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School of Public Health
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BRANZ
Burns Registry of Australia and New Zealand

Burn Quality Improvement Program: The use of clinical registry data to directly improve patient outcomes

A report from the BRANZ HCF Research Foundation Project team

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1 EXECUTIVE SUMMARY

Burn injuries are a significant global burden that are associated with substantial treatment and rehabilitation costs. Across Australia and New Zealand, more than 9,000 people each year are admitted to hospitals for treatment of a burn injury. The burn population is heterogeneous, meaning that patients require an individualised approach to their treatment.

Appropriate treatment during the early stages of injury is important, as this exerts a great influence on the recovery from burn injury and the patient's subsequent quality of life. Burn care management is multidisciplinary, requiring timely coordination of surgical, medical, and allied health services.

Clinical quality indicators (QIs) are used to measure, benchmark, and to drive improvement in the quality of health care. QIs can also be used to compare performance between sites. There are 17 specialist burns units in Australia and New Zealand that treat burns patients. However, as each unit may have different processes and models of care in place, there is a possibility that different units will manage patients differently.

This project aimed to use data from the Burns Registry of Australia and New Zealand (BRANZ) to quantify the variation in practice in the management of burn injuries across Australia and New Zealand burns units, and to explore how potential variation in practice between the buns units impact in-hospital outcomes.

Of all the QIs collected by the BRANZ, 11 were selected for detailed analysis as they displayed high levels of data completeness and clear variation in practice between the burns units contributing data to the BRANZ. The results of this project suggest that many of the QIs are applied differently depending on particular patient characteristics (i.e., age) and the severity of the burn (i.e., size and depth).

Each of the 11 QIs that underwent detailed analysis were associated with at least one relevant in-hospital outcome of interest. In the majority of cases the application of the QI predicted a longer hospital stay for these patients, compared to the patients where the QI was not applied. These findings may relate to the QIs being applied more frequently to patients with severe burns, as patients with more severe burns typically have longer hospital stays compared to less severely burned patients.

The results of this project show that the application of the QIs was associated with improved outcomes for patients. The administration of venous thromboembolism prophylaxis is a specific example. Prophylaxis use following a burn injury was associated with reduced odds of the patient experiencing in-hospital mortality. However, it is important to note that further analysis exploring the effects of venous thromboembolism prophylaxis in specific subgroups is required.

We used several composite measures to investigate how performance across multiple QIs related to the in-hospital outcomes. The composite measure ranks and the funnel plots allowed us to identify trends in site performance. Some sites performed well across many or all of the QIs, whereas some of the sites performed poorly across several QIs.

These results show that the variation in practice between the Australian and New Zealand burns units has an association with patient outcomes. Moving forward, collaboration with the sites is required to better understand the reasons for variation in practice, identify potential ways to reduce this variation, and to monitor the impact of changes in policies and guidelines on patient outcomes and hospital performance. These steps will lead to more consistent, better quality burn care across Australian and New Zealand burns units and improved outcomes for their patients.

2 PROJECT BACKGROUND

Significant burn injury is a distinct, complex, and important event. There are more than 9,000 admissions to Australian and New Zealand hospitals each year as a result of burn injuries [1-3]. Burns are associated with substantial treatment and rehabilitation costs, and treatment can often span decades [4-6].

The management of patients with burn injuries is resource intensive. Many patients require a protracted period of surgical, medical, physical, and psychological rehabilitation measures once their survival is ensured [4,6]. The burn population is heterogeneous with respect to both the patient population and the burn injury sustained, meaning most of patients require an individualised approach to burn treatment. Within Australia and New Zealand burn care takes a multidisciplinary approach, requiring the timely coordination of surgical, medical, and allied health services.

2.1 Clinical Quality Indicators

Clinical QIs are used to measure, benchmark, and to drive improvement in the quality of health care [7-10]. QIs are measurement tools based on standards of care that can be used to monitor performance, improve quality of care, and inform and change policy [11-13]. Importantly, indicators and assessment areas must be clinically meaningful and health planners or providers should be able to take action to enhance performance of the measure for the QIs to be valuable.

The Australian and New Zealand Burn Association (ANZBA) in conjunction with Monash University developed the BRANZ, that collects clinical QIs to enable routine monitoring and benchmarking quality of burn care across Australia and New Zealand. An internationally accepted methodology in developing standard clinical QIs guided by the Australia Commission on Safety and Quality in Health Care (ACSQHC) principles, was used by the Bi-National Burns Registry (Bi-NBR) – subsequently renamed as the BRANZ – QI working party to evaluate the quality of burn care across Australia and New Zealand [7,13].

Each indicator concept was researched extensively to determine the evidence base and practicality of collecting appropriate data. The Australian National Health and Medical Research Council (NHMRC) body of evidence matrix (Appendix 1) was used to rate and establish a grade of evidence base for the indicator concept [14]. Where additional information was required to determine the evidence for the indicator concept, or in understanding the feasibility of collecting the data, opinions from external experts in areas such as infectious diseases, biochemistry and dietetics was sought.

Information on quality of care can be classified into three categories: “structure,” “process,” and “outcome”. Structural indicators represent the attributes of the setting in which care occurs including material resources (e.g. facilities and equipment), human resources (e.g. number of personnel), and organisational structure (e.g. conducting weekly multidisciplinary meetings). Process indicators represents what is actually done in giving and receiving care such as practitioners’ activities in making a diagnosis and implementing treatment, or patients’ activities in seeking care. Outcome indicators indicate the effects of care on the health status of patients and populations (e.g. overall length of stay or if there was an unplanned readmission after discharge).

Using an internationally recognised methodology for the development of clinical QIs, the working party, which consisted of multidisciplinary burn clinicians from both adult and paediatric burn centres across Australia and New Zealand, developed four structural, eight process and eight outcome indicators for inclusion and routine reporting in the Bi-NBR at the time of its launch in July 2009. With six years of data collected since the initial development of the indicators, the QI Working Party (QIWP) reviewed the clinical QI in terms of relevance and meaning, as well as considered others. In July 2016, the list of QIs in the BRANZ was updated to four structural, 10 process, and eight outcome indicators, with some QIs/data items being removed as they were not considered useful (e.g., duplicates of existing indicators), some QIs revised, and some new QIs added.

Table 1 shows the clinical QIs and data item that were unchanged following the review in 2016.

Table 1: Unchanged clinical quality indicators following 2016 review

Quality Indicator/Data Item	Type
If the patient had a LOS > 2 weeks;	Process
Were they weighed between 3 – 5 days of admission?	
Were they weighted weekly during the episode of care?	
Did the patient lose weight during the episode of care i.e. Discharge weight is less than admission weight?	Outcome
Overall LOS for acute episode of care	Outcome
Intensive care unit LOS	Outcome
Mechanical ventilator time	Outcome
Were there other burn wound management procedures(s) conducted during the 'first theatre episode?	Data Item

LOS = Length of Stay.

Table 2 shows the clinical QIs and data items that were changed following the review in 2016. Six clinical QIs were changed as part of the 2016 review. The changes to these indicators included being updated to reflect best clinical practice, being simplified to prevent confusion/provide additional flexibility, being modified to collect additional information, and being changed to avoid unnecessary duplication. Two data items – relating to burn wound treatment and readmissions to the intensive care unit – were also revised as part of the review. The change to the former involved a reduction in the number of potential responses due to the addition of escharotomy as an independent data item, while the change to the latter involved additional fields regarding whether the readmission was planned or unplanned to better understand the incidence of unplanned readmissions in burns patients.

Table 3 shows the new QIs and data items that were implemented following the 2016 review. The new clinical QIs related to infection control and management, various assessments of the burn injury and the patient, and the management of the burn injury (i.e., fluid resuscitation and anticoagulation prophylaxis administration). The newly implemented data item related to whether the patient received an escharotomy, and if so, the time and location that the escharotomy was performed.

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Table 2: Revised clinical quality indicators following 2016 review

Initial Indicator	Revised Indicator	Type	Comments	NHMRC Level of Evidence
First Aid Were any burn cooling techniques completed at: • Scene of injury • Ambulance • Referral centre • Bi-NBR ED If yes: Was cool running water used? If yes: • How long was cool running water applied? • Was cool running water completed within three hours of the burn injury? • Intervention provided by? Was hydrogel applied? If yes: • Intervention applied by? Other cooling techniques?	**First Aid** Was any first aid applied? If yes: Was the first aid applied 20 minutes of cool running water within three hours of injury? Free-text field for additional first aid information	Process	QI was changed to match the ANZBA gold standard of 20 minutes of cool running water within 3 hours of injury.	B
Physical Functioning Assessment Did adults with >15 %TBSA and children with > 10 %TBSA receive assessment of their physical functioning by physio and/or OT within 48 hours of admission?	**Physical Functioning Assessment** For patients with LOS >48 hours, did the patient have a physical functioning assessment by the Physiotherapist/Occupational Therapist in <48 hours of admission?	Process	Advice from the ANZBA Allied Health Expert Reference Group suggested that all patients regardless of their %TBSA should have a complete assessment with 48 hours of admission. Rehabilitation following burn injury requires a coordinated early approach from a specialised multi-disciplinary team to minimise complications from burns such as scarring, contractures and loss of function.	D
Excision of Deep Burns For full thickness burns was a complete excision of the burn completed by day 5 of admission?	**Excision of Deep Burns** What date was the deep burns excision completed?	Data item	Original QI had negative connotations in the absence of evidence and was also difficult to collect. The new QI was changed so include all times and practices.	A
Enteral/Parenteral Feeding	**Enteral/Parenteral Feeding** Did the patient receive enteral or parenteral feeding?	Process	QI was separated into two – cater to burn units who wanted to collect data on all patients who received any enteral nutrition	B

For an adult with >20 %TBSA and a child with >10 %TBSA was enteral or parenteral feeding commenced within 24 hours of injury?	If %TBSA >20 %TBSA and >15% Children – Was Enteral/Parenteral Nutrition commenced within 24 hours of admission to the Burn Service?		(patients with smaller burns are usually not enterally fed in <24 hours – only after issues are identified – therefore this QI was changed to capture that. ANZBA Allied Health Clinical Practice Guidelines recommended early enteral feeding for paediatrics with burns exceeding 15 %TBSA and therefore changed to match this.	
Unplanned Readmissions Unplanned readmission within 28 days of discharge?	**Unplanned Readmissions** Was the patient readmitted within 28 days of discharge? If yes: Date and time of readmission? Was the readmission due to a complication?	Outcome	Direct question of "was the readmission due to a complication" was included to clarify if it was a planned or unplanned readmission? This would be an indication of the quality of care given. It was recommended the addition of a drop down menu was needed to specify reasons for readmission.	D
In-hospital mortality In hospital mortality	**In-hospital mortality** In-hospital mortality	Outcome	It was recommended to include a drop down menu options for "treatment decision" section of this data item as the current working implies treatment was withdrawn without context. Drop down menu selection criteria: 1. Palliative management 2. Active treatment initiated subsequently changed to palliative management 3. Active treatment until the time of death	D
Burn Wound Assessment Was the burn size documented? Who completed the assessment? Assessment date/time?	**Burn Wound Assessment** Was the burn size documented? Assessment date/time Who completed the assessment?	Process	The QI "Was a burn surgeon or nurse practitioner assessment completed < 24 hours of admission?" was removed in lieu of this data. On review, the QIWP agreed that the QI listed did relate to assessment of the burn wound so it was duplication of data.	D

Was a burn surgeon or nurse practitioner assessment completed within 24 hours of admission?				
ICU Readmission Was the patient readmitted to the ICU? Date and time of readmission	**ICU Readmission** Was the patient readmitted to the ICU? Date and time of readmission Was this readmission planned or unplanned? Free text field for additional readmission information	Data Item	Knowing about patients who return to ICU is useful information as a possible sign of the quality of patient care.	D

ANZBA = Australian and New Zealand Burns Association; Bi-NBR ED = Bi-National Burns Registry Emergency Department; ICU = Intensive Care Unit; N/A = Not Available; NHMRC = National Health and Medical Research Council; LOS = Length of Stay; OT = Occupational Therapist; TBSA = Total Body Surface Area; QI = Quality Indicator; QIWP = Quality Indicator Working Party.

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Table 3: New clinical quality indicators following 2016 review

New Indicator	Comments	Type	NHMRC Level of Evidence
Multi Resistant Organisms Did this patient have any NEW positive micro results (regardless of location) of the following organisms: • MRSA • VRE • Carbapenem resistant Pseudomonas • Carbapenem resistant Enterobacter If yes: Site and date of positive swab Was this isolated on admission?	Culture of resistant microorganisms can be an indicator of hand hygiene practices and over use of antibiotics.	Outcome	B
Positive Blood Culture Management Did the Patient have blood cultures taken during the admission? Date and Time of First Positive Result What microorganism was identified in the first positive blood culture result? At the time of the first positive result, was the patient on appropriate antibiotics?	This QI can identify the number of positive blood cultures recorded during admissions to BRANZ burns units. For quality burn care, it is reasonable to expect that if and when a clinician takes blood cultures because they suspect the patient has a bloodstream infection –thoughtful consideration regarding antibiotic selection should be given — it would be unreasonable to start antibiotics once the organism has been isolated.	Outcome	C
Malnutrition Risk Screening and Assessment For patients with LOS > 24 hours, was the patient screened for risk of malnutrition within 24 hours of Admission? If the Malnutrition Risk Screening was positive, did the patient have a complete Nutritional Assessment with 24 hours of the positive screen?	Early identification of patients who are nutritionally depleted (or who are at risk to become so) is vital to provide best quality care and use resources effectively. Proactive early treatment can be used to mitigate the risk and deleterious effects of malnutrition.	Process	D
Pain Assessment Did the patient have a pain assessment completed (using a validated Pain Scale) within 24 hours of Admission?	It is reasonable to expect that a patient who has been admitted for a burn injury should have an assessment of their pain within 24 hours of admission.	Process	D
Psychosocial Assessment For patients with a LOS >48 hours, did they have their psychosocial needs screened during their admission?	Psychosocial care is paramount to quality burn care. There is no evidence regarding the timeliness of screening or assessment of psychosocial needs in burn injuries which is why no time frame around the initial screening should	Process	B

For patients who tested positive on their psychosocial screen, were they referred to psychosocial services in <24 hours of the positive screen? When did psychosocial assessment occur?	occur. The timeframe of >48 hours was used to increase the sensitivity of the QI for those with more complex injuries or needs. If the screen was positive for psychosocial issues, it is reasonable to expect as good quality care that a referral to psychosocial health care clinicians should be made in <24 hours.		
Fluid Resuscitation For burns >20 %TBSA (adults) and >10 %TBSA (children): Was there evidence/documentation in the medical record, that an accepted Formula (Parklands or similar) was used to estimate the patients fluid resuscitation requirements in the first 24 hours of admission?	Fluid resuscitation remains a cornerstone of quality early burn care. Specialised burn care includes the estimation of fluid resuscitation requirements in severe burns.	Process	B
Venous Thromboembolism Prophylaxis If the patient is ≥16 years old, did they receive anticoagulation prophylaxis?	Anticoagulation prophylaxis is used in adult burn patients to prevent venous thrombosis and pulmonary embolism. This data item will assist in better understanding of anticoagulation prophylaxis practices in adults with burn injuries.	Data Item	C
Escharotomy Did the patient have an escharotomy? Date & Time Where was it Performed?	This data item highlights the severity and possible complications such as distal limb ischemia. The data item is included to allow time to escharotomy to be calculated as a process indicator.	Data Item	C
Burn Wound Assessment Was there evidence in the medical history that an accepted diagram was used to accurately calculate %TBSA by the burn clinicians at the burn unit (e.g. Lund Browder or the Rule of Nine)?	Specialised burn care includes the estimation of %TBSA burns. The %TBSA burn is used to determine severity of burn and calculate fluid resuscitation requirement.	Process	C

LOS = Length of Stay; N/A = Not Available; NHMRC = National Health and Medical Research Council; MRSA = Methicillin-resistant Staphylococcus aureus; QI = Quality Indicator; TBSA = Total Body Surface Area; VRE = Vancomycin-resistant Enterococci.

