

Point prevalence of wounds in a sample of acute hospitals in Canada

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ABSTRACT

To provide new information on wound prevalence and the potential resource impact of non healing wounds in the acute sector by summarising results from wound audits carried out at 13 acute hospitals in Canada in 2006 and 2007. Audits were carried out in each hospital by the same independent team of advanced practice nurses using standard data-collection forms. The results reported here were derived from the summary reports for each hospital. A total of 3099 patients were surveyed (median 259 patients per hospital). In the sample hospitals, the mean prevalence of patients with wounds was 41.2%. Most wounds were pressure ulcers (56.2%) or surgical wounds (31.1%). The mean prevalence of pressure ulcers was 22.9%. A majority of pressure ulcers (79.3%) were hospital-acquired, and 26.5% were severe (Stage III or IV). The rate of surgical wound infection was 6.3%. Forty-five percent of patients had dressings changed at least daily and the mean dressing time was 10.5 minutes. Wounds are a common and potentially expensive occurrence in acute hospitals. Any wound has the potential to develop complications which compromise patient safety and increase hospital costs. Ensuring consistent, best-practice wound management programmes should be a key priority for hospital managers.

Key words: Audit • Acute hospital • Prevalence • Wounds

INTRODUCTION

The presence of wounds is a common event in any acute hospital, although the true extent and impact of wounds is rarely understood. Most wounds heal without incident but any wound has the potential to develop complications which compromise healing and increase hospital costs. Costs include the risk of litigation and the additional resource costs associated with the need for extended treatment. In future, hospitals are likely to bear more of the resource costs directly, as payers decline to pay for avoidable events such as surgical site infection (SSI) and hospital-acquired pressure ulcers.

Hospital-acquired pressure ulceration represents a major failure in systems to secure patient safety and quality of care. Pressure damage is a relatively common risk among hospital inpatients, such as the elderly, whose mobility is restricted. Ulceration is caused by the pressure, shear or friction of the body on surfaces such as a bed or chair, which restricts blood flow to the skin leading to tissue damage and cell death. A high proportion of pressure ulcers should be avoidable with adequate risk assessment, pressure relieving equipment and regular turning. Estimates of the prevalence of patients, with a pressure ulcer among hospital inpatients in the USA, range between 14% and 17% (1). In Canada, most estimates suggest that the prevalence of patients with a pressure ulcer in acute hospitals is between 24% and 26% (2). Some patients are admitted to hospital with an ulcer, but the majority of pressure ulcers in hospitalised patients develop after admission. In European studies, between 51% and 80% of

Key Points

- most wounds heal without incident but any wound has the potential to develop complications which compromise healing and increase hospital costs
- hospital-acquired pressure ulceration represents a major failure in systems to secure patient safety and quality of care
- a high proportion of pressure ulcers should be avoidable with adequate risk assessment, pressure relieving equipment and regular turning

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Key Points

- SSI is one of the most common sources of hospital-acquired infection (HAI)
- the three most common sources of HAI were urinary tract infections (3.4%), respiratory tract infections (3.0%) and SSIs (2.5%)
- from 1 October 2008, Medicare will no longer pay hospitals in the USA at a higher rate to compensate for the additional costs associated with a range of hospital-acquired conditions which should be preventable, including a Stage III or IV pressure ulcer
- private health-care insurers are expected to follow Medicare in withdrawing payment for similar avoidable events
- pressure ulcers also represent an important litigation risk
- our aim is to provide new information on the prevalence and potential resource impact of wounds in the acute sector by summarising the results from baseline wound audits carried out in 13 acute hospitals in Alberta, Manitoba and Ontario, Canada, between June 2006 and May 2007
- the overall aim of the programme is to help providers improve patient outcomes through consistent application of best-practice wound management procedures
- a baseline audit is the first stage in the SPP process and is designed to identify opportunities for the improvement and to establish priorities for training and development
- audits were carried out by a team of advanced practice nurses (nurse consultants), which was independent of the hospital and Smith & Nephew, working in collaboration with each hospital

pressure ulcers in hospitalised patients were hospital-acquired (3–5).

