INTRODUCTION
Traumatic fracture is the most common reason for admission to hospital following injury in Australia, accounting for 60% of admissions due to falls [1]. The management of many long bone fractures is complex and the risk of non-union and their associated costs can be high [2]. Rates of non-union of 5-10% have been reported but many estimates are from small scale studies [3]. Cost estimates associated with healing complications following long bone fractures vary widely in the literature, from £7,000-79,000 in the UK [4, 5] and $25,666US in the US [6]. Given the differences in the healthcare systems direct extrapolation of cost estimates is not possible.

AIM
To describe hospital admissions and inpatient costs of hospital readmissions for healing complications following long bone fracture.

METHODS

Design
Retrospective cohort study using routinely collected hospital data linked to data from the Victorian Orthopaedic Trauma Outcomes Registry (VOTOR). VOTOR is a clinical registry capturing data about all orthopaedic trauma admissions to four hospitals in the State of Victoria.

Participants
All patients who were admitted to hospital for >24 hours for treatment of a humeral, tibial or femoral fracture registered by VOTOR with a date of admission from 1 Jan 2007 to 31 Dec 2011. Fractures were identified using ICD-10-AM diagnosis codes from the index admission.

Data Linkage
The extracted VOTOR dataset was linked to the hospital dataset. The resultant dataset represented the subset of patients who had been readmitted with a diagnosis of non-union, mal-union, delayed union or a periprosthetic fracture within two years of the index fracture.

Inpatient costs and Length of Stay (LOS):
Derived using a case-mix approach based on AN-DRGs.

RESULTS

Type of fracture healing complication
Fracture cases were linked with hospital readmissions for 3,908 patients. Of these, 8.6% were readmitted to hospital for fracture healing complications within two years of their index fracture.

Proximal humerus fractures and shaft of tibia fractures were the most common fracture type (Table 1). The most common type of complication in readmission was non-union (Figure 1). Table 1 summarises the median DRG costs per patient for all complication types and patients with non-union. Patients with multiple fracture healing complications were also those with multiple admissions, which explains their higher costs. The total inpatient costs for all admissions for fracture healing complications (n=337) was $5.4M AUD. The median inpatient hospital cost per patient for all complication admissions was $14,957 AUD.

LOS and costs of admissions
The majority of patients with complications (85%) had a single surgical readmission in the two years following their index fracture, 12% had two admissions for healing complications during this period. The median hospital length of stay for all complication admissions was 3 days (Table 2).

DISCUSSION
This study described the incidence and inpatient costs of hospitalisation for healing complications following fracture of the humerus, tibia or femur in the state of Victoria in Australia. Despite the widely varying estimates for fracture complications and their costs in the literature, the results of this study have similarities to results of other published studies [5, 6]. Owing to limitations of ICD diagnosis coding of complications and fracture types in hospital records, it is possible that complication rates were underestimated. There is a lack of consensus in the literature about how to define fracture healing complications and wide variability in the reliability of these methods [7].

CONCLUSION
Our study has provided important new knowledge of fracture healing complication rates. The findings of this study have provided the data necessary to drive prioritisation of such future research towards preventing fracture healing complications and improving long-term patient outcomes.

REFERENCES