3 AIM

This project aimed to use the Australian and New Zealand Burns Association (ANZBA) Burns Quality Improvement Program (BQIP) to quantify variation in practice in the management of serious burn injuries across Australian and New Zealand burns units.

4 METHODS

4.1 Identification of Cases

Patients were eligible for inclusion in this study if they had an acute admission to an Australian or New Zealand burns unit registered by the BRANZ between July 2009 and December 2018 (inclusive). Inclusion and exclusion criteria for the BRANZ are listed in Appendix 2.

4.2 Data Management and Analysis

Demographic, injury event, admission, management, QI, and in-hospital outcome data were extracted from the BRANZ for eligible patients. Summary statistics were used to describe the patient population and outcomes; frequencies and percentages for categorical variables, mean and standard deviation (SD) for normally distributed continuous variables, and median and interquartile range (IQR) for continuous variables not following a normal distribution. These statistics were used to describe the profile of patients across the following groups:

i. Pre-QI change – patients with a date of admission from July 2009 to June 2016;

ii. Post-QI change – patients with a date of admission form July 2017 to December 2018.

Of all the QIs promulgated by the BRANZ, 11 were selected for detailed analysis based on displaying high levels of data completeness and notable variation in practice between the BRANZ sites collecting the QIs. The QIs were included in analysis based on their relevance to the in-hospital outcomes collected by the BRANZ; mortality, the overall hospital length of stay (LOS), discharge disposition (for patients surviving to discharge), and whether the patient was readmitted to the BRANZ hospital after discharge from the acute admission episode (regardless of whether the readmission was planned or unplanned; Table 4).

Table 4: Quality Indicators and In-hospital Outcomes of Interest

	Mortality	LOS	Discharge Disposition	Readmission
Was a diagram used to accurately assess the size of the burn?	✓			
Was the patient admitted to theatre for a surgical procedure?	✓	✓		✓
Did the patient receive a skin graft?	✓			✓
Did the patient receive their skin graft within 105.8 hours of admission?*	✓	✓		✓
Did the first excision of burn injuries occur in less than 12.5 days?*	✓	✓	✓	
For patients with a LOS greater than 48 hours, did the patient have a physical functioning assessment by a physiotherapist or occupational therapist within 48 hours of admission?		✓	✓	✓
For patients with a LOS greater than 24 hours, was the patient screened for their risk of malnutrition within 24 hours of admission?	✓	✓	✓	
For patients with a LOS greater than 48 hours, did the patient have their psychosocial needs screened during their admission?			✓	✓
Was the patient admitted to the ICU?	✓	✓	✓	
For patients admitted to the ICU, was the patient mechanically ventilated for less than 163.2 hours?*	✓			
If the patient was 16 years or older, did they receive anticoagulation prophylaxis?	✓			

* Values based on 75th percentile.
ICU = intensive care unit; LOS = length of stay.

Valid data is important aim for clinical quality registries. Invalid data includes responses such as 'not stated/inadequately described', 'not applicable', and situations where no response has been entered. Invalid data also includes unknown dates (09/09/9999) or values (-1) responses. For each QI of interest, the frequency and percentage of valid and invalid responses were calculated for each site. The frequency and percentage of the number of times the QI was met was also calculated for each site. The characteristics of patients who did and did not meet the QI were described using summary statistics; frequencies and percentages for categorical variables, median and IQR for continuous variables not following a normal distribution.

Funnel plots were then used to compare performance on various QIs and data items between the specialist burns units in Australia and New Zealand that contributed data to the BRANZ between July 2009 and December 2018. Site-specific performance ratios were calculated from each admission's probability of meeting the QI. Performance on the QIs and data items were adjusted to account for the effects of patient age, patient gender (male/female), the primary cause of burn injury (flame/scald/contact/other), the logarithmic transformed percentage total body surface area burned (%TBSA), and whether the patient had a documented inhalation injury (yes/no). Site-specific risk adjusted performance rates were subsequently calculated by multiplying the site-specific performance rate by the average registry-wide performance rate. Site performance rates were then plotted against the number of admissions using the 'funnelcompar' command in Stata

with the 95% (two standard deviations) and 99.8% (three standard deviations) control limits (the inner and outer grey dashed lines in the plots, respectively) around the target (the registry-wide performance rate represented as the horizontal red line on the chart). Burns units for which the performance was more than three standard deviations from the registry-wide performance were considered to be outliers.

Mixed effects logistic regression models and multilevel mixed effects generalised linear models (accounting for the random effects of BRANZ hospital) were performed to determine if there was an association between whether or not a patient received a particular QI and in-hospital outcomes. Due to the skewed distribution of continuous outcome measures (i.e., ICU and overall hospital LOS, time spent on a mechanical ventilator), a natural logarithm was used for all analyses. Unadjusted models were run initially, followed by risk-adjusted models that accounted for 'true confounders'—characteristics that differed between both the patient group and the outcome. The list of potential 'true confounders' included in the risk-adjusted models were: patient age group (male/female), patient gender (male/female), the primary cause of the burn (flame/contact/scald/other), the %TBSA group (< 10%, 10-19%, 20-49%, ≥ 50%), the depth of the burn (superficial or mid-depth only/deep dermal or full-thickness ± superficial or mid-dermal burn), whether the patient was admitted to the ICU (yes/no), and whether the patient had a documented inhalation injury (yes/no). Unadjusted and risk-adjusted odds ratios (ORs) or mean differences and 95% confidence intervals (CIs) are reported for the mixed effects logistic regression models. As a logarithmic transformation was used for continuous variables, the coefficients from the multilevel mixed effects generalised linear models were exponentiated to report a ratio of geometric means, and the corresponding 95% CIs were calculated and presented.

To compare performance across a range of relevant QIs, composite performance measures were created. The QIs were entered into analyses according to the opportunity model specified by Scinto et al. [15], which presents QIs as the ratio of the number of patients who received the process of care as specified by the QI compared to the number of patients eligible to receive the process.

Two denominator-based weight (DBW) approaches described by Schwartz et al. [16] were applied. The first method involved assigning weights to each QI for each observation per hospital (DBWhosp), whereas the second method generated an individual weight per QI that was the same across all hospitals (DBWall). A third weighting scheme used the number of occasions each hospital was identified as an outlier (i.e., more than three standard deviations from the overall registry mean) of the previously generated funnel plots for each QI.

The correlation between each in-hospital outcome of interest and each composite measure was assessed using Spearman's rank order correlation coefficient (ρ). For mortality, the composite performance measures were correlated against the number of in-hospital deaths at each site. For LOS, the 75th percentile for the LOS of the entire study population was calculated (9.6 days). The LOS for each participant was then coded as being beneath or above the 75th percentile value. The number of participants with a LOS within the 75th percentile was counted for each site and compared to the three composite measures of hospital performance. For the patients surviving to discharge, the location to which patients were discharged was recoded into either 'home/usual place of residence' and 'other'. The number of patients discharged to home at each site were then counted. For each outcome, the Spearman's rank order correlation coefficients for each composite performance measure were compared to determine if the correlation coefficients differed from one another.

5 RESULTS

5.1 Overview of BRANZ Admissions

There were 27,183 patients recorded by the BRANZ who were admitted during the study timeframe; 18,800 were admitted prior to the QI change and another 8,383 were admitted after the QI change. Most patients were male (67.7%), adult (68.5%; median age 27 years), and a scald was the most common cause of burn injury (36.6%). Most patients sustained a burn of less than 10 %TBSA (82.3%; median TBSA of 3%) and were discharged to their home or usual place of residence at the end of their admission (86.4%).

Table 5 summarises the profile of patients admitted to BRANZ participating hospitals since July 2009. The profile of patients admitted since the changes to the QI differs slightly from the profile of patients prior to the QI changes. Patients

admitted to the BRANZ after the QI change in 2016 are older, and a greater proportion of these patients sustained a contact burn. A greater proportion of patients sustained a deep-dermal or full-thickness burn, but the proportion of patients who sustained a burn less than 10 %TBSA increased. A greater proportion of patients were admitted to theatre for a surgical procedure, but fewer patients were admitted to the intensive care unit (ICU). There was a decrease in the overall hospital LOS.

Table 5: Demographic characteristics by injury date

Population Descriptor	Pre-QI Change (n = 18,800)	Post-QI Change (n = 8,383)
Gender		
Female	6,104 (32.5%)	2,676 (31.9%)
Male	12,696 (67.5%)	5,707 (68.1%)
Age, median (IQR) years [a]	26.0 (7.0, 46.0)	29.0 (10.0, 49.0)
Age Group [a]		
Paediatric	6,131 (32.6%)	2,442 (29.1%)
Adult	12,668 (67.4%)	5,939 (70.9%)
Burn Cause [b]		
Flame	6,412 (34.2%)	2,767 (33.2%)
Scald	6,862 (36.6%)	3,026 (36.3%)
Contact	2,989 (16.0%)	1,465 (17.6%)
Other	2,473 (13.2%)	1,087 (13.0%)
Burn Depth [c]		
Superficial/mid dermal only	7,264 (45.4%)	2,664 (35.1%)
Deep dermal/full thickness	8,746 (54.6%)	4,924 (64.9%)
TBSA, median (IQR) percent [d]	3.0 (1.0, 7.0)	3.0 (1.0, 6.5)
TBSA Group [d]		
< 10%	14,675 (81.7%)	6,856 (83.5%)
10-19%	2,132 (11.9%)	877 (10.7%)
20-49%	913 (5.1%)	370 (4.5%)
≥ 50%	232 (1.3%)	105 (1.3%)
Documented Inhalation Injury [e]		
No	17,905 (95.4%)	7,998 (95.8%)
Yes	865 (4.6%)	353 (4.2%)
Theatre for Procedure [f]		
No	5,083 (27.4%)	1,962 (23.4%)
Yes	13,436 (72.6%)	6,408 (76.6%)
ICU Admission [g]		
No	16,674 (89.1%)	7,618 (91.3%)
Yes	2,050 (10.9%)	729 (8.7%)
In-hospital Deaths [h]		
No	18,535 (98.9%)	8,277 (98.8%)
Yes	208 (1.1%)	100 (1.2%)
Discharged to Home		
No	2,347 (12.7%)	1,018 (12.3%)
Yes	16,188 (87.3%)	7,259 (87.7%)
LOS, median (IQR) days	4.2 (1.7, 9.9)	3.6 (1.2, 8.9)

Data are presented as frequency (percentage) unless otherwise specified.

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

[a] n = 3 missing; [b] n = 102 missing; [c] n = 3,585 missing; [d] n = 1,023 missing; [e] n = 62 missing; [f] n = 294 missing; [g] n = 112 missing; [h] n = 63 missing; [i] n = 75 missing.

5.2 Was there evidence in the medical history that an accepted diagram was used to accurately calculate burn size by the clinicians at the burn unit?

5.2.1 Overview

The %TBSA of the burn is used to determine the severity of the burn and calculate fluid resuscitation requirements. Appropriate fluid resuscitation is a cornerstone of early quality burn care. The BRANZ determines if accepted tools were used to determine the %TBSA in the assessment of the patient's burn. Accepted diagrams include the Lund Browder or the Rule of Nines diagrams. This QI was introduced on July 1 2016, and is conditional depending on whether or not the patient's burn size was documented (i.e., admissions where the burn size was not documented do not require a response to this indicator).

5.2.2 Data Validity

Ninety-nine percent of admissions (n = 8,263) had a complete response to the diagram use QI. Of the admissions that had a complete response to the diagram use QI, 95.2% of admissions had a valid response. Data validity for the diagram use QI ranged from 69.1% at Site 12 to 100% at Sites 5 and 7. Table 6 displays the validity data for the diagram use QI for each site, sorted by the percentage of invalid responses.

Table 6: Validity data for whether an accepted diagram was used

	Valid		Invalid	
Site	N	%	N	%
12	400	69.1%	179	30.9%
8	265	84.4%	49	15.6%
15	233	86.6%	36	13.4%
9	230	88.8%	29	11.2%
14	360	89.8%	41	10.2%
17	215	94.3%	13	5.7%
3	167	96.0%	7	4.0%
11	426	97.9%	9	2.1%
6	846	98.3%	15	1.7%
16	809	98.8%	10	1.2%
4	284	99.0%	3	1.0%
13	748	99.5%	4	0.5%
1	974	99.5%	5	0.5%
2	689	99.6%	3	0.4%
10	888	99.9%	1	0.1%
5	223	100.0%	0	0.0%
7	222	100.0%	0	0.0%

5.2.3 Site Performance

Of the valid responses, 69% of admissions (n = 5,530) reported that an accepted diagram was used to accurately calculate the %TBSA of the burn. The proportion of admissions where an accepted diagram was used ranged from 1.3% at Site 5 to 98.7% at Site 2. Table 7 displays the performance data for the diagram use for each site, sorted by the percentage of admissions where an accepted diagram was used.

Table 7: Site performance for whether an accepted diagram was used

	Diagram Used		Diagram Not Used	
Site	N	%	N	%
2	680	98.7%	9	1.3%
10	875	98.5%	13	1.5%
1	934	95.9%	40	4.1%
4	272	95.8%	12	4.2%
6	810	95.7%	36	4.3%
12	339	84.8%	61	15.3%
17	158	73.5%	57	26.5%
14	256	71.1%	104	28.9%
16	569	70.3%	240	29.7%
15	139	59.7%	94	40.3%
8	114	43.0%	151	57.0%
3	64	38.3%	103	61.7%
11	150	35.2%	276	64.8%
9	68	29.6%	162	70.4%
7	36	16.2%	186	83.8%
13	63	8.4%	685	91.6%
5	3	1.3%	220	98.7%

5.2.4 Patient Characteristics

Table 8 displays the characteristics of patients who did and did not have an accepted diagram used to accurately calculate the %TBSA of their burn. A greater proportion of patients who had a diagram used were adults, had sustained a flame burn, had a burn that exceeded 10 %TBSA, had clinical documentation of an inhalation injury, and were admitted to the ICU.