SSI is one of the most common sources of hospital-acquired infection (HAI). The Canadian Nosocomial Infection Surveillance Program carried out a survey of 5750 adult inpatients in 25 large university-affiliated acute care hospitals in Canada in 2002 (6). The overall prevalence of HAI was 10.5% (601/5750 patients). The three most common sources of HAI were urinary tract infections (3.4%), respiratory tract infections (3.0%) and SSIs (2.5%). Among surgical patients, SSI was the most common form of HAI with an average prevalence of 4.7%. The risk of surgical infection varies according to the type of procedure. Among patients undergoing cardiac surgery in Canada since 1998 the average incidence of SSI ranged from 3.1% to 11% depending on the procedure and patient risk factors (6). Klevens et al. (7) estimate that there were 1.7 million hospital-acquired infections in the USA in 2002, a rate of 4.5 per 100 admissions. Of these, SSIs were the second most common. There were 274 000 surgical infections, approximately 2% of all surgical procedures, and 8205 deaths directly attributable to the presence of a surgical infection (3% of SSI patients).

From 1 October 2008, Medicare will no longer pay hospitals in the USA at a higher rate to compensate for the additional costs associated with a range of hospital-acquired conditions which should be preventable, including a Stage III or IV pressure ulcer (8). Under previous payment rules, a severe pressure ulcer was classified as a complicating condition (CC) or major complicating condition (MCC) which attracted a higher payment rate for the hospital. Under the new rules, the hospital receives no additional payment unless the pressure ulcer was present on admission. Private health-care insurers are expected to follow Medicare in withdrawing payment for similar avoidable events. Pressure ulcers also represent an important litigation risk. A recent study by a major insurer in the USA concluded that hospital-acquired conditions accounted for 12.2% of total legal liability costs incurred by health-care providers in 2007. Pressure ulcers were the most expensive, costing an average of \$145 000 per claim (9). The Centres for Medicare and Medicaid Services (CMS) has now proposed to expand the list of so-called

'never events' which Medicare will not pay for to include nine additional conditions. One of these is SSI (10). Under the CMS proposals, a hospital will not receive any additional payment relating to the extra costs associated with treating surgical infections. A number of US States have already legislated to require hospitals to report publicly on rates of nosocomial infections, including SSIs (11).

Because wound care is not highly visible most hospital managers are not aware of the extent to which wound management practice can impact patient welfare and hospital costs. Our aim is to provide new information on the prevalence and potential resource impact of wounds in the acute sector by summarising the results from baseline wound audits carried out in 13 acute hospitals in Alberta, Manitoba and Ontario, Canada, between June 2006 and May 2007. These hospitals were selected because they were part of a Strategic Partnership Programme (SPP) involving collaboration between health-care providers and Smith & Nephew Advanced Wound Management. The overall aim of the programme is to help providers improve patient outcomes through consistent application of best-practice wound management procedures. A baseline audit is the first stage in the SPP process and is designed to identify opportunities for the improvement and to establish priorities for training and development.

METHODS

Audits were carried out by a team of advanced practice nurses (nurse consultants), which was independent of the hospital and Smith & Nephew, working in collaboration with each hospital. The same team carried out all of the audits reported in this study. Members of the audit team were trained in the clinical assessment of wounds and the use of a standardised data-collection tool. All of the inpatients in each hospital were included in the audit, with the exception of patients in neonatal and psychiatric wards and patients in wards that were subject to an infection outbreak. Data were collected over a 1- or 2-day period using specially designed audit software loaded on to a handheld personal computer. Data were downloaded and analysed in Excel. All of the nurses working in the audit hospital were also asked to complete a questionnaire designed to identify current wound care knowledge and

needs for additional education (results of this questionnaire will be reported elsewhere).

The audit team performed a head-to-toe assessment on each patient, including the removal of dressings where necessary. Throughout the course of the assessment, the privacy rights of all patients were protected and no patient encountered any risks or discomfort beyond those ordinarily encountered during the performance of routine physical examinations. Each patient gave verbal consent to be examined. Less than 3% of patients withheld consent.

