THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Acute surgical treatment of cutaneous abscesses: cost savings from prioritisation in theatre

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Abstract

Introduction Treatment of cutaneous abscesses is an important part of the acute surgical workload and most are treated with incision and drainage. Traditionally most are treated after major cases in theatre prioritisation and remain in hospital overnight.

Aim To examine the cost saved in patients after drainage of skin abscesses according to the time of surgery ('am' versus 'pm').

Methods The clinical records of all patients who underwent acute incision and drainage of cutaneous abscesses at North Shore Hospital (Takapuna, Auckland, New Zealand) between 1 June–31 December 2011 were reviewed with respect to the time of day when surgery was performed [am (defined as 0730–12 noon of the day of surgery)] versus pm). Costs were calculated using standard tariffs set by our hospital.

Results 339 patients (median age 34 yr, 164 female) were admitted for acute drainage of cutaneous abscesses with 149 operated in "am". There was no difference in patients undergoing am versus pm drainage in terms of age, sex, race, Charlson comorbidity score or smoking status although diabetic patients were more likely to undergo a pm drainage (p=0.008). The median cost per discharge was NZ$2397.39. The cost of the 'am' group was significantly less compared to the cost of the 'pm' group with NZ$2236.63 compared to NZ$2531.70 (p=0.0034) and saved a median of NZ$295.07 per patient. This amounted to the cost of an overnight bed stay.

Conclusion Prioritisation of abscess drainage in acute theatre management is safe and associated with significant cost savings.

Cutaneous abscesses affecting the skin, axillae, groins and perineal area are common conditions and are frequently seen by general surgeons when they present acutely for treatment. While not complex, cutaneous abscesses represent a significant part of the acute surgical load in Australasia and consume a significant amount of surgical resources.[1]

Traditional surgical teaching has been that all abscesses require an overnight stay after incision and drainage under general anaesthesia with the first dressing change performed in hospital.[2] However this policy dates from an earlier era when saline soaked gauze was used to pack the abscess cavity and this has now been replaced by softer, more absorbable dressings that can often be changed by community-based nurses.

Since most abscesses are treated with incision and drainage they are often prioritised for operative intervention after major acute cases such as cholecystectomy, appendicectomy and laparotomy. Consequently many abscesses are operated on by junior staff late in the surgical day.[1]

The development of dedicated acute surgical services has resulted in adequate resources being consistently available for the management of acute surgical patients. This includes staffed acute operating theatres and available senior surgical expertise.[3] This more consistent and regular acute commitment has facilitated new approaches to management of traditional surgical conditions.

This investigation was undertaken to determine whether prioritising abscess drainage and undertaking the earlier drainage was safe and resulted in same day discharge with consequent financial savings.

Methods

This is a retrospective analysis of all adult patients who underwent emergency drainage of skin abscesses at North Shore Hospital, Waitemata District Health Board (WDHB) between 1 June 2011 and 31 December 2011. The institution ethics board granted approval for the study.

At North Shore Hospital acute surgical patients are booked with the operating theatre supervisor for surgery. Patient details are recorded and then the cases are prioritised by the acute surgeon of the day.

Abscesses were treated in the mornings when there were no more urgent cases such as laparotomies or when urgent cases required preoperative investigations or stabilisation and consequently operating theatre space and staff were available for a limited period of time. The daily logbooks of the acute theatre were reviewed and all abscess cases operated on in the study period were recorded.

Data collection included patient demographics, comorbidities such as diabetes, smoking status, location of abscesses, time of day when surgery was performed ('am' versus 'pm'), length of hospital stay and associated in-hospital costs. The definition of 'am' is 7.30am to 12 noon of the day. The Charlson comorbidity score was used to quantify patient comorbid status.[4]

For cost purposes, standard tariffs set by our hospital independent coding and costing committee were adopted. Cost analysis included operating time per minute, surgeon time per minute, anaesthetist time per minute, operation room supplies, inpatient nursing and catering costs, laboratory testing and overall hospital stay.

Statistical analysis—Data was entered into a Microsoft Excel spreadsheet and analysed using SAS (v9.3) software. Descriptive statistics for continuous are reported as mean and standard deviation (SD) for normally distributed variable and median and inter-quartile range (IQR) for variables not normally distributed. Categorical variables were reported as frequency and proportions in descriptive analysis.

The Wilcoxon rank sum test was used to compare non-parametric continuous variables (e.g. age, cost and length of stay), and Chi-squared test for categorical variables when appropriate. Multivariable analyses were done to control for confounding factors. Statistical significance was defined as $p \leq 0.05$.

Results

A total of 339 patients were admitted to North Shore Hospital in the study period. All had emergency abscess drainage with 149 undergoing surgery between 7.30 am and 12 noon and 190 undergoing surgery after noon.

All abscesses are included with the most common being perianal 119 (35%), pilonidal 40 (11.7%), breast 38 (11.2%), lower limb 38 (11.2%), axillary 37 (10.9%), groin/inguinal 43 (13%), abdominal wall 24 (7%).