Table 8: Characteristics of patients who did and did not have a diagram used in the assessment of their burn injury

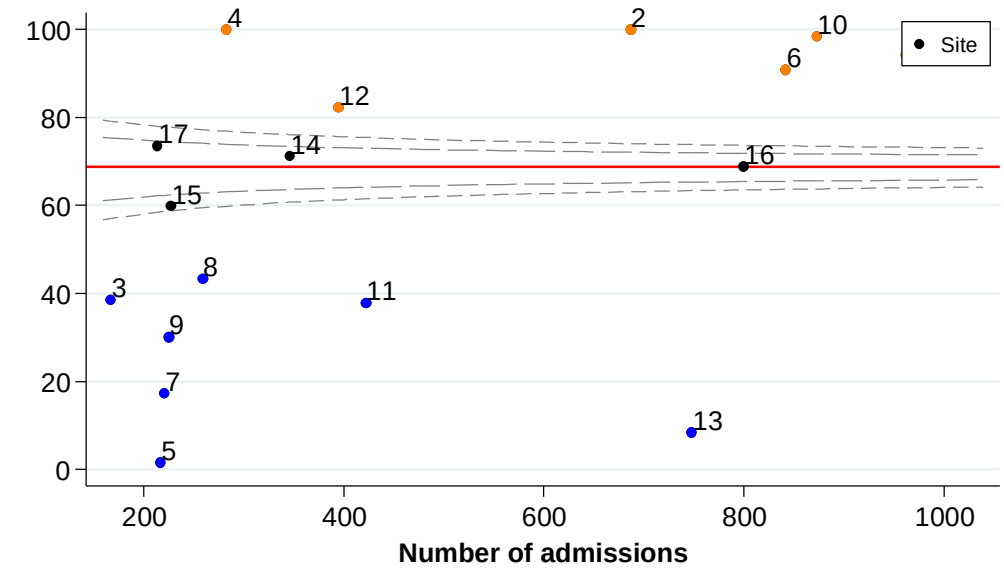
	No Diagram Used (n = 2449)	Diagram Used (n = 5530)	*p*-value
Age, median (IQR) years	25.0 (5.0, 47.0)	30.0 (14.0, 49.0)	<0.001
Age Group, N (%)			<0.001
Paediatric	915 (37.4%)	1,454 (26.3%)	
Adult	1,532 (62.6%)	4,076 (73.7%)	
Gender, N (%)			0.030
Male	1,632 (66.6%)	3,821 (69.1%)	
Female	817 (33.4%)	1,709 (30.9%)	
Burn Cause, N (%)			<0.001
Flame	654 (26.8%)	1,993 (36.2%)	
Scald	898 (36.8%)	1,989 (36.1%)	
Contact	509 (20.9%)	897 (16.3%)	
Other	376 (15.4%)	628 (11.4%)	
TBSA, median (IQR) %	2.0 (1.0, 5.0)	3.0 (1.0, 7.0)	<0.001
TBSA Group, N (%)			<0.001
<10%	2,157 (88.9%)	4,486 (81.2%)	
10-19%	185 (7.6%)	662 (12.0%)	
20-49%	65 (2.7%)	289 (5.2%)	
50+%	18 (0.7%)	86 (1.6%)	
Burn Depth, N (%)			0.004
Superficial/mid dermal only	702 (32.4%)	1,854 (35.9%)	
Deep dermal/full thickness	1,465 (67.6%)	3,315 (64.1%)	
Documented Inhalation Injury, N (%)			0.007
No	2,365 (96.7%)	5,257 (95.4%)	
Yes	80 (3.3%)	253 (4.6%)	
Admitted to ICU, N (%)			<0.001
No	2,293 (94.0%)	4,965 (90.1%)	
Yes	147 (6.0%)	545 (9.9%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.2.5 Variation Between Sites

For patients admitted to the BRANZ since July 2016, the risk-adjusted rate of diagram use to calculate the %TBSA of the burn was more than three standard deviations from the registry wide mean for 13 sites (Figure 1). The funnel plot identified seven outliers below the mean (Sites 3, 5, 7, 8, 9, 11, and 13), and six sites as outliers above the mean (Sites 1, 2, 4, 6, 10, and 12).

Figure 1: Funnel plot for diagram used to calculate %TBSA



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.2.6 In-hospital Outcomes

Table 9 summarises the in-hospital outcomes for diagram use. The use of an accepted diagram to calculate the size of the burn was associated with a 31% longer overall hospital LOS. The use of an accepted diagram to calculate the size of the burn was not associated with any of the remaining in-hospital outcomes in the risk-adjusted models.

Table 9: In-hospital outcomes for the use of a diagram to assess burn size

Acute Kidney Injury (RIFLE Criteria)	**No AKI**	**AKI**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
No Diagram Used	597 (97.6%)	15 (2.4%)	1.00	1.00
Diagram Used	1,812 (96.8%)	60 (3.2%)	1.56 (0.83, 2.95)	1.05 (0.54, 2.06)
Acute Kidney Injury (ICD-10-AM Codes)	**No AKI**	**AKI**		
No Diagram Used	1,159 (96.8%)	38 (3.2%)	1.00	1.00
Diagram Used	3,079 (98.3%)	52 (1.7%)	0.93 (0.51, 1.69)	0.72 (0.37, 1.42)
Multisystem Organ Failure (BRANZ Cause of Death)	**No MSOF**	**MSOF**		
No Diagram Used	15 (71.4%)	6 (28.9%)	1.00	1.00
Diagram Used	40 (57.1%)	30 (42.9%)	2.94 (0.71,12.16)	3.54 (0.75, 16.70)
In-hospital Mortality	**Survived**	**Died**		
No Diagram Used	2,427 (99.1%)	22 (0.9%)	1.00	1.00
Diagram Used	5,452 (98.7%)	73 (1.3%)	1.79 (0.93, 3.49)	0.98 (0.52, 1.84)
ICU LOS (Days)	**Median (IQR)**		**Unadjusted ratio of geometric mean (95% CI)**	**Adjusted ratio of geometric mean (95% CI)**
No Diagram Used	2 (1-7)		1.00	1.00
Diagram Used	3 (1-10)		1.18 (0.90, 1.54)	0.98 (0.76, 1.26)
Ventilator Time (Hours)				
No Diagram Used	44.9 (19.4-182.5)		1.00	1.00
Diagram Used	54.6 (20-216)		1.07 (0.76, 1.53)	0.94 (0.69, 1.30)
In-hospital LOS (Days)				
No Diagram Used	2.8 (1.0-7.6)		1.00	1.00
Diagram Used	4.0 (1.5-9.6)		*1.34 (1.25, 1.45)*	*1.31 (1.22, 1.41)*

AKI = acute kidney injury; BRANZ = Burns Registry of Australia and New Zealand; CI = confidence interval; ICU = intensive care unit; ICD-10-AM = International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification; IQR = interquartile range; LOS = length of stay; MSOF = multisystem organ failure; OR = odds ratio.
Significant findings are highlighted by *red, italicised text*.

5.3 For patients with a length of stay greater than 48 hours, did the patient have a physical functioning assessment by the physiotherapist or occupational therapist within 48 hours of admission?

5.3.1 Overview

Rehabilitation following burn injury requires a coordinated early approach from a specialised multi-disciplinary team to minimise complications from burns such as scarring, contractures and loss of function. Advice from the ANZBA Allied Health Expert Reference Group suggested that all patients regardless of their burn size should have a complete assessment within 48 hours of admission. This QI was introduced on July 1 2016, and is conditional on the LOS of the patient (i.e., only required for patients with a LOS exceeding 48 hours).

5.3.2 Data Validity

Between July 1 2016 and December 2018, there were 5,406 admissions to the BRANZ with a LOS exceeding 48 hours. Ninety-nine percent of admissions (n= 5,385) had a complete response to the QI. Of the admissions that had a complete response to the QI, 96.6% of admissions had a valid response. Data validity ranged from 83.1% at Site 8 to 100% at Site 13. Table 10 displays the validity data for the physical functioning assessment QI for each site, sorted by the percentage of invalid responses.

Table 10: Validity data for whether the patient received a physical functioning assessment

	Valid		Invalid	
Site	N	%	N	%
8	212	83.1%	43	16.9%
15	145	85.8%	24	14.2%
9	161	92.0%	14	8.0%
4	188	92.2%	16	7.8%
2	168	93.3%	12	6.7%
16	605	94.1%	38	5.9%
17	124	95.4%	6	4.6%
5	126	96.9%	4	3.1%
12	333	97.1%	10	2.9%
14	307	97.2%	9	2.8%
10	600	98.2%	11	1.8%
3	113	98.3%	2	1.7%
7	82	98.8%	1	1.2%
6	699	99.1%	6	0.9%
1	702	99.2%	6	0.8%
11	253	99.6%	1	0.4%
13	385	100.0%	0	0.0%

5.3.3 Site Performance

Of the valid responses, 82.4% of admissions (n = 4,288) reported that a physical functioning assessment was performed. The proportion of admissions that received a physical functioning assessment ranged from 6.9% at Site 4 to 99.8% at Site 10. Table 11 displays the performance data for the physical functioning assessment for each site, sorted by the percentage of admissions that received an assessment.

Table 11: Site performance for whether the patient received a physical functioning assessment

	Received Assessment		Did Not Receive Assessment	
Site	N	%	N	%
10	599	99.8%	1	0.2%
1	696	99.1%	6	0.9%
16	567	93.7%	38	6.3%
6	646	92.4%	53	7.6%
8	194	91.5%	18	8.5%
12	304	91.3%	29	8.7%
5	111	88.1%	15	11.9%
15	124	85.5%	21	14.5%
14	261	85.0%	46	15.0%
2	128	76.2%	40	23.8%
13	256	66.5%	129	33.5%
17	73	58.9%	51	41.1%
11	142	56.1%	111	43.9%
3	60	53.1%	53	46.9%
9	84	52.2%	77	47.8%
7	30	36.6%	52	63.4%
4	13	6.9%	175	93.1%

5.3.4 Patient Characteristics

Table 12 displays the characteristics of patients who did and did not receive a physical functioning assessment. A larger proportion of adult and male patients received an assessment, as did a larger proportion of patients with a flame burn. Patients who received an assessment sustained larger burn injuries compared to patients who did not receive an assessment. A greater proportion of patients who received an assessment had a documented inhalation injury and were admitted to the ICU.

Table 12: Characteristics of patients who did and did not receive physical functioning assessment of their burn injury within 48 hours of admission

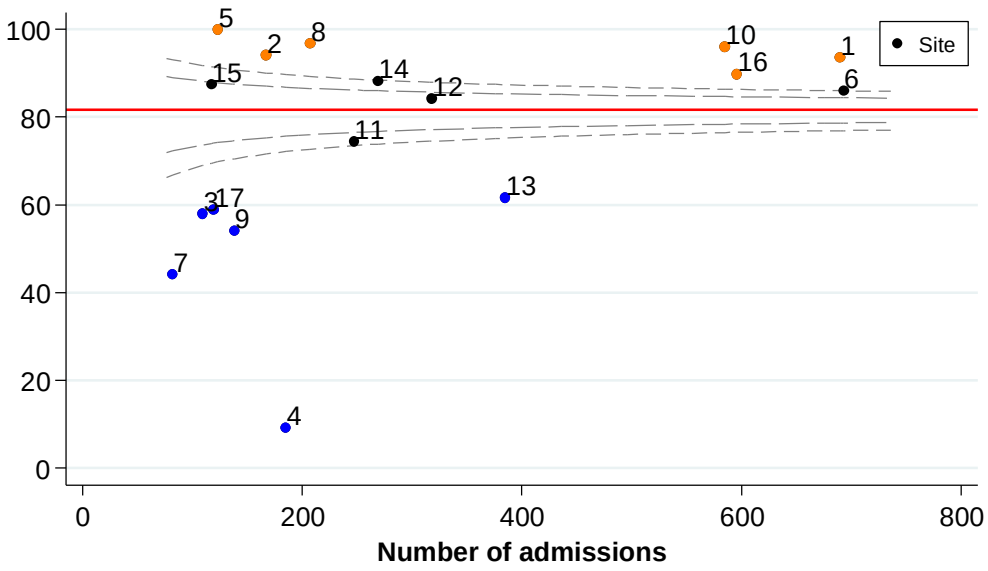
	Physical Functioning Assessment Received (n = 4288)	Physical Functioning Assessment Not Received (n = 915)	*p*-value
Age, median (IQR) years	37.0 (22.0, 56.0)	11.0 (2.0, 41.0)	<0.001
Age Group, N (%)			<0.001
Paediatric	659 (15.4%)	502 (54.9%)	
Adult	3,629 (84.6%)	413 (45.1%)	
Gender, N (%)			<0.001
Male	3,075 (71.7%)	573 (62.6%)	
Female	1,213 (28.3%)	342 (37.4%)	
Burn Cause, N (%)			<0.001
Flame	1,819 (42.6%)	204 (22.4%)	
Scald	1,359 (31.9%)	445 (48.8%)	
Contact	600 (14.1%)	171 (18.8%)	
Other	488 (11.4%)	91 (10.0%)	
TBSA, median (IQR) %	4.0 (1.5, 10.0)	3.0 (1.0, 6.5)	<0.001
TBSA Group, N (%)			<0.001
<10%	3,124 (74.2%)	756 (85.7%)	
10-19%	689 (16.4%)	106 (12.0%)	
20-49%	329 (7.8%)	18 (2.0%)	
50+%	66 (1.6%)	2 (0.2%)	
Burn Depth, N (%)			<0.001
Superficial/mid dermal only	1,319 (33.9%)	353 (44.3%)	
Deep dermal/full thickness	2,567 (66.1%)	443 (55.7%)	
Documented Inhalation Injury, N (%)			<0.001
No	4,012 (93.9%)	893 (98.1%)	
Yes	261 (6.1%)	17 (1.9%)	
Admitted to ICU, N (%)			<0.001
No	3,691 (86.3%)	865 (94.7%)	
Yes	586 (13.7%)	48 (5.3%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.3.5 Variation Between Sites

For patients admitted to the BRANZ since July 2016, the risk-adjusted rate of completed physical functioning assessment was more than three standard deviations from the registry wide mean for 10 sites (Figure 2). The funnel plot identified five outliers below the mean (Sites 2, 4, 7, 11, and 17) and five sites as outliers above the mean (Site 1, 6, 13, 14, and 16).

Figure 2: Funnel plot for physical functioning assessment



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.3.6 In-hospital Outcomes

Table 13 summarises the in-hospital outcomes for physical functioning assessment. Receiving an assessment was not associated with whether the patient was discharged to home. After risk-adjusting for patient and injury characteristics, patients who were admitted over the weekend were 29% less likely to receive an assessment within 48 hours of admission compared to patients who were admitted during the week. Going to theatre for a surgical procedure was associated with 1.24-fold higher adjusted odds of receiving an assessment. Receiving an assessment was associated with a 12% risk-adjusted increase in the overall hospital LOS.

Table 13: In-hospital outcomes for physical functioning assessment

Weekend Admissions	**Weekday**	**Weekend**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
No Assessment	554 (60.7%)	359 (39.3%)	1.00	1.00
Assessment	2,876 (67.2%)	1,404 (32.8%)	*0.73 (0.61, 0.87)*	*0.71 (0.59, 0.86)*
Theatre for Surgical Procedure	**No Theatre**	**Theatre**		
No Assessment	314 (34.4%)	600 (65.6%)	1.00	1.00
Assessment	938 (21.9%)	3,344 (78.1%)	*1.30 (1.07, 1.59)*	*1.24 (1.00, 1.53)*
Discharge to home	**Discharged Elsewhere**	**Discharged to Home**		
No Assessment	86 (9.4%)	825 (90.6%)	1.00	1.00
Assessment	823 (19.4%)	3,409 (80.6%)	*0.56 (0.42, 0.75)*	*0.77 (0.57, 1.05)*
Overall LOS (Days)	**Median (IQR)**		**Unadjusted ratio of geometric mean (95% CI)**	**Adjusted ratio of geometric mean (95% CI)**
No Assessment	5.67 (3.27-10.59)		1.00	1.00
Assessment	7.31 (4.02-13.64)		*1.35 (1.26, 1.45)*	*1.12 (1.05, 1.20)*

CI = confidence interval; IQR = interquartile range; LOS = length of stay; OR = odds ratio.
Significant findings are highlighted by *red, italicised text*.

5.4 If the patient was over the age of 16, did they receive venous thromboembolism prophylaxis?

5.4.1 Overview

Venous thromboembolism prophylaxis is used in adult burn patients to prevent venous thrombosis and pulmonary embolism. This indicator item will assist in better understanding of venous embolism prophylaxis practices in adults with burn injuries. This QI was introduced on July 1 2016, and is conditional depending on the age of the patient (i.e., only required for patients aged 16 years or older who do not receive end of life care on admission).

