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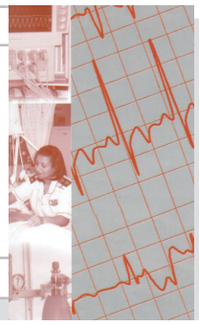
Pressure sores in spinal cord injury: Active intervention saves costs



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Summary. Pressure sores are a predictable consequence of poorly managed spinal cord-injured patients. Not only do pressure sores contribute to the morbidity, but also add significantly to the medical/nursing management, cost and admission stay, limiting optimal bed utilisation. This intervention study assesses the impact of active intervention in terms of pressure-relief mattresses, establishment of a 'turning team' and medical/nursing staff education on pressure sore incidence, extended stay and associated costs.

Results. The *de novo* incidence reduced from 16% to nil once the interventions were in place, with an annualised estimated saving of R738 239, or R4 732 per cervical spine-injured patient admitted.

Conclusion. Active intervention costs are well justified by the cost saving in terms of reduced extended stay days. The routine use of pressure-relieving mattresses and a turning team in the management of spinal cord injuries is recommended.

Decubitus ulcers or pressure sores, as they are more often referred to, are a frequent complication of recumbency following spinal cord injury (SCI). The reported incidence varies widely, with SCI experiencing 33% incidence in the acute management phase.[1] This high incidence is due to the loss of sensation, poor motor control limiting re-positioning and loss of muscle bulk and subcutaneous tissue making bony prominences more vulnerable (Fig. 1). In addition, these patients are frequently transported strapped supine on hard surfaces (fracture boards) for hours to the tertiary centre where they are definitively managed.

Fig. 1. Sacral pressure sore in a patient neglected while waiting for an ASCI unit bed.

When the acute spinal cord injury (ASCI) unit was established at Groote Schuur Hospital (GSH) in 2003, an extremely high incidence of pressure sores was noted.[2] Pressure sores not only pose a significant risk to the patient, but admission is prolonged, reducing bed turnover and increasing associated costs per patient treated. A variety of interventions were employed in a sequential manner to successfully reduce both the incidence and healing period of these pressure sores.

The aim of this study was to assess the effect of these interventions on pressure sore incidence, duration of admission, and associated cost.

Material and methods

The ASCI unit is a specialised 18-bed unit housed within GSH. It was established in 2003 when the Conradie Hospital Spinal Unit was closed. The acute care component was assumed by GSH and the rehabilitation service relocated to Lentegeur Hospital. Only SCI patients are admitted, with polytrauma patients being excluded. The unit has an aggressive surgical philosophy with early surgical stabilisation

to facilitate nursing care and early referral to the rehabilitation service once the patient is physiologically stable.

A computer database of all admissions is maintained where patient demographics, diagnosis, treatment and complications are recorded. The database was interrogated for all cervical spine injuries. Patients were identified retrospectively for the period April 2003 to May 2006 and divided into 4 groups according to the level of intervention they received to prevent pressure sores.

Group A

These were the first 100 patients with cervical injuries managed in the unit and reported previously.[2] At this point there was no special intervention with regard to nursing care and this group reflects the worst-case scenario of a new unit, variable nursing skill and limited equipment.

Group B

These 21 patients were managed during August and September 2005, when the 6-bed intensive/high care unit was equipped with 2 pressure-relief mattresses. The mattresses were allocated to the highest risk patients.

Group C

These 38 patients were managed from October 2005 to January 2006 when there were 4 pressure-relief mattresses in the intensive/high care unit. In addition, a turning team had been employed. This group of aides were trained by the unit staff to assist with regular turning and other ward duties which will be discussed below.

Group D

These 42 patients were managed from February 2006 until completion of the study in May 2006. In this period all 6 intensive/high care beds had pressure-relief mattresses. The turning team was active and a pressure care protocol was implemented. This included risk assessment of the patient as per the Waterlow Chart, grading of sores, daily documentation of the pressure area and an individualised management plan. The primary purpose of risk assessment was to promote a high degree of awareness with regard to pressure sores.

Case notes were reviewed and the presence of a pressure sore was noted. For the purposes of this study, only sacral, ischial and trochanteric pressure sores were collected. Elbow, heel and occipital sores were not included in the study. In our setting, the rehabilitation service will not accept the former group for admission, as they reduce patient throughput and delay the start of rehabilitation. The latter group did not have a significant impact on our management and were therefore not investigated.