The baseline characteristics were summarised in Table 1. There were 164 female (48%) and 175 male (52%) with mostly Europeans (61%), followed by Māori (15%), Pacific Islanders (15%), and Asian (9%). Ten percent of patients had Type 2 Diabetes. There were no significant differences between both the 'am' and 'pm' groups except for patients with diabetes were more likely to undergo abscess drainage in the morning.

The overall median age was 39 years old (Q1 27 years and Q3 51 years). Using Wilcoxon rank sum test, there was no statistically difference in age between the two groups (P=0.665).

Primary outcome—The overall median cost per case was NZ$2397.39 (Q1 NZ$1910.34 and Q3 NZ$3089.74). When the groups were categorised, the cost of the 'am' group was NZ$2236.63 (Q1 NZ$1878.72 and Q3 NZ$2728.72) compared to the 'pm' group of NZ$2531.70 (Q1 NZ$1951.18 and Q3 NZ$3337.92; p=0.0034 with respect to "am" surgical drainage).

Table 2 showed the relationship between the time of surgery and cost. Patients were divided into four groups according to the quartiles of the cost for the multivariate analysis. Taking into all confounding factors (including age, gender, ethnicity, smoking and Charlson score), the 'pm' group is 1.67 times more costly compared to the 'am' group (P=0.0104). In addition, Pacific Islanders and type 2 diabetes were associated with a higher cost.

Table 1. Patient characteristics vs timing of operation ('am' or 'pm')

Variable		AM (n=149)	PM (n=190)	P value
Gender	Female	78	86	0.195
	Male	71	104	
Ethnicity	European	90	118	0.787
	Asian	13	16	
	Māori	21	31	
	Pacific Islander	25	25	
Abscess site	Perianal	61	58	
	Pilonidal	18	22	
	Breast	20	18	
	Lower limb	19	19	
	Axilla	19	18	
	Abdominal	10	14	
	Inguinal	20	23	0.880
Charlson score	0 (ref)	117	139	0.522
	1	17	27	
	2 and more	15	24	
Type 2diabetes mellitus	No	141	163	0.008
	Yes	8	27	
Smoking	No	102	123	0.472
	Yes	47	67	
Discharge day of surgery		147	0	-

Table 2. Multivariate analysis of cost of operation timing 'am' vs 'pm'

Variable	Reference	Odds Ratio	95% Confidence Interval	
Age		1.02	1.00	1.03
Female	Male	0.91	0.61	1.34
Māori	European	0.79	0.45	1.38
Pacific Islander	European	1.90	1.08	3.37
Asian	European	1.43	0.71	2.89
Smoking	No smoking	0.98	0.65	1.49
Charlson score	Score <2	1.47	1.06	2.11
OT – pm	OT – am	1.67	1.13	2.48

Secondary outcome—The overall median length of stay was 2 days (Q1: 1 day; Q3: 2 days) and a mean of 2.2 days (SD 3.19). Comparing both groups resulted in similar median of 2 days but a mean of 1.89 days in the 'am' group and 2.48 days in the 'pm' group (Wilcoxon rank sum test, P=0.5297)..

For the multivariate analysis, patients were divided according to the distribution of length of stay for ordinal logistic regression. The three groups were less than 2 days, 2 days and more than 2 days. This showed that there were no statistical significant difference in length of stay between the two groups (Table 3, OR=1.08, 95%CI 0.72–1.63 for time of surgery).

The potential savings were calculated by subtracting the median of the 'am' and 'pm' group, which were NZ$295.07 per patient. Therefore, if all patients had their surgeries performed in the 'am', the potential savings would have totalled NZ$56063.30 in the 6 months period.

Table 3. Multivariate analysis of length of stay of operation timing 'am' vs 'pm'

Variable	Reference	Odds Ratio	95% Confidence Interval	
Age		1.01	0.99	1.02
Female	Male	0.92	0.61	1.39
Māori	European	1.17	0.65	2.10
Pacific Island	European	1.88	1.05	3.37
Asian	European	0.80	0.37	1.71
Smoking	No smoking	0.76	0.48	1.19
Charlson score	Score=0	1.75	1.02	3.00
OT – pm	OT – am	1.08	0.72	1.63

Discussion

This small study was undertaken in the context of an organisation-wide change in the way acute surgical patients are managed in our hospital.[3] Prior to 2011, surgical teams and consultants were rostered on acute take without any change to their concurrent elective commitments such as operating lists or outpatient clinics.

Consequently acute commitments had to be accommodated around elective commitments on the day. A similar situation existed on subsequent days as patients' condition changed or investigations were completed and the need for operative

intervention became apparent creating further issues for admitting teams with elective commitments to fulfil. In 2011 services were revised and a system instituted whereby the consultant taking weekend acute call would then be available and in house within normal working hours on the following Monday through Thursday inclusive to run a dedicated acute operating theatre and ensure timely management of patients needing acute surgery.

