

Cost Savings to the NHS Associated with Implementation of Model Hospital-Acquired Pressure Ulcer Prevention Strategy

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Abstract:

Validated incidence of pressure ulcers (“PUs”) and the proportion of hospital acquired PUs (“haPUs”) at St Helens and Knowsley Trust were compared with the average acute hospital trust. The duration of stay in the hospital was correlated with PU occurrence, stratified by the ten primary diagnoses most associated with PUs. Calculation of the excess bed-day costs and community nursing visit costs were used to estimate the cost of healing a hospital acquired Category 2 pressure ulcer at £1219. The measures taken by this trust to prevent patients at high risk from progressing to a Category 2+, which include at the point of entry (A&E) intervention, profiling beds and reduction of friction and shear, were estimated to reduce incidence and hence associated costs by 87%, therefore saving the wider NHS *at least* £968,000 per year/100,000 admissions.

Introduction:

During the year ending in March 2020 St. Helens and Knowsley Teaching Hospitals NHS Trust (“StH&K”) consisted of two main hospitals, Whiston and St. Helens, with a total of 718 beds (Q1 2020)¹ and 126,550 admissions in the year. The trust is rated overall as “Outstanding” by the Care Quality Commission [1] and has had PU risk assessment highlighted as an area of outstanding practice [2]. The analysis reported in this paper uses data from that year because it preceded the Covid-19 pandemic, and the data is thus unaffected by the extraordinary changes in practice and costs incurred in subsequent years until the end of the pandemic.

The tissue viability nurse team has adopted a policy across the entire hospital to limit the exposure of, especially at-risk, patients to pressure but also to friction and shear (the “StH&K Prevention Model”). Patients’ risk of acquiring a pressure ulcer is assessed using the Maelor score, within 6 hours of admission to the hospital. Patients at high risk are placed on pressure redistributing mattresses, from the point of admission including in A&E. All beds used by the Trust are four-sectional profiling to limit sliding down, which leads to friction and shear strains in the sacrum and buttocks. Additional measures are focused on limiting the exposure of heels to friction and the associated shear. Patients largely confined to bed are given low-

¹ Has since merged with another trust to become Lancashire and Merseyside Teaching Hospitals NHS Trust.

friction fabric booties (Parafricta®) to wear or, if they are more mobile, a prophylactic, thin film wound (Tegaderm®) dressing is applied to the heel (and to elbows where appropriate). All measures are extended to A&E, as waiting times prior to ward admission can be long, including use of profiling trolleys and air mattresses. Frequent repositioning is facilitated, where required, by using “tilt and turn” beds/mattresses for bariatric, immobile, or end-of-life patients.

This paper presents TVN-validated data, compared to ICD-10 coding data from clinical records, to compare outcomes at StH&K with those experienced by the average acute hospital trust. Using newly described assumptions for the cost of treating otherwise preventable Category 2 pressure ulcers, it is possible therefore to calculate how much money StH&K is saving versus the average trust.

Estimations of the cost of treating pressure ulcers have been published by several authors. For example, the cost for healing an uncomplicated Category 2 pressure ulcer was estimated to be £4399 (£5573 adjusted for inflation by 2022) [3]. Similar analysis in the USA concluded that a Category 2 PU costs an accumulated \$3560 (approximately £3030) [4]. We note that the average cost of healing pressure ulcers of *all* categories and levels of complexity is heavily weighted by Category 2, as they occur much more frequently [5]. Estimations are sometimes based on patients being admitted to, or remaining in, hospital until a pressure ulcer is healed, which does not accord with the authors’ experience in practice for Category 2 PUs. If a Category 2 pressure ulcer is acquired during a hospital stay, the costs associated with treatment are likely to extend, post-discharge, to community nurse visits to patients’ homes. A new method for quantifying these costs is used herein to calculate the potential savings to the NHS of reducing the incidence of haPUs to the level recorded at StH&K.

Methods:

Hospital Episode Statistics (“HES”) including Admitted Patient Care Activity statistics used by NHS England are in the public domain [6] whilst some of the same statistics for StH&K trust separately were purchased from Data Access Ltd for the period of analysis (April 2019 to March 2020). Just 7,800 admissions in England were for pressure ulcers as a *primary* diagnosis, whereas the incidence ancillary to another primary diagnosis was 319,847. Incidence of Category 2 pressure ulcers by *all* diagnoses were stratified, therefore, by the ten primary diagnoses most associated Pressure Ulcer incidence (25% of the total). The length of stay of the patients with the same primary diagnosis could, therefore, be compared for those with and without a pressure ulcer and to exclude the effect of co-morbidities.