5.4.2 Data Validity

Between July 1 2016 and December 2018, there were 5,928 admissions to the BRANZ that were over the age of 16 and admitted to adult hospitals. Ninety-nine percent of admission (n = 5,901) had a complete response to the venous thromboembolism prophylaxis QI. Of the admissions that had a complete response the QI, 91.1% of admissions had a valid response. Data validity ranged from 75.3% at Site 8 to 99.6% at Site 13. Table 14 displays the validity data for the venous thromboembolism prophylaxis QI for each site, sorted by the percentage of invalid responses.

Table 14: Validity data for whether patient received venous thromboembolism prophylaxis

	Valid		Invalid	
Site	N	%	N	%
8	143	75.3%	47	24.7%
3	77	75.5%	25	24.5%
15	149	77.2%	44	22.8%
14	207	82.5%	44	17.5%
16	676	83.1%	137	16.9%
12	496	86.0%	81	14.0%
9	152	90.5%	16	9.5%
10	798	90.5%	84	9.5%
1	910	94.2%	56	5.8%
17	173	97.2%	5	2.8%
6	847	98.7%	11	1.3%
13	747	99.6%	3	0.4%

5.4.3 Site Performance

Of the valid responses, 63.4% of admissions (n = 3,412) received venous thromboembolism prophylaxis. The proportion of admissions receiving prophylaxis varied from 5.5% at Site 13 to 89.6% at Site 6. Table 15 displays the performance data for the prophylaxis data for each site, sorted by the percentage of admissions that received prophylaxis.

Table 15: Site performance for whether patient received venous thromboembolism prophylaxis

	Received Prophylaxis		No Prophylaxis	
Site	N	%	N	%
6	759	89.6%	88	10.4%
1	787	86.5%	123	13.5%
12	365	73.6%	131	26.4%
10	572	71.7%	226	28.3%
15	100	67.1%	49	32.9%
16	401	59.3%	275	40.7%
14	118	57.0%	89	43.0%
17	90	52.0%	83	48.0%
3	38	49.4%	39	50.6%
8	69	48.3%	74	51.7%
9	72	47.4%	80	52.6%
13	41	5.5%	706	94.5%

5.4.4 Patient Characteristics

Table 16 displays the characteristics of patients who did and did not receive venous thromboembolism prophylaxis during their admission. Patients who received prophylaxis were older and had larger burns compared to the patients who did not receive prophylaxis. A greater proportion of patients who received prophylaxis were male, sustained a flame burn, had a deep dermal or full thickness burn, were admitted to the ICU, and had a documented inhalation injury.

Table 16: Characteristics of patients who did and did not receive venous thromboembolism prophylaxis in during their stay in hospital

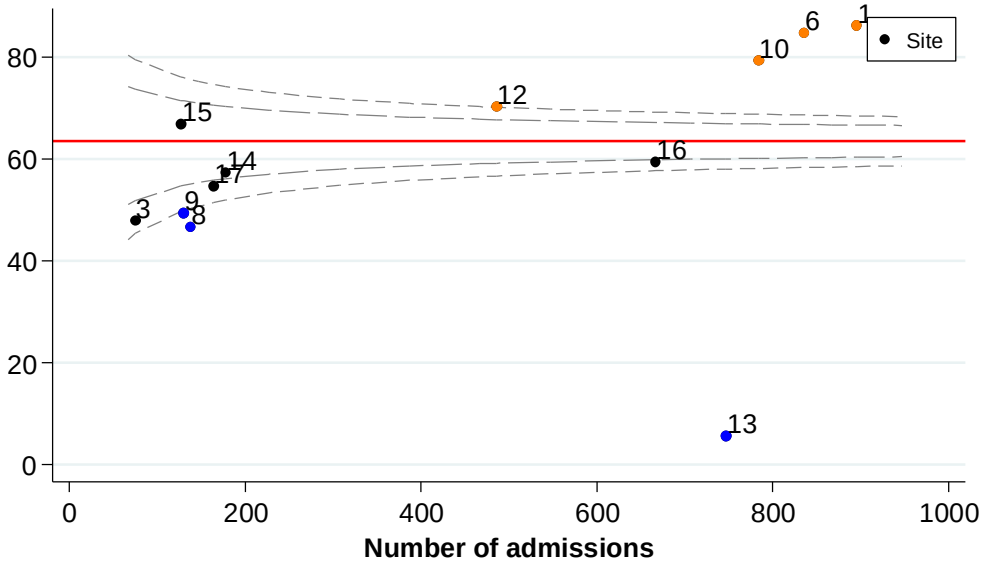
	Prophylaxis Received (n = 3,412)	Prophylaxis Not Received (n = 1,963)	*p*-value
Age, median (IQR) years	43.0 (29.0, 58.0)	37.0 (25.0, 53.0)	<0.001
Age Group, N (%)			
Adult	3,412 (100.0%)	1,963 (100.0%)	
Gender, N (%)			0.001
Male	2,486 (72.9%)	1,348 (68.7%)	
Female	926 (27.1%)	615 (31.3%)	
Burn Cause, N (%)			<0.001
Flame	1,616 (47.6%)	713 (36.5%)	
Scald	897 (26.4%)	556 (28.5%)	
Contact	471 (13.9%)	357 (18.3%)	
Other	411 (12.1%)	328 (16.8%)	
TBSA, median (IQR) %	4.0 (1.5, 9.5)	1.5 (0.5, 4.0)	<0.001
TBSA Group, N (%)			<0.001
<10%	2,525 (75.1%)	1,718 (89.9%)	
10-19%	517 (15.4%)	123 (6.4%)	
20-49%	260 (7.7%)	44 (2.3%)	
50+%	61 (1.8%)	26 (1.4%)	
Burn Depth, N (%)			0.028
Superficial/mid dermal only	997 (31.8%)	636 (34.8%)	
Deep dermal/full thickness	2,141 (68.2%)	1,191 (65.2%)	
Documented Inhalation Injury, N (%)			<0.001
No	3,163 (93.1%)	1,882 (96.2%)	
Yes	234 (6.9%)	74 (3.8%)	
Admitted to ICU, N (%)			<0.001
No	2,916 (85.5%)	1,846 (94.1%)	
Yes	495 (14.5%)	116 (5.9%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.4.5 Variation Between Sites

For patients admitted to the BRANZ since July 2016, the risk-adjusted rate of receiving venous thromboembolism prophylaxis was more than three standard deviations from the registry wide mean for seven sites (Figure 3). The funnel plot identified three outliers below the mean (Sites 8, 9, and 13) and four sites as outliers above the mean (Site 1, 6, 10, and 12).

Figure 3: Funnel plot for VTE prophylaxis



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.4.6 In-hospital Outcomes

Age stratification

The proportion of patients receiving venous thromboembolism prophylaxis during their admission increased based on the age of the patient from 49.2% of admissions aged 16-19 years to 69.3% of admissions over the age of 80 (Table 17). The largest proportion of patients receiving venous thromboembolism prophylaxis during their admission was the 60-69 year age bracket, where 73.3% of patients received prophylaxis.

Table 17: Proportion of patients who did and did not receive venous thromboembolism prophylaxis stratified by age group

	No Prophylaxis		Received Prophylaxis	
Age Group	N	%	N	%
16-19 years	183	49.5%	187	50.5%
20-29 years	514	41.0%	740	59.0%
30-39 years	381	38.8%	602	61.2%
40-49 years	290	32.1%	613	67.9%
50-59 years	296	36.9%	506	63.1%
60-69 years	144	28.0%	370	72.0%
70-79 years	90	26.7%	247	73.3%
80+ years	65	30.7%	147	69.3%

Table 18 summarises the in-hospital outcomes for venous thromboembolism prophylaxis use. Receiving prophylaxis was associated with 87% lower risk-adjusted odds of in-hospital mortality (regardless of the cause), 69% lower risk-adjusted odds of a thrombotic event (fatal or non-fatal), and 63% lower risk-adjusted odds of being readmitted to a BRANZ hospital compared to cases where prophylaxis was not administered. One important caveat is that further analysis exploring the effects of venous thromboembolism prophylaxis in specific subgroups is required.

Table 18: In-hospital outcomes for venous thromboembolism prophylaxis

In-hospital Mortality	**Survived**	**Died**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
No Prophylaxis	1,922 (98.0%)	39 (2.0%)	1.00	1.00
Prophylaxis	3,368 (98.8%)	42 (1.2%)	*0.49 (0.29, 0.83)*	*0.13 (0.06, 0.30)*
Thrombolytic events	**No Event**	**Event**		
No Prophylaxis	1,889 (96.7%)	64 (3.3%)	1.00	1.00
Prophylaxis	3,322 (97.4%)	90 (2.6%)	1.29 (0.83, 1.99)	*0.31 (0.18, 0.54)*
Readmission	**No Readmission**	**Readmission**		
No Prophylaxis	1,867 (95.1%)	96 (4.9%)	1.00	1.00
Prophylaxis	3,225 (94.6%)	186 (5.4%)	1.03 (0.76, 1.39)	*0.37 (0.22, 0.62)*

CI = confidence interval; OR = odds ratio.
Significant findings are highlighted by *red, italicised text*.

5.5 For patients with a hospital stay exceeding 24 hours, was the patient screened for risk of malnutrition within 24 hours of admission?

5.5.1 Overview

A significant proportion of patients admitted to hospital with a burn injury are at risk of malnutrition. Early identification of patients who are nutritionally depleted (or at risk of becoming so) allows the development of a plan for early intervention to optimise care. This QI was introduced on July 1 2016, and is conditional for patients with a LOS that exceeds 24 hours.

5.5.2 Data Validity

Between July 1 2016 and December 31 2018, there were 6,761 admissions to the BRANZ with a LOS exceeding 24 hours. Ninety-nine percent of admission (n = 6,737) had a complete response to the malnutrition risk screening QI. Of admissions that had a complete response, 91.6% had a valid response. Data validity for the QI ranged from 68.4% at Site 14 to 99.8% at Site 13. Table 19 displays the validity data for the QI for each site, sorted by the percentage of invalid responses.

Table 19: Validity data for whether patient received a malnutrition risk screening

	Valid		Invalid	
Site	N	%	N	%
14	273	68.4%	126	31.6%
8	227	73.9%	80	26.1%
15	184	82.5%	39	17.5%
2	269	85.4%	46	14.6%
5	143	86.7%	22	13.3%
3	135	87.1%	20	12.9%
7	116	87.2%	17	12.8%
9	214	92.2%	18	7.8%
16	733	93.6%	50	6.4%
12	399	93.9%	26	6.1%
17	158	94.0%	10	6.0%
10	684	94.3%	41	5.7%
6	784	94.8%	43	5.2%
1	781	95.4%	38	4.6%
4	254	97.7%	6	2.3%
11	368	98.1%	7	1.9%
13	449	99.8%	1	0.2%

5.5.3 Site Performance

Of the valid responses, 68% of admission (n = 4,193) reported that a risk screening had been completed within 48 hours of admission. The proportion of admissions that received a risk screening ranged from 13.9% at Site 17 to 98.8% at Site 1. Table 20 displays the performance data for the risk screening at each site, sorted by the percentage of admissions where the risk screening was performed.

Table 20: Site performance of whether patient received a malnutrition risk screening

	Risk Screening		No Risk Screening	
Site	N	%	N	%
1	765	98.0%	16	2.0%
16	714	97.4%	19	2.6%
10	655	95.8%	29	4.2%
15	153	83.2%	31	16.8%
14	221	81.0%	52	19.0%
7	92	79.3%	24	20.7%
12	284	71.2%	115	28.8%
6	505	64.4%	279	35.6%
8	145	63.9%	82	36.1%
2	167	62.1%	102	37.9%
3	54	40.0%	81	60.0%
5	56	39.2%	87	60.8%
9	77	36.0%	137	64.0%
13	158	35.2%	291	64.8%
11	87	23.6%	281	76.4%
4	38	15.0%	216	85.0%
17	22	13.9%	136	86.1%

5.5.4 Patient Characteristics

Table 21 displays the characteristics of patients who did and did not have a malnutrition risk screening. Patients who received a risk screening were older and had larger burns compared to the patients who were not risk screened. A greater proportion of patients who were risk screened sustained a flame burn, a deep dermal or full thickness burn, were admitted to the ICU, and had a documented inhalation injury.

Table 21: Characteristics of patients who did and did not receive malnutrition risk screening

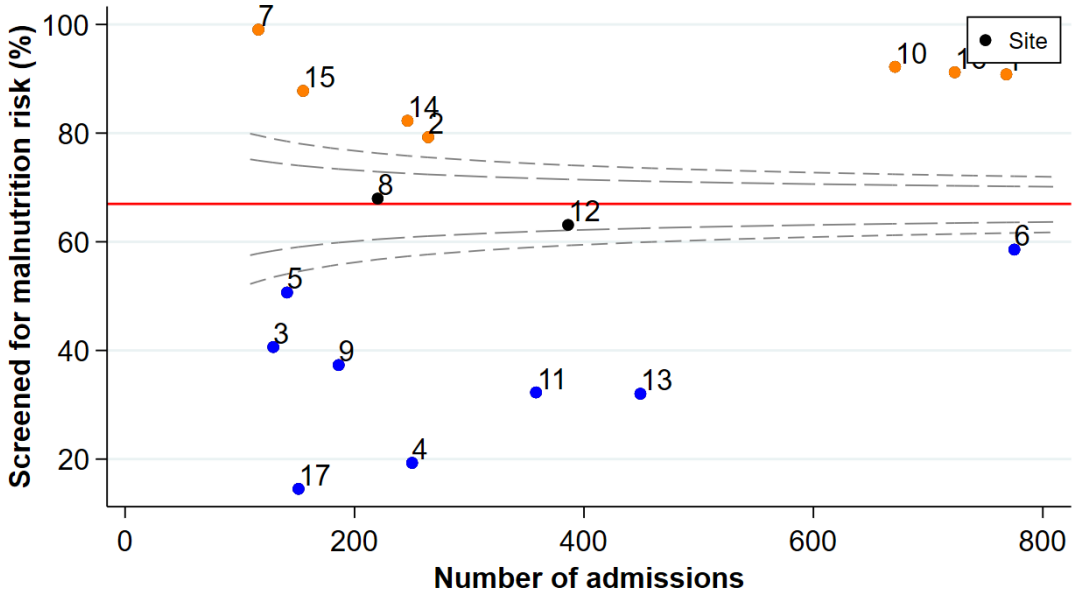
	Malnutrition Screening Received (n = 4,193)	Malnutrition Screening Not Received (n = 1,978)	*p*-value
Age, median (IQR) years	37.0 (22.0, 54.0)	20.0 (3.0, 46.0)	<0.001
Age Group, N (%)			<0.001
Paediatric	632 (15.1%)	907 (45.9%)	
Adult	3,561 (84.9%)	1,071 (54.1%)	
Gender, N (%)			0.10
Male	2,942 (70.2%)	1,347 (68.1%)	
Female	1,251 (29.8%)	631 (31.9%)	
Burn Cause, N (%)			<0.001
Flame	1,729 (41.4%)	585 (29.7%)	
Scald	1,395 (33.4%)	799 (40.6%)	
Contact	571 (13.7%)	347 (17.6%)	
Other	478 (11.5%)	237 (12.0%)	
TBSA, median (IQR) %	4.0 (1.5, 9.0)	3.0 (1.0, 6.0)	<0.001
TBSA Group, N (%)			<0.001
<10%	3,137 (76.1%)	1,676 (87.0%)	
10-19%	612 (14.8%)	208 (10.8%)	
20-49%	310 (7.5%)	35 (1.8%)	
50+%	63 (1.5%)	7 (0.4%)	
Burn Depth, N (%)			<0.001
Superficial/mid dermal only	1,400 (36.8%)	781 (45.1%)	
Deep dermal/full thickness	2,407 (63.2%)	952 (54.9%)	
Documented Inhalation Injury, N (%)			<0.001
No	3,922 (94.0%)	1,930 (97.7%)	
Yes	250 (6.0%)	45 (2.3%)	
Admitted to ICU, N (%)			<0.001
No	3,608 (86.4%)	1,896 (95.9%)	
Yes	570 (13.6%)	81 (4.1%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.5.5 Variation Between Sites

For patients admitted to the BRANZ since July 2016, the risk-adjusted rate of completed nutrition screening was more than three standard deviations from the registry wide mean for 15 sites (Figure 4). The funnel plot identified eight outliers below the mean (Sites 3, 4, 5, 6, 9, 11, 13, and 17) and seven sites as outliers above the mean (Site 1, 2, 7, 10, 14, 15, and 16).