In addition, a surgical registrar was allocated to the acute theatre with the express role of performing acute surgical operations under the supervision of the acute consultant. This left the rostered admitting teams free to assess and investigate acute admissions and senior expertise available on subsequent days to manage acute patients requiring surgical intervention.

This system has been successful in increasing the numbers of patients managed during daylight hours and in reducing bed stay and waiting times in the emergency department. However the development of a dedicated system to manage acute patients has also provided the opportunity to reappraise and update our management protocols for common surgical conditions.

Cutaneous abscesses are commonly seen and a large part of the acute surgical workload of general surgical departments. Historically cutaneous abscesses were managed with surgical incision and drainage and packing of the cavity with ribbon gauze soaked in saline. Mostly this required general anaesthesia and overnight stay was recommended so the first dressing change could be undertaken in a hospital environment if narcotic analgesia was required.

In addition abscesses and other minor cases were generally scheduled late in the surgical day and treated by junior staff when more major cases such as laparotomy, cholecystectomy, and appendicectomy were completed. Partly this reflected the tradition of undertaking “dirty cases” after “clean cases” and also the greater likelihood of senior staff during the day to cover major cases. Based on the sheer numbers of abscesses presenting to surgical departments previous attempts have been made to streamline and improve their management.

The use of local anaesthetic analgesia with incision and drainage in emergency departments has been advocated[5] but is only suitable in a minority because of the sensitivity of the affected areas, difficulty in surgical access in sites such as the perianal area, difficulties in obtaining deep analgesia for the drainage of deeply placed and complex cavities and reduced effectiveness of local anaesthetic agents in the acidic tissue environment that accompanies acute inflammation. Consequently general anaesthesia is necessary for adequate drainage in the majority of cases.

We hypothesised that abscesses drained in theatre early in the surgical day would be able to be discharged later that day. For most patients this would mean a one night hospital stay (the night of admission). We believed this was possible for a number of reasons.

Air exchange and filtering units are now more effective and the need to schedule “dirty cases” after “clean cases” in an acute general surgical theatre is now no longer necessary and not associated with an increase in infective risk although this may not be the case in theatres dedicated to joint replacement or other similar environments.

General anaesthesia has now improved significantly with many short acting agents available and the need for patients to stay overnight to manage nausea or other post-anaesthetic symptoms is minimal. Finally packing of abscess cavities with saline soaked gauze is now no longer practice and most are managed with softer gelatine or seaweed based dressings in theatre which makes the first dressing change more straight forward and able to be performed by community based nurses in the patients home.

Our investigation has shown that incision and drainage in the "am" was safe with only 4 patients subsequently requiring readmission for further drainage and all were in complex perianal abscesses. This policy did not result in management delay of any major or high acuity cases and it is important to emphasise that the decision to operate on cutaneous abscess first was the decision of the acute surgical consultant of the day and only occurred when there were no more urgent cases to attend to.

In addition no patient complaints related to same day discharged have been received and this was associated with a cost saving of NZ$295.07 per patient. This saving represents the cost of a night in a general surgical ward. While it is not a large amount of money the frequency with which abscesses are treated means that over NZ$100,000 would have been saved annually if all cutaneous abscesses were managed in this way.

Analysis of the characteristic of patients managed with "am" drainage showed no obvious factors that made this more likely other than the presence of diabetes. This finding is indicative of standard surgical practice where diabetic are managed early in the morning to make subsequent blood sugar management for straight forward. Significantly there was no relationship between "am' drainage and patient age, sex or Charlson Comorbidity Status indicating that most patients can be managed in this way.

This small study can be criticised in a number of ways. It is a retrospective review and while it confirmed our hypothesis that earlier operation was associated with reduced hospital stay and potential cost savings, it has not defined the optimum patient group for this approach. In particular chart review was not useful in determining patients social situation which must be important in this approach since early discharge is only possible to patients with a stable and safe home environment and available caregivers.

In addition we did not find any statistical significance in the length of stay analysis although all but two patients (both of whom had significant cellulitis) operated on in the "am" group were discharged on the same day as surgery. This may be related to the observation unit of time as 'days' for length of stay. 'Days' as analysis unit is not differential in such a setting, with the median of length of stay as 2 days and subsequent investigations in the area will quantify patient hospital stay in hours.

We were also only able to accurately quantify in-hospital costs only but were unable to quantify other potential costs, such as days off work, medications, sick leave, district nursing care and costs associated with General Practitioner driven episodes of care. However this investigation has confirmed that prioritising "am' drainage of cutaneous abscesses is a safe and cost-effective strategy for acute surgical services.

A prospective trial is being developed to further define patient and abscess characteristics that are best suited to this approach and to acutely measure the associated community costs.

Competing interests: Nil.

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Acknowledgements: The authors acknowledge the staff of the Acute Surgical Theatre at North Shore Hospital and Delwyn Armstrong from Waitemata District Health Board for undertaking the cost calculations in this investigation.

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