To calculate the cost of extended stays in hospital a figure of **£320**/ward bed day was used based on the NHS England’s recently released guidance on cost savings methodology [7][8]. It was further assumed that community nurses would treat the PU post-discharge as various authors have published time to healing estimations ranging from 18 to 145 days for Category 2 [9][10][11], significantly longer than the extended bed stays. Based on experience we

assumed **30 days** to healing, and that Community Nurses would visit the patient to assess and dress the wound every 3 days [12]. The costs of these visits were estimated based on the Costs of Health and Social Care Report for 2022 [13] for a Band 6 nurse visit taking 30 minutes, **£28.50** plus an estimate an additional **15%** i.e. **£4.12** [12] for wound dressings at each visit (consistent with the average cost of all wound dressings on the Drug Tariff which is £4.95) [14].

All incidents of PUs at StH&K are validated by the Tissue Viability Team to ensure that patient reports are accurately entered into their incident reporting system (Datix). A small proportion (about 4%) were revised. This source was used to calculate the proportion of PUs reported that were acquired in the hospital (i.e. at any time post admission). The national HES data does not distinguish between pre-existing (old) and hospital-acquired (new) pressure ulcers. An assumption was made, therefore, based on a recent study which surveyed monitoring systems [15] that **36.4%** of reported pressure ulcers are hospital acquired.

Results:

The 10 primary diagnoses most associated with pressure ulcer incidence were analysed for the difference in length of hospital stay (Table 1) indicating that, on average, patients with the same primary diagnosis stay in hospital for **2.62** days longer. Patients with these diagnoses account for 40.4 % of *all* Category 2 PU incidence.

The data on the average age of patients with these primary diagnoses were also compared with the average age of *all* patients with Category 2 PUs (Table 2).

Table 1:

ICD10 Code	ICD10 Description	Frequency	Average length of stay with PU	Frequency	Average length of stay without PU
J181	Lobar pneumonia, unspecified	12569	6.43	352180	3.87
A419	Sepsis, unspecified	9065	6.34	280487	4.50
N390	Urinary tract infection, site not specified	7800	6.56	203199	3.41
J189	Pneumonia, unspecified	7360	6.69	202851	4.13
J690	Pneumonitis due to food and vomit	5379	7.31	175067	5.64
I500	Congestive heart failure	4856	7.16	144649	4.52
R296	Tendency to fall, not elsewhere classified	3934	6.24	141980	4.17
N179	Acute renal failure, unspecified	3633	5.82	123396	3.73
L031	Cellulitis of other parts of limb	3406	6.64	104491	2.90
J440	Chronic obstructive pulmonary disease with acute lower respiratory infection	3326	4.77	69439	2.74
			Weighted average		Weighted average
			6.47		3.85

Table 2:

ICD10 Code	ICD10 Description	Frequency	Weighted Average Age
As above	10 primary diagnoses most associated with Category 2 pressure ulcers	1,852,984	73
L89.1	Stage 2 decubitus ulcer	152,787	79

The analysis of the health episode statistics and the TVN-validated incidence reports at StH&K compared to the nationally available data is presented in Table 3. We did not have access to some data and therefore have explained the basis of estimates used in some cases.

Table 3:

	St Helens & Knowsley Trust	All England Acute Trusts
Pressure Ulcers ICD-10 (L89.1/2/3) = Cat 2/3/4	1,219	224,839
ICD-10 (L89.1/2/3)/100,000 admissions	963	1,307
ICD-10 (L89) = Cat 1/2/3/4 and unspecified (All PUs)	Estimate based on all England data 142.3% * 1219 = 1,734	319,847
ICD-10 All PUs/100,000 admissions	Estimate 142.3% * 963 = 1,370	1,859
TVN-validated all PU incidence reports (VIR)	2,810	Not available data
TVN VIR/ 100,000 admissions	2,220	Estimate based on StH&K ratio of ICD-10 to TVIR reports = 2,990
TVN-validated haPUs	111	Not available data
TVN VIR haPUs/100,000 admissions	88	Estimate 36.4% * 1859-2990 = 676-1088

The incidence of TVN-validated hospital acquired pressure ulcers (of all categories) at StH&K is estimated to be 8-13% of the national average.

Adjusting for inflation in 2023 [16], the calculated cost to the NHS of treatment of a Category 2 haPU, therefore, is as laid out in Table 4.