A wound was defined as infected only when there was a documented diagnosis of infection and antibiotics had been prescribed for the infection. A hospital-acquired pressure ulcer was defined as a pressure ulcer, which was not documented on the initial admission assessment or within 12 hours of admission. Pressure ulcers were staged using the National Pressure Ulcer Advisory Panel (NPUAP) classification (12).

Data were analysed and a report produced separately for each hospital by the independent audit team. The results reported in this paper were derived from the summary reports for each hospital, rather than from original data.

RESULTS

A total of 3099 patients were surveyed in 13 hospitals, with a range from 44 to 537 patients per hospital, reflecting the number of inpatient beds. Two hospitals had very small numbers of inpatients (44 and 47). The median was 259 patients per hospital. The point prevalence of patients with a wound was defined as: number of patients with a wound/total number of inpatients surveyed. Among the sample hospitals, the mean prevalence of patients with at least one wound was 41.2%: approximately two patients in five (Table 1). The lowest recorded prevalence was 30% and the highest was 68%. Most patients with a wound had a pressure ulcer (56.2%) or a surgical wound (31.1%). The remainder were leg ulcers (2.7%), foot ulcers (2.8%) or other wounds (7.2%).

The mean prevalence of pressure ulcers (including Stage I ulcers) was 22.9%, with a range between 15% and 39%. A consistently high proportion of pressure ulcers were hospital-acquired. The mean was 79.3% (median 78%), with a minimum of 68% and a maximum of 91%. Almost a third of pressure ulcers (mean 26.5%) were severe (at Stage III or IV) and the average rate of infection in pressure ulcers was 8.0% compared with an

Key Points

- the results reported in this paper were derived from the summary reports for each hospital, rather than from original data
- a total of 3099 patients were surveyed in 13 hospitals, with a range from 44 to 537 patients per hospital, reflecting the number of inpatient beds

Table 1 Wound prevalence and prevalence of pressure ulcers

	Percent of relevant patient population
Patients with wounds—point prevalence	Patients surveyed (<i>n</i> = 3099)
Mean	41.2%
Median	38.0%
Min—max	30–68%
Patients with a wound—by wound type	Patients with a wound (<i>n</i> = 1204)
Pressure ulcer	56.2%
Surgical wound	31.1%
Diabetic foot ulcer	2.8%
Leg ulcer	2.7%
Other wounds	7.2%
Prevalence of pressure ulcers	Patients surveyed (<i>n</i> = 3099)
Mean	22.9%
Median	23.0%
Min—max	15–39%
Pressure ulcers—hospital-acquired	Patients with a pressure ulcer (<i>n</i> = 677)
Mean	79.3%
Median	78.0%
Min—max	68–91%
Pressure ulcers—Stage III and IV	Patients with a pressure ulcer (<i>n</i> = 677)
Mean	26.5%
Median	27.0%
Min—max	9–39%

Source: sample data.

Table 2 Prevalence of wound infection

	Percent of relevant patient population
Infected wounds—all wounds	Patients with a wound (<i>n</i> = 1204)
Mean	7.3%
Median	5.9%
Min–max	0–23.7%
Infected wounds—surgical wounds only	Patients with a surgical wound (<i>n</i> = 374)
Mean	6.27%
Median	6.0%
Min–max	0–16%
Infected wounds—pressure ulcers only	Patients with a pressure ulcer (<i>n</i> = 677)
Mean	8.0%
Median	8.0%
Min–max	0–33%

Source: sample data.

Table 3 Frequency of dressing change and dressing change time

	Percent of relevant patient population
Dressing change daily or more frequently	Patients with a wound (<i>n</i> = 1204)
Mean	45.0%
Median	39.0%
Min–max	17–76%
Dressing change time	Patients with a wound (<i>n</i> = 1204)
Mean	10.5 minutes
Median	10.0 minutes
Min–max	8.1–17.4 minutes

Source: sample data.