Figure 4: Funnel plot for malnutrition risk screening



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.5.6 In-hospital outcomes

Table 22 summarises the in-hospital outcomes for malnutrition risk screening. There was no association between being admitted on a weekend and receiving the risk screening, nor was there an association between receiving the risk screening and contracting an infection during the admission. Patients who were risk screened had a 19% risk-adjusted increase in overall LOS compared to the patients who did not have a screening.

Table 22: In-hospital outcomes for malnutrition risk screening

Weekend Admissions	**Weekday**	**Weekend**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
No Assessment	1,316 (66.6%)	661 (33.4%)	1.00	1.00
Assessment	2,829 (67.6%)	1,356 (32.4%)	1.01 (0.88, 1.16)	0.95 (0.81, 1.10)
Infection Rate	**No Infection**	**Infection**		
No Assessment	841 (93.3%)	60 (6.7%)	1.00	1.00
Assessment	447 (93.1%)	33 (6.9%)	*3.97 (1.81, 8.75)*	1.76 (0.72, 4.32)
In-hospital LOS (Days)	**Median (IQR)**		**Unadjusted ratio of geometric mean (95% CI)**	**Adjusted ratio of geometric mean (95% CI)**
No Assessment	3.98 (1.95-8.80)		1.00	1.00
Assessment	6.29 (2.97-12.04)		*1.56 (1.47, 1.66)*	*1.19 (1.12, 1.25)*

CI = confidence interval; IQR = interquartile range; LOS = length of stay; OR = odds ratio.
Significant findings are highlighted by *red, italicised text*.

5.6 For patients with an overall hospital length of stay exceeding 48 hours, did the patient have their psychosocial needs screened during their admission?

5.6.1 Overview

Psychosocial care is paramount to quality burn care. There is no evidence regarding the timeliness of screening or assessment of psychosocial needs in burn injuries which is why no time frame around the initial screening should occur. The 48 hour timeframe was used to increase the sensitivity of the QI for those with more complex injuries or needs. This QI was introduced on July 1 2016, and is conditional depending on the LOS of the patient (i.e., only required for patients with a LOS exceeding 48 hours).

5.6.2 Data Validity

Between July 1 2016 and December 31 2018, there were 5,406 admissions to the BRANZ with a LOS exceeding 48 hours. Ninety-nine percent of admissions (n = 5,385) had a complete response to the psychosocial needs screening QI. Of the admissions that had a complete response to the QI, 89.7% had a valid response. Data validity for this QI ranged from 61.5% at Site 15 to 100% at Sites 5 and 7. Table 23 displays the validity data for the psychosocial needs screening QI for each site, sorted by the percentage of invalid responses.

Table 23: Validity data for whether the patient had their psychosocial needs screened

	Valid		Invalid	
Site	N	%	N	%
15	104	61.5%	65	38.5%
14	232	73.4%	84	26.6%
9	134	76.6%	41	23.4%
8	200	78.4%	55	21.6%
6	589	83.5%	116	16.5%
12	306	89.2%	37	10.8%
2	162	90.0%	18	10.0%
16	579	90.0%	64	10.0%
3	105	91.3%	10	8.7%
1	661	93.4%	47	6.6%
17	124	95.4%	6	4.6%
5	126	96.9%	4	3.1%
10	596	97.5%	15	2.5%
4	200	98.0%	4	2.0%
13	378	98.2%	7	1.8%
11	252	99.2%	2	0.8%
7	83	100.0%	0	0.0%

5.6.3 Site Performance

Of the valid responses, 76% of admissions (n = 3,650) reported that a psychosocial needs screening had occurred. The proportion of admissions that received a psychosocial needs screening varied from 2.5% at Site 8 to 99.5% at Site 10. Table 24 displays the performance data for the psychosocial screening QI for each site, sorted by the percentage of admissions where the screening occurred.

Table 24: Site performance for whether the patient had their psychosocial needs screened

	Received Screening		No Screening	
Site	N	%	N	%
10	593	99.5%	3	0.5%
1	656	99.2%	5	0.8%
4	193	96.5%	7	3.5%
16	535	92.4%	44	7.6%
14	209	90.1%	23	9.9%
5	113	89.7%	13	10.3%
12	265	86.6%	41	13.4%
7	71	85.5%	12	14.5%
2	129	79.6%	33	20.4%
3	78	74.3%	27	25.7%
17	92	74.2%	32	25.8%
9	99	73.9%	35	26.1%
6	390	66.2%	199	33.8%
11	121	48.0%	131	52.0%
15	37	35.6%	67	64.4%
13	64	16.9%	314	83.1%
8	5	2.5%	195	97.5%

5.6.4 Patient Characteristics

Table 25 displays the characteristics of patients who did and did not have their psychosocial needs screened during their admission. A greater proportion of patients who received a needs screening were adult, female, had a burn greater than 10 %TBSA, and were admitted to the ICU.

Table 25: Characteristics of patients who did and did not have their psychosocial needs screened

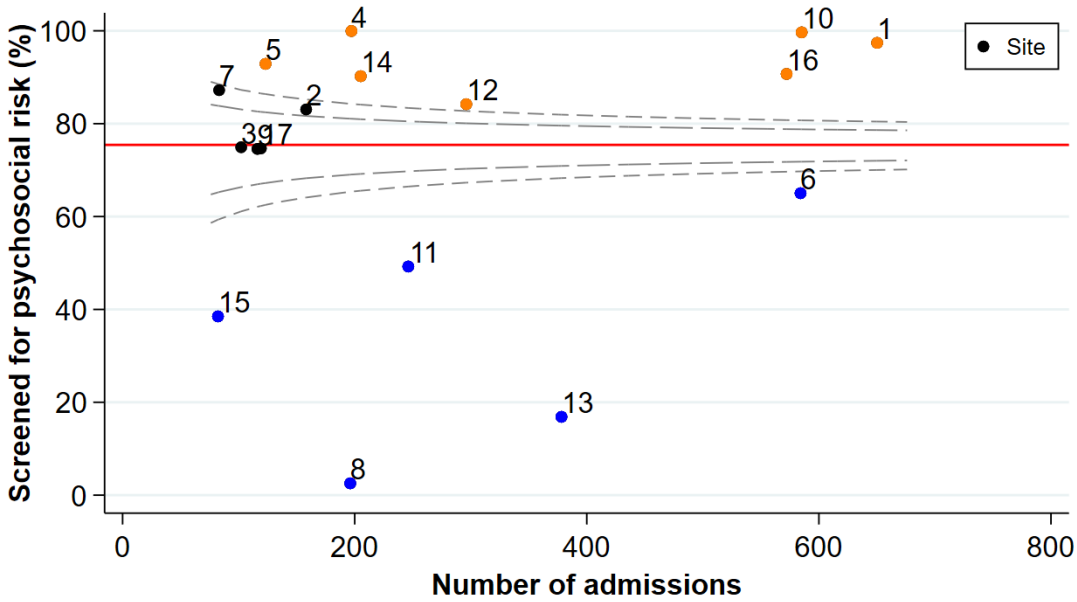
	Psychosocial Screening Received (n = 3,560)	Psychosocial Screening Not Received (n = 1,181)	*p*-value
Age, median (IQR) years	35.0 (19.0, 53.0)	30.0 (13.0, 53.0)	<0.001
Age Group, N (%)			<0.001
Paediatric	780 (21.4%)	327 (27.7%)	
Adult	2,870 (78.6%)	854 (72.3%)	
Gender, N (%)			0.027
Male	2,525 (69.2%)	857 (72.6%)	
Female	1,125 (30.8%)	324 (27.4%)	
Burn Cause, N (%)			0.16
Flame	1,419 (39.1%)	439 (37.3%)	
Scald	1,260 (34.7%)	422 (35.9%)	
Contact	555 (15.3%)	164 (13.9%)	
Other	397 (10.9%)	152 (12.9%)	
TBSA, median (IQR) %	4.0 (1.5, 9.5)	4.0 (2.0, 7.5)	0.033
TBSA Group, N (%)			<0.001
<10%	2,678 (74.7%)	943 (81.8%)	
10-19%	578 (16.1%)	154 (13.4%)	
20-49%	271 (7.6%)	53 (4.6%)	
50+%	57 (1.6%)	3 (0.3%)	
Burn Depth, N (%)			<0.001
Superficial/mid dermal only	1,149 (34.5%)	415 (40.2%)	
Deep dermal/full thickness	2,186 (65.5%)	617 (59.8%)	
Documented Inhalation Injury, N (%)			0.089
No	3,431 (94.4%)	1,126 (95.7%)	
Yes	204 (5.6%)	51 (4.3%)	
Admitted to ICU, N (%)			<0.001
No	3,146 (86.4%)	1,081 (91.8%)	
Yes	495 (13.6%)	97 (8.2%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.6.5 Variation Between Sites

For patients admitted to the BRANZ since July 2016, the risk-adjusted rate of completed nutrition screening was more than three standard deviations from the registry wide mean for 12 sites (Figure 5). The funnel plot identified five outliers below the mean (Sites 6, 8, 11, 13, and 15) and seven sites as outliers above the mean (Site 1, 4, 5, 10, 12, 14, and 16).

Figure 5: Funnel plot for psychosocial risk screening



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.6.6 In-hospital Outcomes

Table 26 summarises the in-hospital outcomes for psychosocial needs screening. Receiving a needs screening was not associated with whether the patient was discharged to home or whether the patient was readmitted to a BRANZ hospital. Receiving a screening was associated with a 34% longer in-hospital LOS in comparison to patients who did not receive a screening.

Table 26: In-hospital outcomes for psychosocial needs screening

Discharge to home	**Discharged Elsewhere**	**Discharged to Home**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
No Screening	165 (14.1%)	1,003 (85.9%)	1.00	1.00
Screening	651 (18.0%)	2,958 (82.0%)	*0.44 (0.34, 0.56)*	0.83 (0.60, 1.15)
Readmission	**No Readmission**	**Readmission**		
No Screening	1,095 (92.7%)	86 (7.3%)	1.00	1.00
Screening	3,382 (92.7%)	268 (7.3%)	1.16 (0.85, 1.59)	0.83 (0.60, 1.14)
In-hospital LOS (Days)	**Median (IQR)**		**Unadjusted ratio of geometric mean (95% CI)**	**Adjusted ratio of geometric mean (95% CI)**
No Screening	5.8 (3.2-10.3)		1.00	1.00
Screening	7.5 (4.1-13.8)		*1.62 (1.51,1.73)*	*1.34 (1.26,1.42)*

CI = confidence interval; IQR = interquartile range; LOS = length of stay; OR = odds ratio.
Significant findings are highlighted by *red, italicised text*.

5.7 Did the patient go to theatre for burn wound management?

5.7.1 Overview

Many patients who sustain a burn injury are subsequently taken to theatre for surgical procedures, which can range from dressing changes to skin grafting to amputation. This QI serves to better understand burn wound management practices across Australia and New Zealand and to identify best practices. This QI was introduced on July 1 2009, and is not associated with any conditions (i.e., all patients should have a response to this indicator/data item).

5.7.2 Data Validity

Between July 1 2009 and December 31 2018, there were 27,183 admissions to the BRANZ. Ninety-nine percent of admissions (n = 27,153) had a complete response to the QI. Of these admissions, 98.9% were valid. Data validity for this QI ranged from 89.5% at Site 15 to 100% at Sites 1, 3, and 11. Table 27 displays the validity data for this QI for each site, sorted by the percentage of invalid responses.

Table 27: Validity data for whether the patient went to theatre

	Valid		Invalid	
Site	N	%	N	%
15	1,265	89.5%	149	10.5%
8	651	97.7%	15	2.3%
4	883	97.8%	20	2.2%
17	820	98.0%	17	2.0%
14	1,781	98.6%	26	1.4%
5	627	99.1%	6	0.9%
13	2,632	99.2%	20	0.8%
16	3,178	99.5%	17	0.5%
9	822	99.5%	4	0.5%
7	785	99.6%	3	0.4%
6	2,773	99.8%	6	0.2%
12	2,335	99.8%	5	0.2%
10	2,720	99.9%	4	0.1%
2	2,457	99.9%	2	0.1%
1	980	100.0%	0	0.0%
3	626	100.0%	0	0.0%
11	1,554	100.0%	0	0.0%

5.7.3 Site Performance

Of the valid responses, 74% of admission (n = 19,844) reported that the patient went to theatre for a wound management procedure. The proportion of admissions that went to theatre ranged from 47.2% at Site 4 to 86.1% at Site 9. Table 28 displays the performance data this QI, sorted by the percentage of admissions where the patient went to theatre.

Table 28: Site performance for whether the patient went to theatre

	Procedure		No Procedure	
Site	N	%	N	%
9	708	86.1%	114	13.9%
13	2,234	84.9%	398	15.1%
15	1,049	82.9%	216	17.1%
2	2,024	82.4%	433	17.6%
1	773	78.9%	207	21.1%
16	2,506	78.9%	672	21.1%
14	1,395	78.3%	386	21.7%
10	2,089	76.8%	631	23.2%
3	465	74.3%	161	25.7%
8	483	74.2%	168	25.8%
5	443	70.7%	184	29.3%
6	1,917	69.1%	856	30.9%
12	1,573	67.4%	762	32.6%
17	502	61.2%	318	38.8%
7	471	60.0%	314	40.0%
11	795	51.2%	759	48.8%
4	417	47.2%	466	52.8%

5.7.5 Patient Characteristics

Table 29 displays the characteristics of patients who did and did not go to theatre during their admission. A greater proportion of patients who went to theatre were adult, sustained a contact burn, had a burn exceeding 10 %TBSA, and had deep dermal and/or full-thickness burns. A smaller proportion of patients who went to theatre were admitted to the ICU and had documented evidence of an inhalation injury.