Extended stay days were then calculated. When the patient's only reason for being in the unit was the pressure sore delaying transfer to the rehabilitation unit, it was regarded as an extended stay. The cost was then calculated based on this additional stay. Due to state facilities not itemising costs, an empirical formula provided by the hospital administration was used as follows:

Patient day cost (=R1 250.00) x days in hospital

+ 5% for consumables/dressings

+ 2% for surgical costs

The 'turning team' (Fig. 2)

Fig. 2. The turning team.

During the early phase of the ASCI unit's existence, it became clear that the patients were not being turned frequently enough. After lengthy motivation the hospital administration agreed to establish the turning team on a trial basis. This was difficult administratively as this category of staff do not readily fit into the existing civil service structure. Residential health workers or home care givers were recruited from the community. Team members received training in basic nursing care in the community and were appointed as ward aides, directly accountable to the professional nurse in charge of the ward. The requirements for employment included a pleasant demeanour with good interpersonal skills, enthusiasm, and physical strength. The successful recruits were employed via a private nursing agency to address the administrative obstacles.

The recruits underwent an in-service multidisciplinary training programme in the ASCI unit co-ordinated by the ASCI ward unit nursing manager. This included patient turning, lifting and positioning, patient transfers, pressure care, splint application, hygiene, basic anatomy, assessment of pressure sores and

feeding. After successful completion of the in-service training, the ward aides were encouraged to interact with the patients and motivate them.

Initially (2004) the cost of employment for the ward aides was R9.95 per hour. Therefore the total cost for a turning team per 24-hour day was R716.40 for two 3-member teams working 12-hour shifts.

The ward aides were later used for outlying spinal-injured patients in the rest of GSH who were awaiting a bed in the ASCI unit.

Results

The results are summarised in Table I and represented graphically in Chart 1.

During period A 16 pressure ulcers (16%) were identified. Seven manifested before admission to the ASCI unit and 9 occurred in the unit. The average extended hospital stay was 27.9 (0 - 128±38.1) days, with 36.7 (0 - 128±44.8) days due to pressure sores occurring in the unit. The average duration of admission of these patients was 58.6 (7 - 246±60.4) days. Therefore the extended days accounted for 48% of the admission. The total extended stay was 479 days with an estimated cost of R 640 662.50. Of this, 367 days were due to pressure sores occurring while in the unit with an estimated cost of R490 862.50.

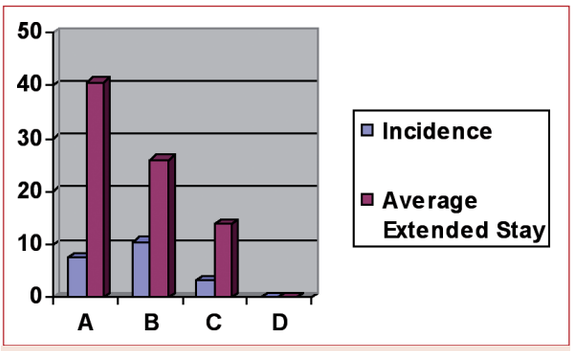

Chart 1. Graphical representation of decreasing incidence of pressure sores developing in the unit and reduced average extended stay days as the interventions intensified.

During period B (2 mattresses) there were 21 patients managed with 4 pressure sores, 2 pre-dating admission and 2 occurring in the unit. This represents an overall 19% incidence with a 9.5% incidence of pressure sores developing in the unit. The extended stay of 26 days was only due to the pressure sores occurring in the unit with an associated additional cost of R69 550.00

In period C (4 mattresses plus turning team) 38 patients were managed. Five patients had pressure sores on admission but only 1 additional pressure sore developed in the unit. Although the overall incidence is 16%, the pressure sores developing in the unit fell to 3%. The overall extended stay was 33 days with 14 days due to the pressure sore that developed in the unit. The associated costs were R18 725.00 for this pressure sore.

In period D (6 mattresses, turning team and pressure sore protocol) 42 patients were managed. Six patients were admitted with pressure sores. No pressure sores developed while in the unit. The extended stay was 188 days with an average of 37.6 (0 - 100±49.2) days and an associated cost of R251 450.

Discussion

The cause of pressure sores is multifactorial. Many of these cannot be influenced by the hospital staff as the patients are pre-selected as neurologically impaired. Generally patients from the lower socio-economic group utilise the State Health Service. The patients are often malnourished and have concomitant diseases such as tuberculosis and HIV.