Key Points

- in our sample, approximately 40% of acute hospital beds were occupied by patients with a wound

overall rate of wound infection of 7.3%. The rate of infection in surgical wounds was 6.3% (Table 2).

Frequency of dressing change is an important determinant of the costs of treating wounds, but it can also be an indicator of whether the choice of dressings is appropriate. Traditional dressings such as gauze need to be changed frequently in order to maintain a moist wound environment, whereas modern dressings can be left in place for longer. Daily or more frequent dressing changes are usually an indicator of a high reliance on traditional dressings. In the sample hospitals, a mean of 45% of patients had their wounds dressed at least daily (Table 3). The mean dressing time, measuring time to remove dressings, cleanse the wound and reapply dressings, was 10.5 minutes (range 8.1–17.4 minutes).

DISCUSSION

In our sample, approximately 40% of acute hospital beds were occupied by patients with a wound. We are not aware of any other

North American studies which report total wound prevalence in the acute sector and there are few comparable international studies. A point prevalence study carried out in one acute hospital in Paris found 52% of inpatients had a wound (327 of 624 patients), of which 42% were surgical wounds. (13) A wound prevalence study involving all 85 public hospitals in Western Australia in 2007 surveyed 2777 inpatients. The prevalence of wounds in the surveyed population was 49% (1363 of 2777 patients). Most were acute (surgical) wounds (54%) or pressure ulcers (17.5%). The prevalence of patients with a pressure ulcer was 11% (303 of 2777 patients), of which 72% acquired the ulcer in hospital (14). Direct comparison between sources is difficult because methodologies differ. For example, the number of wounds recorded is likely to be lower if information is obtained from medical notes than if each patient is examined. Similarly, some studies include Stage I pressure ulcers while others include only Stage II and higher.

The prevalence of pressure ulcers among hospitalised patients in our study (23%) is similar to other Canadian estimates (24–26%) (2) and to recent estimates from a sample of European hospitals. A standardised survey of 5947 inpatients in 25 acute hospitals in Europe reported an overall prevalence of 18.2%. Prevalence was similar in Belgium (21.1%), Sweden (23%) and in the UK (21.9%) and was lower in Italy (8.3%) and Portugal (12.5%) (15). The proportion of pressure ulcers, which are hospital-acquired in our study (78–79%), is also consistent with available evidence from elsewhere. European estimates range from 80% in an acute hospital in France (4) and 77% in three teaching hospitals in Ireland (5) to 51% in a survey of 87 German hospitals. (3)

Our estimate of the prevalence of infection in patients with a surgical wound (6.0–6.27%) is similar to the average rate of 4.7% observed in the Canadian Nosocomial Infection Surveillance Programme survey carried out in 2002 (6). There was a wide range of infection rates between the hospitals in our sample (from 0% to 16%) and this is most likely because of differences between hospitals in the types of surgical procedures performed and in the age and other risk characteristics of patients.

Hospital-acquired pressure ulcers, particularly severe ulcers, are expensive to treat and may require prolonged hospitalisation. Allman et al. (16) report results of a prospective study of 286 patients aged 55 and older admitted to a university hospital in the USA between December 1988 and July 1991. The excess cost for patients developing a pressure ulcer (adjusted for illness severity, comorbidities, nosocomial infections and other hospital complications) was \$15 229 (in 1991 US\$)—2.1 times higher than for similar patients who did not develop a pressure ulcer. Diagnosis-adjusted length of stay was 8.2 days higher for patients with a pressure ulcer (1.6 times higher). These are averages across patients with all stages of ulcer. For severe ulcers, the resource impact is substantially higher. In a retrospective costing analysis of one patient with three full-thickness (Stage IV) pressure ulcers treated in a hospital in Ireland, the total cost of treatment was €119 094 including 129 days of inpatient treatment (17).