Table 29: Characteristics of patients who did and did not go to theatre

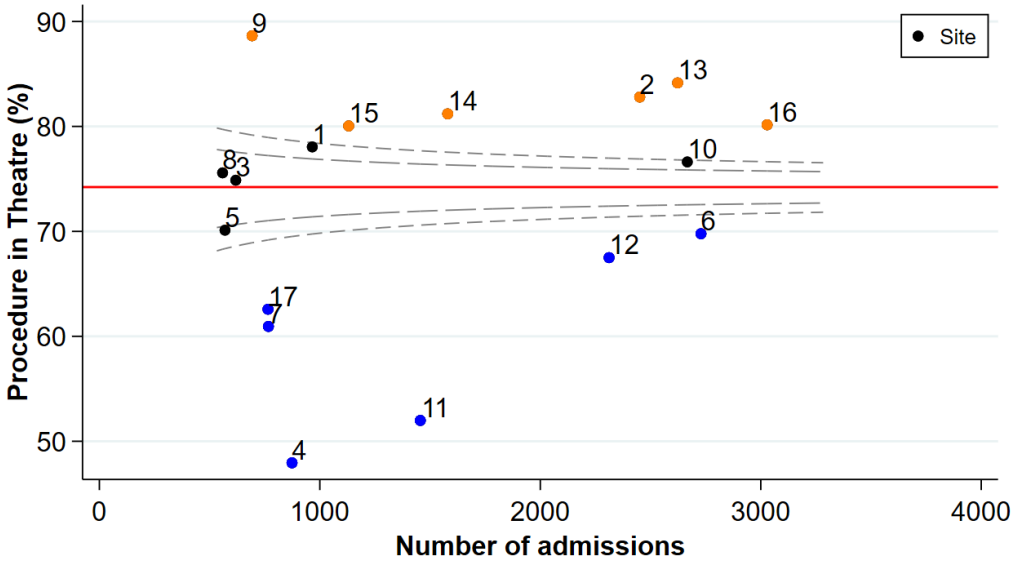
	No Theatre (n = 7,045)	Theatre (n = 19,844)	p-value
Age, median (IQR) years	26.0 (4.0, 47.0)	27.0 (10.0, 47.0)	<0.001
Age Group, N (%)			<0.001
Paediatric	2,510 (35.6%)	5,964 (30.1%)	
Adult	4,533 (64.4%)	13,879 (69.9%)	
Gender, N (%)			0.83
Male	4,759 (67.6%)	13,432 (67.7%)	
Female	2,286 (32.4%)	6,412 (32.3%)	
Burn Cause, N (%)			<0.001
Flame	2,449 (34.9%)	6,639 (33.6%)	
Scald	2,727 (38.9%)	7,077 (35.8%)	
Contact	889 (12.7%)	3,509 (17.7%)	
Other	946 (13.5%)	2,555 (12.9%)	
TBSA, median (IQR) %	3.0 (1.0, 6.0)	3.0 (1.0, 7.0)	0.006
TBSA Group, N (%)			<0.001
<10%	5,831 (87.3%)	15,468 (80.5%)	
10-19%	635 (9.5%)	2,348 (12.2%)	
20-49%	115 (1.7%)	1,164 (6.1%)	
50+%	95 (1.4%)	241 (1.3%)	
Burn Depth, N (%)			<0.001
Superficial/mid dermal only	4,104 (70.9%)	5,695 (32.4%)	
Deep dermal/full thickness	1,686 (29.1%)	11,877 (67.6%)	
Documented Inhalation Injury, N (%)			<0.001
No	6,634 (94.3%)	19,002 (96.0%)	
Yes	399 (5.7%)	802 (4.0%)	
Admitted to ICU, N (%)			0.019
No	6,253 (88.9%)	17,768 (89.9%)	
Yes	777 (11.1%)	1,987 (10.1%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.7.6 Variation Between Sites

For patients admitted to the BRANZ since July 2009, the risk-adjusted rate of theatre admission was more than three standard deviations from the registry wide mean for 12 sites (Figure 6). The funnel plot identified six sites as outliers below the mean (Sites 4, 6, 7, 11, 12, and 17), and six sites as outliers above the mean (Sites 2, 9, 13, 14, 15, and 16).

Figure 6: Funnel plot for surgical procedure in theatre



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.7.7 In-hospital Outcomes

Table 30 displays the in-hospital outcomes for theatre admissions. There was no association between going to theatre and the in-hospital LOS. Going to theatre was associated with 47% lower risk-adjusted odds of being readmitted to a BRANZ hospital and with 16% lower odds of being discharged to home.

Table 30: In-hospital outcomes for theatre admission

Readmission	**No Readmissions**	**Readmitted**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
No Procedure	6,354 (90.3%)	685 (9.7%)	1.00	1.00
Procedure	18,185 (91.7%)	1,647 (8.3%)	*0.85 (0.77, 0.94)*	*0.53 (0.47, 0.60)*
Discharge Disposition	**Discharged Elsewhere**	**Discharged to Home**		
No Procedure	695 (10.1%)	6,172 (89.9%)	1.00	1.00
Procedure	2,617 (13.3%)	17,038 (86.7%)	*0.63 (0.57, 0.69)*	*0.84 (0.75, 0.95)*
In-hospital LOS (Days)	**Median (IQR)**		**Unadjusted ratio of geometric mean (95% CI)**	**Adjusted ratio of geometric mean (95% CI)**
No procedure	3.00 (1.79-5.98)		1.00	1.00
Procedure	4.82 (1.17-11.10)		*1.15 (1.11, 1.19)*	1.01 (0.97, 1.05)

CI = confidence interval; IQR = interquartile range; LOS = length of stay.
Significant findings are highlighted by *red, italicised text*.

5.8 Did the patient receive a skin graft in theatre?

5.8.1 Overview

Autologous skin grafting has been the cornerstone of the surgical treatment approach for significant burn injuries. This QI captures whether or not patients were admitted to theatre for a skin graft. This QI was introduced on July 1 2009, and is conditional on the patient being admitted to theatre for a surgical procedure (i.e., required only for patients who were admitted to theatre for a surgical procedure).

5.8.2 Validity Data

Between July 1 2009 and December 31 2018, there were 19,844 admissions to the BRANZ that were taken to theatre for a surgical procedure. Ninety-nine percent of admissions (n = 19,835) had a complete response to this QI. Of these, 98.8% were valid. Data validity for this QI ranged from 78.7% at Site 8 to 100% at Sites 1, 3, 9, 11, and 12. Table 31 displays the validity data for this QI for each site, sorted by the percentage of invalid responses.

Table 31: Validity data for whether the patient received a skin graft in theatre

	Valid		Invalid	
Site	N	%	N	%
8	380	78.7%	103	21.3%
15	1,022	97.4%	27	2.6%
2	1,981	97.9%	43	2.1%
5	436	98.4%	7	1.6%
17	496	98.8%	6	1.2%
7	466	98.9%	5	1.1%
14	1,382	99.1%	13	0.9%
16	2,493	99.5%	13	0.5%
6	1,910	99.6%	7	0.4%
13	2,226	99.6%	8	0.4%
10	2,082	99.7%	7	0.3%
4	416	99.8%	1	0.2%
1	773	100.0%	0	0.0%
3	465	100.0%	0	0.0%
9	708	100.0%	0	0.0%
11	795	100.0%	0	0.0%
12	1,573	100.0%	0	0.0%

5.8.3 Site Performance

Of the valid responses, 63% of admissions (n = 12,274) received a skin graft. The proportion of admissions that received a skin graft ranged from 17.2% at Site 15 to 88.2% at Site 1. Table 32 displays performance data for this QI, sorted by the percentage of admissions that received a skin graft.

Table 32: Site performance for whether the patient received a skin graft in theatre

	Skin Graft		No Skin Graft	
Site	N	%	N	%
1	682	88.2%	91	11.8%
13	1,918	86.2%	308	13.8%
4	348	83.7%	68	16.3%
10	1,683	80.8%	399	19.2%
12	1,267	80.5%	306	19.5%
17	397	80.0%	99	20.0%
6	1,431	74.9%	479	25.1%
7	326	70.0%	140	30.0%
2	1,375	69.4%	606	30.6%
11	434	54.6%	361	45.4%
5	237	54.4%	199	45.6%
8	183	48.2%	197	51.8%
9	318	44.9%	390	55.1%
14	576	41.7%	806	58.3%
3	182	39.1%	283	60.9%
16	741	29.7%	1,752	70.3%
15	176	17.2%	846	82.8%

5.8.4 Patient Characteristics

Table 33 displays the characteristics of patients who did and did not receive a skin graft. A larger proportion of patients who received a skin graft were adult, sustained a flame or contact burn, had a deep dermal or full thickness burn, were admitted to the ICU, and had an inhalation injury. Patients who received a skin graft had a smaller median %TBSA compared to the patients who did not receive a skin graft.

Table 33: Characteristics of patients who did and did not receive a skin graft

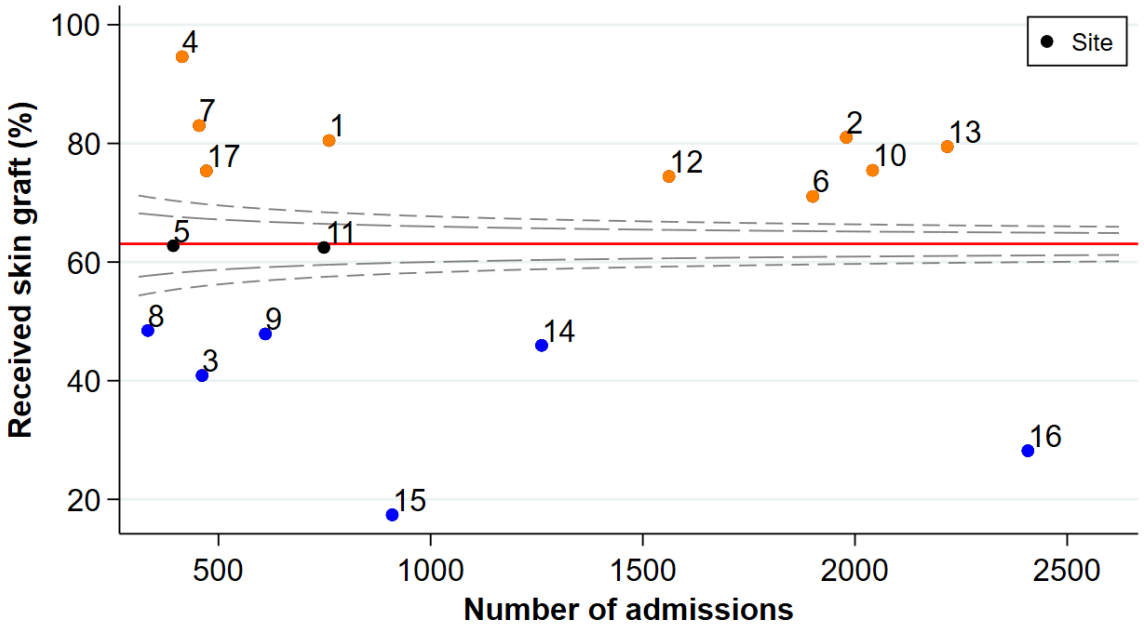
Factor	No Graft (n = 7,330)	Skin Grafted (n = 12,274)	p-value
Age, median (IQR) years	23.0 (3.0, 41.0)	31.0 (16.0, 50.0)	<0.001
Age Group, N (%)			<0.001
Paediatric	2,756 (37.6%)	3,067 (25.0%)	
Adult	4,573 (62.4%)	9,207 (75.0%)	
Gender, N (%)			0.32
Male	4,933 (67.3%)	8,345 (68.0%)	
Female	2,397 (32.7%)	3,929 (32.0%)	
Burn Cause, N (%)			<0.001
Flame	2,347 (32.1%)	4,242 (34.7%)	
Scald	3,261 (44.6%)	3,683 (30.1%)	
Contact	986 (13.5%)	2,492 (20.4%)	
Other	715 (9.8%)	1,814 (14.8%)	
TBSA, median (IQR) %	3.5 (1.5, 7.0)	2.5 (1.0, 7.0)	<0.001
TBSA Group, N (%)			<0.001
<10%	5,743 (81.8%)	9,550 (79.7%)	
10-19%	924 (13.2%)	1,393 (11.6%)	
20-49%	283 (4.0%)	870 (7.3%)	
50+%	68 (1.0%)	169 (1.4%)	
Burn Depth, N (%)			<0.001
Superficial/mid dermal only	4,073 (64.2%)	1,506 (13.6%)	
Deep dermal/full thickness	2,269 (35.8%)	9,550 (86.4%)	
Documented Inhalation Injury, N (%)			<0.001
No	7,070 (96.7%)	11,698 (95.5%)	
Yes	243 (3.3%)	554 (4.5%)	
Admitted to ICU, N (%)			<0.001
No	6,743 (92.5%)	10,808 (88.3%)	
Yes	549 (7.5%)	1,426 (11.7%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.8.5 Variation Between Sites

For patients admitted to the BRANZ since July 2009, the risk-adjusted rate of receiving a skin graft was more than three standard deviations from the registry wide mean for 15 of the sites (Figure 7). The funnel plot identified six outliers below the mean (Sites 3, 8, 9, 14, 15, and 16) and nine sites as outliers above the mean (Sites 1, 2, 4, 6, 7, 10, 11, 12, 13, and 17).

Figure 7: Funnel plot for skin grafting



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.8.6 In-hospital Outcomes

Table 34 displays the in-hospital outcomes for skin grafting. Receiving a skin graft was associated with 73% lower risk-adjusted odds of being readmitted to a BRANZ hospital, 36% lower risk-adjusted odds of being discharged to home or the usual place of residence, and a 10% higher in-hospital LOS.

Table 34: In-hospital outcomes for skin grafting

Readmission	**No Readmissions**	**Readmitted**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
No Graft	6,545 (89.3%)	781 (10.7%)	1.00	1.00
Skin Graft	11,425 (93.1%)	841 (6.9%)	*0.48 (0.43, 0.54)*	*0.27 (0.23, 0.31)*
Discharge Disposition	**Discharged Elsewhere**	**Discharged to Home**		
No Graft	724 (10.0%)	6,525 (90.0%)	1.00	1.00
Skin Graft	1,872 (15.4%)	10,301 (84.6%)	*0.48 (0.43, 0.53)*	*0.64 (0.55, 0.74)*
In-hospital LOS (Days)	**Median (IQR)**		**Unadjusted ratio of geometric mean (95% CI)**	**Adjusted ratio of geometric mean (95% CI)**
No Graft	3.49 (1.77-6.98)		1.00	1.00
Skin Graft	6.76 (0.93-14.26)		*1.24 (1.19, 1.30)*	*1.10 (1.04, 1.15)*

CI = confidence interval, IQR = interquartile range; LOS = length of stay; OR = odds ratio.
Significant findings are highlighted by *red, italicised text*.

5.9 How long did it take for the patient to receive their first skin graft in theatre?

5.9.1 Overview

Autologous skin grafting has been the cornerstone of the surgical treatment approach for significant burn injuries, but there is debate about the timelines of when excision and grafting should be completed. This data item captures the time taken for the patient to receive their first skin graft. This data item has been collected since July 1 2009, and is conditional on the patient being admitted to theatre for a surgical procedure and receiving a skin graft.

5.9.2 Data Validity

Between July 1 2009 and December 31 2018, there were 12,277 patients that were admitted to theatre and received a skin graft. Eighty-nine percent of admissions (n = 10,878) had a valid time to first grafting. Data validity for the time to first grafting varied from 54.2% at Site 13 to 100% at Sites 3, 8, 11, and 15. Table 35 displays the validity data for the time to first grafting for each site, sorted by the percentage of invalid responses.

Table 35: Validity data for time taken for the patient to receive their first skin graft

	Valid		Invalid	
Site	N	%	N	%
13	1,039	54.2%	879	45.8%
17	357	89.9%	40	10.1%
16	684	92.3%	57	7.7%
6	1,334	93.2%	97	6.8%
14	537	93.2%	39	6.8%
12	1,184	93.4%	83	6.6%
10	1,580	93.8%	104	6.2%
9	301	94.7%	17	5.3%
2	1,317	95.8%	58	4.2%
5	229	95.8%	10	4.2%
7	316	96.9%	10	3.1%
4	344	98.9%	4	1.1%
1	681	99.9%	1	0.1%
3	182	100.0%	0	0.0%
8	183	100.0%	0	0.0%
11	434	100.0%	0	0.0%
15	176	100.0%	0	0.0%

5.9.3 Site Performance

Of the valid responses, 75% of admissions (n = 8,517) received their first skin graft within 105.8 hours of admission (i.e., the 75% percentile). The proportion of admissions receiving their first skin graft within 105.8 hours of admission ranged from 42.6% at Site 15 to 89.75 at Site 1. Table 36 displays the performance data for the time to first grafting for each site, sorted by the percentage of admissions where the first skin graft was received within 105.8 hours of admission.