Table I. Summary of results

	Group A	Group B	Group C	Group D
Pressure-relief mattresses	0	2	4	6
Turning team	No	No	Yes	Yes
Patients managed	100	21	38	42
Pre-existing sores	7	2	5	6
Sores developed in unit	9	2	1	0
Extended stay days (overall)	479	52	33	188
Extended stay days (new sores)	367	52	14	0
Average extended stay days per new sore	40.7	26	14	0
Cost (new sores)	R490 862	R69 550	R18 725	R0
Cost (new sores) per patient managed*	R5 278	R3 660.52	R567.42	R0

*The cost per patient managed was calculated after excluding those admitted with sores.

Pressure care should be a priority but due to high staff turnover, poor morale and staff shortages in the State Health Service, pressure care is often not optimal. A pressure sore can develop within a few hours, and education of all staff about the management cascade is mandatory.

This paper presents evidence that education and appropriate pressure care can reduce both the incidence and associated costs of poor pressure care. Although the numbers are small in groups B, C and D, a trend is evident that the incidence of pressure sore development in the unit is reduced with active intervention. The average extended stay per new pressure sore developed also decreased with an increase in the appropriate intervention. This suggests that despite ulcer development the pressure sores were of a lower grade with a more rapid healing time, or that the intervention accelerated healing time. The associated cost per *de novo* pressure sore managed also decreased.

In an effort to quantify the financial saving the same data were reviewed. Groups A and B were compared with C and D, i.e. the periods of no turning team were compared with those when the turning team was established.

In group B, only 2 pressure-relieving mattresses were available, with no turning team. Eleven pressure sores developed in 112 patients admitted without pressure sores. In the latter period, once there were at least 4 mattresses and the turning team employed, only 1 sore developed in 69 patients managed who were admitted without pressure sores. This is statistically significant (Fisher exact 0.031). The extended stay days were 419 versus 14.

Total estimated costs were calculated as per the previously mentioned formula. This was provided by the Provincial Government Health Service. This is probably a very conservative estimate, as a daily rate plus 7% for consumables was used. The extended stay cost pre-turning team was R560 412.50 versus R18 725.00. These costs are not directly comparable due to different denominators.

In an effort to make a rational comparison, costs were corrected to a denominator of 156, as the ASCI unit manages this number of cervical spine-injured patients a year. Following correction, i.e. cost/112 × 156 versus cost/69 × 156, the first group would cost R780 574.00 per annum and the post-intervention group R42 334.78, indicating an annual saving of R738 239.00.

To be able to relate this saving to other units, it can be calculated as a saving of R4 732.00 per cervical spine-injured patient managed. This is well in excess of both the cost of the mattresses and employment of the turning team staff. This calculation is the lowest minimum saving. Although this intervention study has not shown this, it is expected that the healing time of pre-existing pressure sores will be reduced with these nursing care interventions.

In addition, the costs were limited to extended stay within the unit. Seven patients in total were transferred to the rehabilitation service with persistent pressure sores requiring further plastic surgical care. This carries an additional cost.

It is clearly evident that the cost of employing a turning team was quite comfortably remunerated for by these savings. Furthermore, the turning team has additional advantages of reducing the physical work of the nursing staff and increasing the time available for nursing care. This has improved staff morale.

Nursing quadriplegic patients is intensive nursing care, as the most basic patient needs require assistance. Feeding patients is time consuming and the turning team assists with this, thus freeing up the nurses for other tasks.

Conclusion

Active intervention by means of pressure-relief mattresses, education and a motivated turning team reduces the incidence of pressure sores in cervical spinal cord-injured patients. In addition, the associated admission period is reduced, freeing up the bed for other patients with acute SCIs.

The associated costs are more than adequately compensated by the enormous cost saving generated by reducing the incidence and the reduced hospital admission period. The study cost saving was estimated at R738 239.00 per annum or R4 732.00 per cervical spine-injured patient managed in the unit.

The use of pressure-relieving mattresses and employing a turning team in the management of SCIs is strongly recommended.

1. Mawson AR, Biundo JJ, Neville P, *et al*. Risk factors for early occurring pressure ulcers following spinal cord injury. *Am J Phys Med Rehabil* 1988; 67: 123-127.
2. Frielingsdorf K, Dunn RN. Cervical injury outcome – a review of 101 cases. *S Afr Med J* 2007; 97; 203-207.