The costs of surgical infection are well documented. Patients developing a SSI before

discharge are at increased risk of mortality, are more likely to be readmitted because of wound complications, have higher postoperative length of stay and higher total hospital costs. McGarry (18) compared 96 elderly patients (aged 70 or older) with *staph aureus* SSI with 59 uninfected patients of the same age treated in a 750-bed tertiary care hospital and a 350-bed community hospital in the USA. Elderly patients with SSI were at increased risk of mortality [odds ratio (OR), 5.4; 95% CI 1.5–20.1], longer postoperative length of stay [mean 2.5 times longer (95% CI 2.0–3.1)] and higher hospital charges [mean 2 times higher (95% CI 1.7–2.4)]. Another study carried out in a 415-bed community hospital in the USA (19) compared patients with SSI with a set of matched controls (255 matched pairs). All of the patients underwent surgery at the hospital between June 1991 and July 1995. Patients with SSI had a higher risk of mortality (relative risk (RR), 2.2; 95% CI 1.1–4.5), higher risk of readmission (RR, 5.5; 95% CI 4.0–7.7), higher postoperative length of stay (total excess attributable to SSI was 12 days per patient; 95% CI 10–14 days) and higher total hospital costs (excess attributable cost, \$5038; 95% CI \$4020–\$6289). In this hospital, which undertook approximately 5000 inpatient surgical procedures a year, surgical infections accounted for five deaths, a total of 107 days in ICU, 920 days of hospitalisation and \$473 997 in direct costs annually in the study period.

Zoutman et al. (20) carried out a study to determine the attributable costs of SSI in a 425-bed Canadian teaching hospital for patients who underwent an inpatient clean or clean-contaminated procedure during 1991. From 5513 eligible procedures in that year, 108 surgical infections were identified (1.96%) during a 30-day follow-up period. These infections required 28 surgical procedures, 1116 inpatient days, 55 emergency and 42 outpatient visits. The total hospital costs attributable to surgical wound infection in 1991 was \$321 533 (\$3937 per infection). Of this total, pharmacy costs (mostly antibiotics) amounted to \$41 617. The mean number of inpatient days attributable directly to a wound infection was 10.2 days per patient (median 4.5 days). Kahn et al. (21) report the incidence of postoperative complications and costs for 7457 patients undergoing non cardiac surgery in a 750-bed tertiary care centre in Calgary

Key Points

- the prevalence of pressure ulcers among hospitalised patients in our study (23%) is similar to other Canadian estimates (24–26%) and to recent estimates from a sample of European hospitals
- the proportion of pressure ulcers, which are hospital-acquired in our study (78–79%), is also consistent with available evidence from elsewhere
- our estimate of the prevalence of infection in patients with a surgical wound (6.0–6.27%) is similar to the average rate of 4.7% observed in the Canadian Nosocomial Infection Surveillance Programme survey carried out in 2002
- there was a wide range of infection rates between the hospitals in our sample (from 0% to 16%) and this is most likely because of differences between hospitals in the types of surgical procedures performed and in the age and other risk characteristics of patients

Key Points

- based on our evidence, a 250-bed acute hospital might expect to have between 95 and 103 beds (38–41%) occupied on any day by a patient with a wound
- of these, around 57 will be patients with a pressure ulcer (23% of occupied beds), 44 of which (78%) were hospital-acquired and 15 of which (27%) are severe ulcers
- assuming the hospital performs around 5000 surgical procedures annually, it can expect to have between 65 and 125 (1.3 – 2.5%) surgical wound infections at a cost of 790–1500 excess bed-days (12.2 additional days per case) and between \$260 000 and \$500,000 (at a mean cost of \$4000 per infection)
- even on these conservative assumptions, the excess costs to the hospital of pressure ulcers and surgical wound infection alone could be more than 1200 bed-days and between \$1 million and \$1.3 million
- a limitation of our study is the fact that the hospitals included in the audits were not selected randomly, but rather on the basis of their willingness to participate in a programme designed to improve wound treatment
- to the extent that these hospitals had previously experienced problems with wound care, or were simply more aware of the issues, they may not be representative of other similar hospitals
- in addition, all of the sample hospitals are Canadian and it is possible that the results of audits carried out in these hospitals are not generalisable to hospitals in other health-care systems
- to the extent that ulcers were present on admission but were not recorded, the proportion pressure ulcers which were hospital-acquired may be over-estimated