Table 36: Site performance for whether the patient received their first graft within 105.8 hours of admission

	Within 105.8 hours		Beyond 105.8 hours	
Site	N	%	N	%
1	611	89.7%	70	10.3%
2	1,110	84.3%	207	15.7%
7	265	83.9%	51	16.1%
11	344	79.3%	90	20.7%
12	936	79.1%	248	20.9%
16	540	78.9%	143	21.1%
10	1,231	77.9%	349	22.1%
9	220	73.1%	81	26.9%
6	939	70.4%	395	29.6%
13	728	70.1%	310	29.9%
5	153	66.8%	76	33.2%
4	228	66.3%	116	33.7%
3	117	64.3%	65	35.7%
14	341	63.5%	196	36.5%
8	114	62.3%	69	37.7%
17	205	57.4%	152	42.6%
15	75	42.6%	101	57.4%

5.9.4 Patient Characteristics

Table 37 displays the characteristics of patients who did and did not receive their first skin graft within 105.8 hours of admission. A greater proportion of patients who received their first skin graft within 105.8 hours of admission were paediatrics, had sustained a contact burn, sustained a burn less than 10 %TBSA, and had a deep dermal or full-thickness burn. A smaller proportion of patients who received their first skin graft within 105.8 hours were admitted to the ICU and had an inhalation injury.

Table 37: Characteristics of patients who did and did not receive a skin graft during their admission

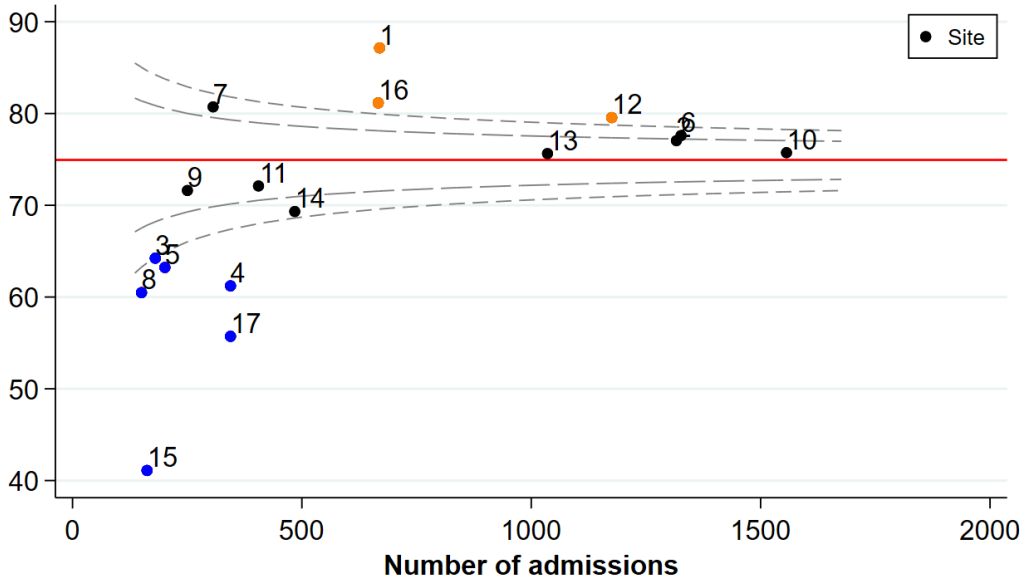
Factor	Beyond 105.8 hours (n = 2,719)	Within 105.8 hours (n = 8,157)	p-value
Age, median (IQR) years	35.0 (15.0, 55.0)	29.0 (13.0, 48.0)	<0.001
Age Group, N (%)			0.003
Paediatric	681 (25.0%)	2,282 (28.0%)	
Adult	2,038 (75.0%)	5,875 (72.0%)	
Gender, N (%)			0.069
Male	1,888 (69.4%)	5,511 (67.6%)	
Female	831 (30.6%)	2,646 (32.4%)	
Burn Cause, N (%)			<0.001
Flame	1,266 (46.8%)	2,593 (31.9%)	
Scald	823 (30.4%)	2,416 (29.7%)	
Contact	319 (11.8%)	1,852 (22.8%)	
Other	299 (11.0%)	1,269 (15.6%)	
TBSA, median (IQR) %	8.0 (3.0, 15.0)	2.0 (1.0, 5.0)	<0.001
TBSA Group, N (%)			<0.001
<10%	1,506 (56.4%)	6,826 (85.9%)	
10-19%	651 (24.4%)	673 (8.5%)	
20-49%	432 (16.2%)	374 (4.7%)	
50+%	81 (3.0%)	77 (1.0%)	
Burn Depth, N (%)			<0.001
Superficial/mid dermal only	490 (20.7%)	743 (10.0%)	
Deep dermal/full thickness	1,878 (79.3%)	6,676 (90.0%)	
Documented Inhalation Injury, N (%)			<0.001
No	2,473 (91.2%)	7,875 (96.7%)	
Yes	239 (8.8%)	269 (3.3%)	
Admitted to ICU, N (%)			<0.001
No	2,008 (74.1%)	7,486 (92.1%)	
Yes	702 (25.9%)	644 (7.9%)	

ICU = intensive care unit; IQR = interquartile range; TBSA = total body surface area.

5.9.5 Variation Between Sites

For patients admitted to the BRANZ since July 2009, the risk-adjusted rate of receiving a skin graft within 105.8 hours of admission was more than three standard deviations from the registry wide mean for nine sites (Figure 8). The funnel plot identified six sites as outliers below the mean (Sites 3, 4, 5, 8, 15, and 17), and three sites as outliers above the mean (Sites 1, 12, and 16).

Figure 8: Funnel plot for time to graft (percentile)



Risk adjusted for age, gender, primary cause, logTBSA, and inhalation injury.

5.9.6 In-hospital Outcomes

Table 38 summarises the in-hospital outcomes for the time to first skin grafting. There was no association between time to grafting and whether the patient was readmitted to a BRANZ hospital. Receiving the first skin graft within 105.8 hours of admission was associated with a 1.80-fold risk-adjusted increase in the odds of the patient being discharged to home and a 69% shorter in-hospital LOS.

Table 38: In-hospital outcomes for time to skin grafting

Readmission	**No Readmissions**	**Readmitted**	**Unadjusted OR (95% CI)**	**Risk-adjusted OR (95% CI)**
Beyond 105.8 hours	2,521 (92.9%)	193 (7.1%)	1.00	1.00
Within 105.8 hours	7,563 (92.7%)	592 (7.35)	0.94 (0.79, 1.13)	1.13 (0.92, 1.34)
Discharge Disposition	**Discharged Elsewhere**	**Discharged to Home**		
Beyond 105.8 hours	683 (25.5)	1,995 (74.5)	1.00	1.00
Within 105.8 hours	1,078 (13.3)	7,033 (86.7)	*2.36 (2.07, 2.69)*	*1.80 (1.55, 2.10)*
In-hospital LOS (Days)	**Median (IQR)**		**Unadjusted ratio of geometric mean (95% CI)**	**Adjusted ratio of geometric mean (95% CI)**
Beyond 105.8 hours	17.5 (12.2-26.8)		1.00	1.00
Within 105.8 hours	5.0 (0.9 – 9.1)		*0.18 (0.17, 0.19)*	*0.31 (0.29, 0.33)*

CI = confidence interval; IQR = interquartile range; LOS = length of stay; OR = odds ratio.
Significant findings are highlighted by *red, italicised text*.

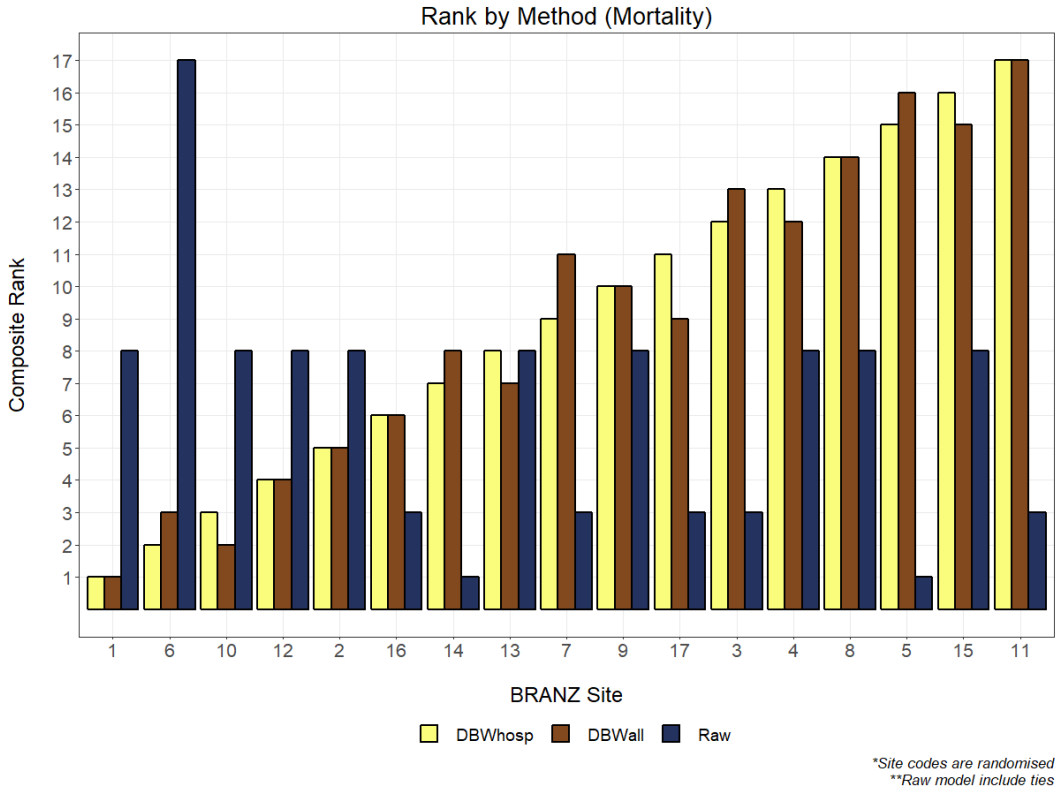
5.10 Composite Performance Measures

5.10.1 Mortality

Correlation between two of the three composite measures and in-hospital mortality was strong (Table 39). The DBWall method demonstrated the highest correlation with in-hospital mortality (ρ = -0.6387, *p* = 0.006), whereas the lowest correlation with in-hospital mortality was with the raw composite score (ρ = 0.1990, *p* = 0.44). The negative correlations suggest that as the DBWall and DBWhosp ranks increase (i.e., move towards 17), the number of in-hospital deaths decline. The DBWall method coefficient—which was correlated with in-hospital mortality—was not significantly different from the DBWhosp method coefficient (ρ = -0.6313, *p* = 0.007; *z* = 0.20, *p* = 0.84). Both the DBWhosp method coefficient (z = -2.64, p = 0.008) and the DBWall method coefficient (z = -2.62, p = 0.009) differed from the raw method coefficient.

Variation in site rank between the composite measures was observed (Figure 9). No site received the same rank by each of the three methods of composite performance. Eight of the 17 sites were one rank different (i.e., moved up or down one rank) between the two DBW composite measures. Two sites were two ranks different between the two measures, while the remaining seven sites had the same rank across the two composite measures.

Figure 9: Variation in site rank by composite method for mortality

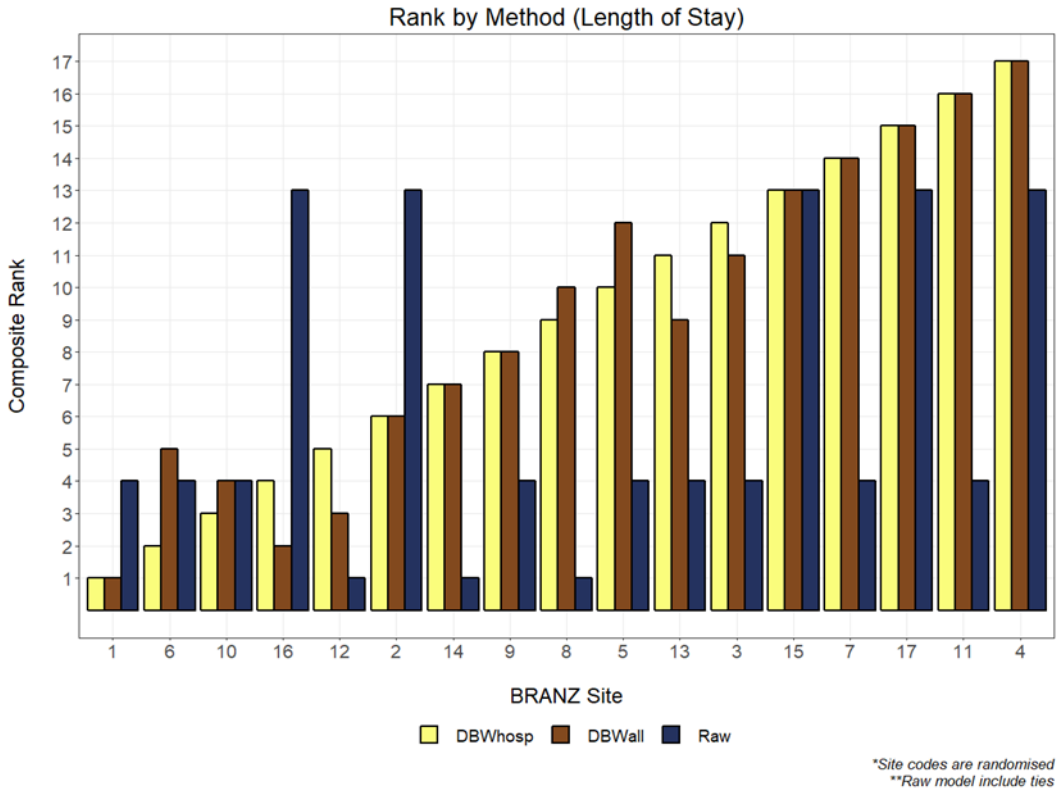


5.10.2 In-hospital Length of Stay

Correlation between the two of the three composite measures and the number of patients with a LOS within the 75th percentile of values was good (Table 39). The DBWall method demonstrated the highest correlation with the number of patients with a LOS within the 75th percentile of values (ρ = -0.5049, p = 0.039), whereas the lowest correlation with the number of patients with a LOS within the 75th percentile of values was with the raw composite score (ρ = 0.1485, p = 0.57). The negative correlation suggests that as the DBwall ranks increase (i.e., move towards 17), the number of patients with a LOS within the 75th percentile of values decreases. The DBWhosp method was not correlated with the number of patients with a LOS within the 75th percentile of values (ρ = -0.4412, p = 0.08). The DBWall method coefficient was significantly different from the raw composite method (z = -2.59, p = 0.0095).

Variation in site rank between the composite measures was observed (Figure 10). One site (Site 15) received the same rank by each of the three methods of composite performance. Three of the 17 sites were one rank different (i.e., moved up or down one rank) between the two DBW composite measures. Four sites were two ranks different between the composite measures, and one site was three ranks different between the measures. The remaining nine sites had the same rank across the two measures.

