow appropriate patient care. This can be done by following guidelines such as those detailed in the NICE guidance[23]. They encourage those at risk to reposition every 6 hours and those at high risk every 4 hours along with other measures such as skin assessments. However, these guidelines do not fully assess the needs of immobile patients who may have serious spinal injuries. Thus, assessment and management partially lie with the health board itself to develop specific guidance that staff can follow.

The Waterlow Risk Assessment tool for pressure ulcers[26] is useful to consider in conjunction with NICE or health board guidelines for patients who may have higher risks of developing pressure sores. This incorporates a "special risks" category involving factors such as motor and sensory deficits, paraplegia, orthopaedic or spinal surgery and the duration of such surgery. All of these factors give a higher risk score than the other factors listed by this framework, thus accounting for the greater risks of spinally injured patients developing pressure sores.

Whilst this study has highlighted some important points, further research into pressure sores in critical care spinal patients should aim to analyse data over longer periods of time and include more detailed analytics of risk factors for these injuries. The data used in this study is limited in that availability of records in some cases was restricted and thus did not allow a complete evaluation of demographical data. Archived notes in certain cases did not contain sufficient information to be able to conduct further analysis of risk factors. Additionally, there was a potential for information bias relating to how the observational data may have been reported and interpreted in the pressure sore databases.

Conclusion

In conclusion, it is important to be aware of the high risks of pressure sore development in critical care spinal patients, especially where patients spend prolonged periods of time on critical care units. Higher age groups and longer periods spent on advanced respiratory support appear to be risk factors. Stakeholders should be made aware of the risks and aim to act using preventative techniques rather than aiming to treat occurrence of such wounds, as this would provide mutual benefits for both patient wellbeing and the burden of treatment cost to the health service. Finally, clear guidance for healthcare workers in the department for the handling of spinal patients may help to educate and allow appropriate action to be taken to reduce pressure sore occurrence. We therefore aim to re-audit this service in 2 years' time to assess outcomes after implementation of new manual handling guidelines.

CRediT Author Contributions:

Sean C. Glossop – Methodology, Formal Analysis, Investigation, Data Curation, Writing – Original Draft, Writing – Review & Editing, Visualisation

Arpit Upadhyay – Conceptualisation, Methodology, Resources, Data Curation, Project Administration

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