between July 1996 and March 1998. The overall rate of postoperative complications was 6.9%. Surgical wound infection was the third most common complication at 1.3% (93/7457 patients). The adjusted increase in median length of stay for patients with a surgical wound infection was 122% (95% CI 91–159%), equivalent to 12.2 days. The adjusted increase in median cost for SSI patients was 79% (95% CI 57–105%) or \$3750 per patient. On this basis, the approximate cost to the hospital of 93 surgical wound infections would be \$348 750 and 1135 excess bed-days in the study period. Taylor (22) identified 89 patients (2.5%) with a wound infection from 3602 surgical patients analysed in a 12-month period in a teaching hospital in Alberta. Patients with infection were compared with 139 matched controls with no infection. Patients with SSI remained in hospital on average 19.5 days longer than controls.

Based on our evidence, a 250-bed acute hospital might expect to have between 95 and 103 beds (38–41%) occupied on any day by a patient with a wound. Of these, around 57 will be patients with a pressure ulcer (23% of occupied beds), 44 of which (78%) were hospital-acquired and 15 of which (27%) are severe ulcers. On the basis of evidence from the USA, these 57 patients with a pressure ulcer may require at least 467 excess bed-days (8.2 days per patient) and cost the hospital more than \$855 000 (\$15 229 per patient at US\$ 1991 prices). Assuming the hospital performs around 5000 surgical procedures annually, it can expect to have between 65 and 125 (1.3–2.5%) surgical wound infections at a cost of 790–1500 excess bed-days (12.2 additional days per case) and between \$260 000 and \$500 000 (at a mean cost of \$4000 per infection). Even on these conservative assumptions, the excess costs to the hospital of pressure ulcers and surgical wound infection alone could be more than 1200 bed-days and between \$1 million and \$1.3 million.

The significance of dressing change frequency is often underestimated. In our sample, the median nurse time required to change a wound dressing was 10 minutes, and 45% of patients had their dressings changed daily or more frequently. Assuming 95 patients with wounds, 45% changed daily and the remainder changed three times a week, requires the equivalent of 76 hours of nurse time per week

(3900 hours annually). Reducing the proportion of daily change to 20% from 45% releases 16 hours of nurse time per week (equivalent to 0.2 full-time equivalent) or more than 800 hours annually which can be reallocated to other patient activities.

A limitation of our study is the fact that the hospitals included in the audits were not selected randomly, but rather on the basis of their willingness to participate in a programme designed to improve wound treatment. To the extent that these hospitals had previously experienced problems with wound care, or were simply more aware of the issues, they may not be representative of other similar hospitals. In addition, all of the sample hospitals are Canadian and it is possible that the results of audits carried out in these hospitals are not generalisable to hospitals in other health-care systems. We have not placed any significance on observed differences between hospitals because wound prevalence depends on case-mix, on differences in the balance between medical and surgical specialties and on the age profile of patients. The point prevalence of wounds is not an indicator of quality, although the incidence of wound infection and the prevalence of hospital-acquired pressure ulcers may be.

Wounds were defined as infected only if a diagnosis of infection was recorded in the patient's notes and antibiotics had been prescribed for the infection. This is likely to underestimate the true number of wounds that are infected or critically colonised. Pressure ulcers were defined as hospital-acquired if the ulcer was not recorded at the time of admission or within 12 hours of admission. To the extent that ulcers were present on admission but were not recorded, the proportion pressure ulcers which were hospital-acquired may be overestimated.

CONCLUSIONS

These audits have shown that wounds are a common and potentially expensive occurrence in all acute hospitals. However, because this type of information has been limited in the past, the true impact of wound management practices on patient outcomes and hospital costs is rarely understood. Any wound has the potential to develop complications which compromise patient safety and increase hospital costs. Ensuring consistent, best-practice

wound management programmes across the organisation should be a key priority for hospital managers.

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Key Points

- any wound has the potential to develop complications which compromise patient safety and increase hospital costs
- ensuring consistent, best-practice wound management programmes across the organisation should be a key priority for hospital managers