Figure 10: Variation in site rank by composite method for LOS

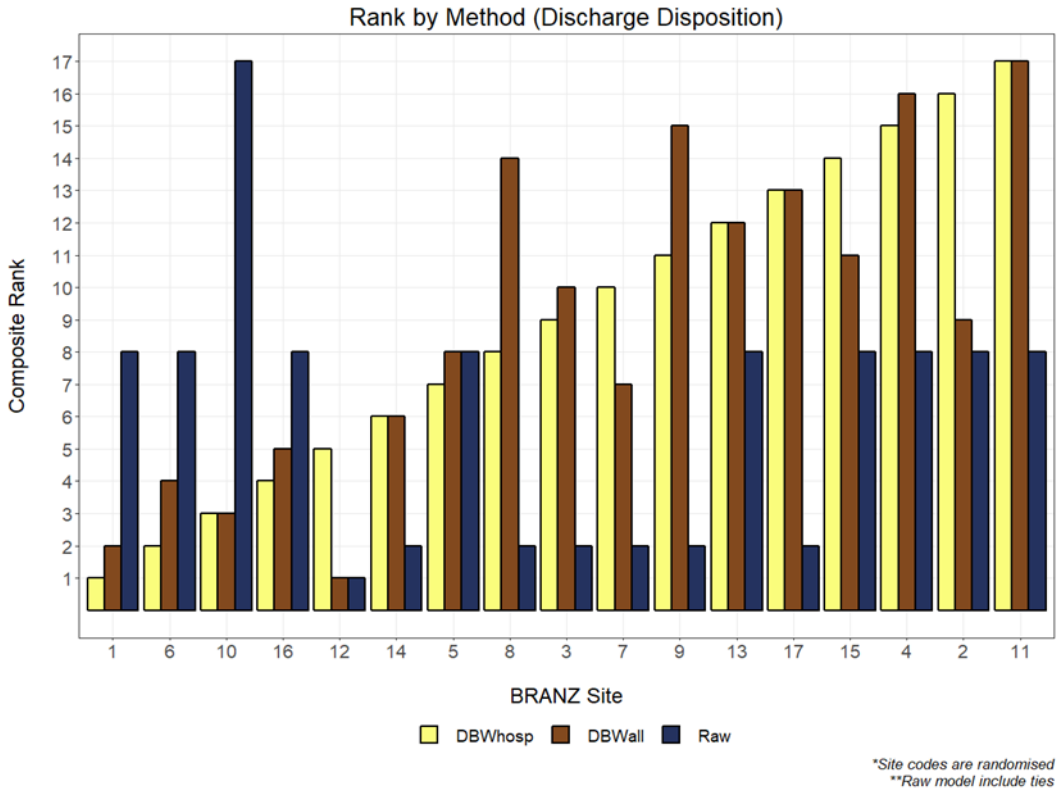


5.10.3 Discharge Disposition

Correlation between the three composite measures and the number of surviving patients discharged to home was poor (Table 39). This implies that there was no relationship between the composite measure ranks and the number of surviving patients that were discharged to home. The raw composite score demonstrated the highest correlation with the number of surviving patients discharged to home (ρ = 0.4657, *p* = 0.06), whereas the lowers correlation with the number of surviving patients discharged to home was the DBWhosp method (ρ = -0.1397, *p* = 0.59). Differences between the coefficients were not tested as none of the composite methods were associated with the number of patients discharged to home.

Variation in site rank between the composite measures was observed (Figure 11). No site received the same rank by each of the three methods of composite performance. Five of the 17 sites were one rank different (i.e., moved up or down one rank) between the two DBW composite measures. One site was two ranks different between the two measures, two sites were three ranks different, two sites were four ranks different, one site was six ranks different, and one site was seven ranks different. The remaining five sites were the same rank across the two measures.

Figure 11: Variation in site rank by composite method for discharge disposition



5.10.4 Hospital Readmissions

Correlation between the three composite measures and the number of readmissions at each site was poor; no significant relationships were observed (Table 39). Differences between the coefficients were not tested as none of the composite methods were associated with the number of patients readmitted to a specialist burns unit.

Variation in site rank between the composite measures was observed (Figure 12). No site received the same rank by each of the three methods of composite performance. Four of the 17 sites were one rank different (i.e., moved up or down one rank) between the two DBW composite measures, while the remaining 13 sites had the same rank across the two composite measures.

Figure 12: Variation in site rank by composite method for hospital readmissions

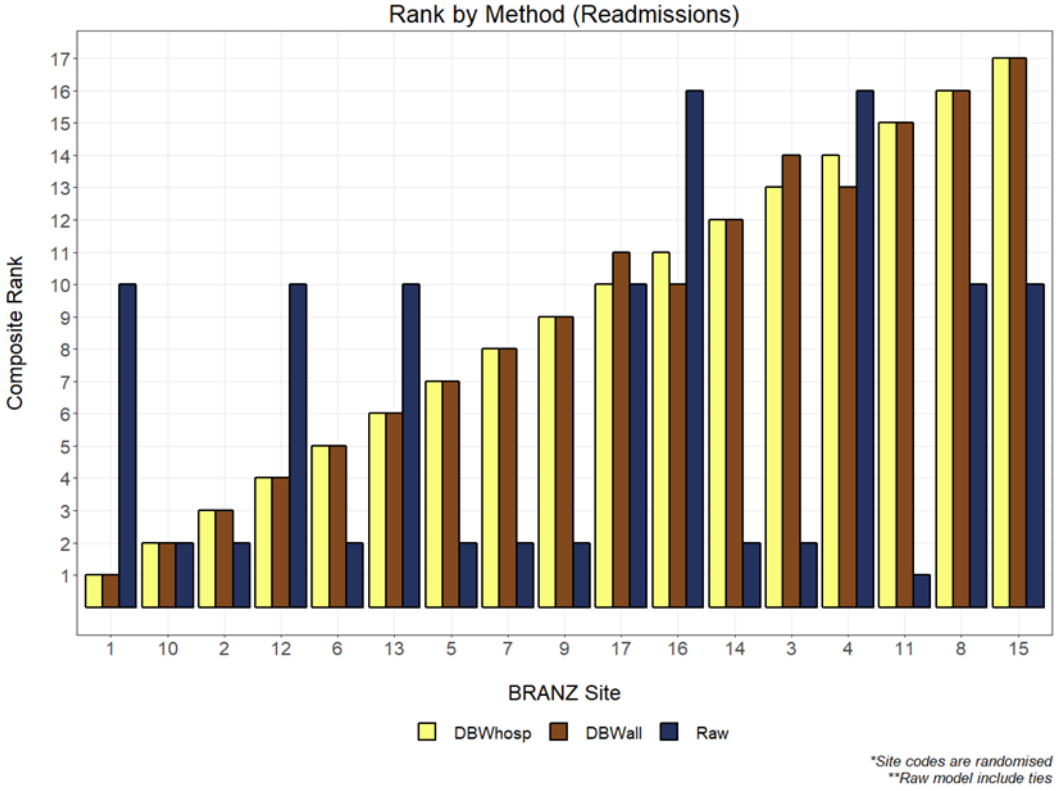


Table 39: Relationship Between Composite Indices and In-Hospital Outcomes

Composite Index	Spearman's ρ (rho)	*p*-value
Mortality		
DBWhosp	*-0.6313*	*0.007*
DBWall	*-0.6387*	*0.006*
Raw	0.1990	0.44
LOS within 75th percentile		
DBWhosp	-0.4412	0.08
DBWall	*-0.5049*	*0.039*
Raw	0.1485	0.57
Discharge Disposition		
DBWhosp	-0.1397	0.59
DBWall	-0.3775	0.14
Raw	0.4657	0.06
Readmission		
DBWhosp	-0.2328	0.37
DBWall	-0.2525	0.33
Raw	-0.0252	0.92

DBWall = denominator-based weight approach where individual weight per quality indicator was the same across all hospitals; DBWhosp = denominator-based weight approach where the weight for each QI was assigned per hospital.
Significant findings are highlighted by *red, italicised text*.

A summary of the each of the composite measures and the in-hospital outcomes of interest can be found in Table 40. A lower rank (i.e., one) indicates better performance across the composite performance measures (i.e., a greater proportion of patients who are eligible for and receive a particular QI). Specifically, Sites 1 and 6 are examples of high performing sites while Sites 11 and 15 are examples of low performing sites.

Table 40: Summary of site performance for the three composite measures, ranked for each in-hospital outcome

	Mortality			LOS			Discharge Disposition			Readmission		
Site	DBWhosp	DWBall	Raw	DBWhosp	DWBall	Raw	DBWhosp	DWBall	Raw	DBWhosp	DWBall	Raw
1	1	1	8	1	1	4	1	2	8	1	1	10
2	5	5	8	6	6	13	16	9	8	3	3	2
3	12	13	3	12	11	4	9	10	2	13	14	2
4	13	12	8	17	17	13	15	16	8	14	13	16
5	15	16	1	10	12	4	7	8	8	7	7	2
6	2	3	17	2	5	4	2	4	8	5	5	2
7	9	11	3	14	14	4	10	7	2	8	8	2
8	14	14	8	9	10	1	8	14	2	16	16	10
9	10	10	8	8	8	4	11	15	2	9	9	2
10	3	2	8	3	4	4	3	3	17	2	2	2
11	17	17	3	16	16	4	17	17	8	15	15	1
12	4	4	8	5	3	1	5	1	1	4	4	10
13	8	7	8	11	9	4	12	12	8	6	6	10
14	7	8	1	7	7	1	6	6	2	12	12	2
15	16	15	8	13	13	13	14	11	8	17	17	10
16	6	6	3	4	2	13	4	5	8	11	10	16
17	11	9	3	15	15	13	13	13	2	10	11	10

DBWall = denominator-based weight approach across all hospitals; DBWhosp = denominator-based weight approach for individual hospital; LOS = length of stay.
A lower rank (e.g., 1) indicates better performance.

6 DISCUSSION

6.1 Key Findings

This project aimed to use data from the BRANZ to quantify the variation in practice in the management of burn injuries across Australia and New Zealand burns units, and to explore how potential variation in practice between the burns units impact in-hospital outcomes.

During the study timeframe (July 1 2009 to December 31 2018), there were 27,183 admissions recorded by the BRANZ. Of these, 18,800 were recorded prior to the QI change on July 1 2016. The remaining 8,383 were recorded after the QI change.

Of all the QIs collected by the BRANZ, 11 were selected for detailed analysis as they displayed high levels of data completeness and clear variation in practice between the burns units contributing data to the BRANZ. The results of this project suggest that many of the QIs are applied differently depending on particular patient characteristics (i.e., age) and the severity of the burn (i.e., size and depth of burn).

Each of the 11 QIs that underwent detailed analysis were associated with at least one relevant in-hospital outcome of interest. In the most cases the application of the QI predicted a longer hospital stay for these patients, compared to the patients where the QI was not applied. These findings may relate to the QIs being applied more frequently to patients with severe burns, as patients with more severe burns typically have longer hospital stays compared to less severely burned patients.

The results of this project show that the application of the QIs was associated with improved outcomes for patients. The administration of venous thromboembolism prophylaxis is a specific example. Prophylaxis use following a burn injury was associated with reduced odds of the patient experiencing a venous thromboembolic event and in-hospital mortality. However, it is important to note that further analysis exploring the effects of venous thromboembolism prophylaxis in specific subgroups is required.

We used several composite measures to investigate how performance across multiple QIs related to the in-hospital outcomes. The composite measure ranks and the funnel plots allowed us to identify trends in site performance. Some sites performed well across many or all of the QIs, whereas some of the sites performed poorly across several QIs.

These results show that the variation in practice between the Australian and New Zealand burns units has an impact on patient outcomes. Moving forward, further collaboration with the sites is required to better understand the reasons for variation in practice, identify potential ways to reduce this variation, and to monitor the impact of changes in policies and guidelines on patient outcomes and hospital performance. This will lead to more consistent, better quality burn care across Australian and New Zealand burns units and improved outcomes for their patients.

6.2 Study Limitations

The strengths of this evaluation were the coverage of the BRANZ, the relatively large number of burn injuries included, and the overall high completeness of the collected QIs and data items. However, there were also limitations. Despite the relatively large number of burn injuries included and the overall high completeness of QIs and data items, the BRANZ does not currently collect long-term or follow up data on admissions (beyond recording readmissions to a specialist burns unit within 28 days of discharge from the original admission). This is an important limitation, as it restricts our ability to fully establish if and how the variation in practice in the management of serious burn injuries across Australian and New Zealand burns units impacts on clinical and patient outcomes. Another key limitation of this report is that we did not distinguish between planned and unplanned hospital readmissions as an outcome. This is important, as in many cases a planned readmission is not an adverse event, but rather a strategic treatment approach.

6.3 Next Steps

This project has laid the initial groundwork for a number of other initiatives. These include:

- Updating of the BRANZ data dictionary and database to better reflect the needs and requirements of particular QIs and data items;
- Establishing the need to collect additional long-term (i.e., post-hospital discharge) outcomes, such as wound healing, function, and health-related quality of life;
- Establishing an outlier policy to work in collaboration with the sites to understand the reasons for variation in practice;
- Engagement with the BRANZ sites to implement changes in quality care for burns patients as a result of these findings;
- Refinement of risk-adjusted analysis models for comparing site performance;
- Further analyses of performance and outcome data in greater detail (e.g., separating paediatric and adult cases, specifically looking at unplanned readmissions, etc.); and
- Incorporation of QI performance and benchmarking into BRANZ routine reporting practices.

7 CONCLUSION

The findings from this project suggest that there is considerable variation in practice in the management of burn injuries in Australian and New Zealand burns units, and that the variation in practice is associated with in-hospital outcomes. This is the first in-depth evaluation of the variation in practice across the clinical QIs embedded in the BRANZ. The results of this initial evaluation provides the foundation for ongoing future quality improvement initiatives. Key steps of the work ahead involves liaising with the sites to improve our understanding of the reasons underlying the observed variation in practice and identifying potential initiatives to reduce the variation in burn care provided by the Australian and New Zealand burns units. This should lead to better care and improved outcomes for burns patients in these countries.

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APPENDIX 1 – NHMRC BODY OF EVIDENCE MATRIX

Table A1: National health and Medical Research Council (NHMRC) Body of Evidence Matrix

Component	A	B	C	D
	Excellent	Good	Satisfactory	Poor
Evidence base	several level I or II studies with low risk of bias	one or two level II studies with low risk of bias or a systematic review/multiple level III studies with low risk of bias	level III studies with low risk of bias, or level I or II studies with moderate risk of bias	level IV studies, or level I to III studies with high risk of bias
Consistency	all studies consistent	most studies consistent and inconsistency may be explained	some inconsistency reflecting genuine uncertainty around clinical questions	evidence is inconsistent
Clinical impact	very large	substantial	moderate	slight or restricted
Generalisability	population/s studied in body or evidence are the same as the target population for the guideline	population/s studied in the body of evidence are similar to the target population for the guideline	population/s studies in body of evidence differ to target population for guideline but it is clinically sensible to apply this evidence to target population	population/s studied in body of evidence differ to target population and hard to judge whether it is sensible to generalise to target population
Applicability	directly applicable to Australian healthcare context	applicable to Australian healthcare context with few caveats	probably applicable to Australian healthcare context with some caveats	not applicable to Australian healthcare context

APPENDIX 2 – BRANZ INCLUSION AND EXCLUSION CRITERIA

All first admissions to Australian and New Zealand burns units where a burn injury is the principal reason for admission are included in the BRANZ. Only first admissions within 28 days of the burn injury occurring are included, with the exception of transfers from another hospital – all transfers are included. The patient may be admitted under the burns unit, or admitted under another unit and is consulted on by the burns unit.

There are additional conditions associated with inclusion in the BRANZ:

- Admission exceeds 24 hours in length; or
- Admission does not exceed 24 hours in length but the patient has a burn management procedure in theatre; or
- Admission does not exceed 24 hours in length but the patient dies.

All readmissions to the burn unit within 28 days from the date of discharge of the first admission are recorded by the BRANZ.

Medical causes of skin loss such as Steven Johnson Syndrome and toxic epidermal necrolysis syndrome (TENS) are excluded from the BRANZ.

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Further information

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