Table 4:

Cost of Treatment of Category 2	Period	Cost (2023/4 prices)
Extended Hospital Stay	2.6 days	2.6 x £320 = £832
Post-discharge Community Nurse Visits	30 days 10 visits	10 x £33.73 (nursing time) 10 x £4.98 (dressings) = £387
TOTAL		£1219

Discussion:

It is notable that the number of PUs at StH&K according to the HES data is substantially less than entered by the TVN team into the Datix system. This suggests, as has been reported elsewhere [17], that coders will need support to interpret many PU references from patient reports and that the writers of clinical reports should use consistent terminology to describe haPUs.

The HES data indicates that there is a 2.6-day difference in the length of stay of patients with the same co-morbidities, depending on whether they also have a Category 2 pressure ulcer. It is possible that this conclusion is confounded by patients with pressure ulcers being older than those without², but several other publications have reported similar findings [18].

Although a Category 2 pressure ulcer could take longer to heal if treated solely in the community, we believe 30 days is realistic for a patient discharged from hospital with the PU dressed and with advice for managing healing at home. The total cost of healing a hospital acquired Category 2 pressure ulcer we concluded, £1219, is less than estimated by other authors.

We have not attempted to calculate confidence intervals around this estimate of costs. This would require more data to input than is available in the public domain. For example we do not know the actual average number of days for a Category 2 pressure ulcer to heal post hospital discharge in England, or the deviation around that average. We did not calculate the variation between hospital trusts in the number of excess bed days associated with a PU

² We do not have access to the data to stratify the patients with the same co-morbidities *and* age profiles.

coding or have access to data to estimate the effect of mismatches between ICD-10 coded incidence and TVN-validated data in trusts other than StH&K.

Nevertheless, using our figure, we can estimate the savings to the StH&K trust (and wider NHS) of its low haPU incidence versus the average English acute hospital trust.

StH&K model of haPU prevention reduced the annual incidence to 8-13% and, taking a mid-point of 10.5% it is possible to calculate the saving to StH&K and the NHS as $(882-88) \times \pounds 1219 \sim \pounds 968,000$ per year (per 100,000 hospital admissions).

The cost to StH&K of additional measures to limit exposure to friction (low-friction booties and prophylactic dressings) is approximately $\pounds 135,000 / 100,000$ admissions and therefore the net cost saving to the NHS $\sim \pounds 833,000 / 100,000$ admissions. This assumes that other measures (e.g. early intervention in A&E and profiling beds) are not adding significant costs versus other NHS Trusts.

In 2019-20 the NHS in England commissioned 17.2 million admissions per year (mostly in acute hospital trusts such as StH&K) [6] and therefore the potential for net savings nationally would exceed $\pounds 143$ million per annum. Recent analysis carried out in Australia estimated much larger savings (AUS\$1.1 billion/ $\pounds 500$ million) if haPUs could be reduced by 50% [19]. In the USA, it has been calculated that investment in PU prevention in patients at risk, according to international guidelines, is *always* cost-effective [20].

The approach we adopt to estimating cost savings is conservative. We assume that the measures taken at StH&K only avoid the costs of treating Category 2 pressure ulcers, whereas, of course, a proportion would have progressed to a Category 3 or 4, potentially with complications. The cost of treating Category 4 pressure ulcers with complications such as osteomyelitis or requiring surgical reconstruction has been estimated to be at least $\pounds 40,000$ [3][4]. The measures used by StH&K are likely, therefore, to save the NHS significantly more than stated above, particularly when adjusted for recent inflation. We also make no attempt to quantify the reputational or legal costs incurred by NHS Trusts when patients acquire pressure ulcers in hospital that are due to lapses in care.

Conclusions:

Using a rule of thumb that every Category 2 haPU avoided saves the NHS $\pounds 1219$ allows for the net cost savings of any additional spending on preventative measures to be calculated and to assist budget holders in making decisions. For example, a hospital recording 500 haPUs per 100,000 admissions could easily justify spending an additional $\pounds 100,000$ to reduce that number to 400. The StH&K model of prevention also suggests that hospitals can realistically reduce the rate of haPUs to less than 100 per 100,000 admissions. This calls into further question which patient harms, when comparing hospitals' performance, should be described as avoidable (or "lapses in care") and which PUs may occur despite all possible preventative measures being taken.

Note:

This paper describes in more detail what was presented at the European Pressure Ulcer Advisory Panel in 2023 - Free paper session 4, Pressure ulcers and health economy [21]. Some of the assumptions have been slightly modified since that presentation, but the overall conclusions are unaffected.

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