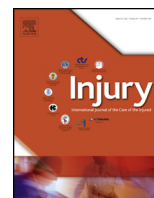




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Review

Development of a blunt chest injury care bundle: An integrative review

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ABSTRACT

Background: Blunt chest injuries (BCI) are associated with high rates of morbidity and mortality. There are many interventions for BCI which may be able to be combined as a care bundle for improved and more consistent outcomes.

Objective: To review and integrate the BCI management interventions to inform the development of a BCI care bundle.

Methods: A structured search of the literature was conducted to identify studies evaluating interventions for patients with BCI. Databases MEDLINE, CINAHL, PubMed and Scopus were searched from 1990–April 2017. A two-step data extraction process was conducted using pre-defined data fields, including research quality indicators. Each study was appraised using a quality assessment tool, scored for level of evidence, then data collated into categories. Interventions were also assessed using the APEASE criteria then integrated to develop a BCI care bundle.

Results: Eighty-one articles were included in the final analysis. Interventions that improved BCI outcomes were grouped into three categories; respiratory intervention, analgesia and surgical intervention. Respiratory interventions included continuous positive airway pressure and high flow nasal oxygen. Analgesia interventions included regular multi-modal analgesia and paravertebral or epidural analgesia. Surgical fixation was supported for use in moderate to severe rib fractures/BCI. Interventions supported by evidence and that met APEASE criteria were combined into a BCI care bundle with four components: respiratory adjuncts, analgesia, complication prevention, and surgical fixation.

Conclusions: The key components of a BCI care bundle are respiratory support, analgesia, complication prevention including chest physiotherapy and surgical fixation.

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Introduction

Blunt chest injury (BCI) is associated with a 10 to 36 percent mortality [1,2]. BCI can also have significant effects on morbidity and disability for up to a year after injury, with 50% of patients having ongoing pain at three months [3,4]. BCI includes bony or non-bony injury to the anterior or posterior chest resulting from blunt force trauma, for example, rib fractures, flail chest, pneumothorax, haemothorax, sternal fractures, lung contusion, and soft tissue contusion [5–7].

Patients with BCI pose a significant burden on the healthcare system due to complications arising post-injury. Respiratory complications, such as pneumonia, are common resulting in extended stays in the intensive care unit (ICU), prolonged mechanical ventilation (MV) duration and increased mortality [8,9]. Interventions for BCI can be diverse, and attempts have been made to combine therapies for BCI into protocols or pathways, though most reported in the literature only involve patients with greater than three rib fractures [10,11]. However, even one rib fracture has been shown to have increased complications especially in the elderly [12], with each additional rib fracture associated with an increased risk of mortality of 19%[8]. Furthermore, rib fractures are not always identified on chest x-ray, with reports of up to 50% of injuries missed [13].

To address this gap, in 2012, a Chest Injury Protocol (ChIP) was introduced in a Level-One Trauma Centre in Sydney, Australia [14,15]. ChIP was an early activation protocol to enable tailored, targeted patient care, as each patient has individual needs dependent on their pre-morbid condition [14]. The intent was to facilitate multidisciplinary management of blunt chest injury and ensure effective multimodal analgesia to prevent respiratory compromise. It involved the activation of a pager system which alerted the trauma team, physiotherapist and pain team; with optional alerts to the aged care and ICU teams.

Evaluation of ChIP in a pre-post study demonstrated a decrease in pneumonia by 56% and an associated increase in the use of physiotherapy assessment, high flow nasal prongs, and patient-controlled analgesia in the patients who received a ChIP call [14]. The interventions that were being utilised “ad hoc” by the admitting medical team were suggestive of the need to formalise a blunt chest injury “care bundle” [14,15]. A care bundle is a small set of evidence-based interventions that when delivered together

improve outcomes more than if they were administered separately [16]. Hence, a synthesis of the existing literature to determine the level of evidence for each of the care bundle components was needed. This paper will present an integrative review of existing research evidence related to interventions for the management of BCI to inform the development of a blunt chest injury care bundle.

Methods

The review was conducted in two parts: firstly, an integrative review was used to determine current evidence on interventions for BCI. Secondly, the findings of the review were considered and assessed for inclusion in the blunt chest injury care bundle.

Integrative review

The process for the review was based on the five steps of the framework described by Whittmore and Knafl [17]. Firstly, problem identification, followed by systematic literature searching, data evaluation, data analysis and presentation [17]. The Participant Intervention Comparator Outcome (PICO) framework was used to formulate the research question (Fig. 1) and inclusion/exclusion criteria [18].

Inclusion/exclusion criteria

Primary research studies investigating interventions for adult patients with blunt chest injury (≥16years) in acute settings were

Population	Adult patients with blunt chest injury presenting to acute services, e.g. Rib fracture, sternal fracture, blunt chest injury, thoracic injury, lung contusion, chest wall contusion Studies investigating clavicle fractures, or vessel injury were not included.
Intervention	Any treatment/care for acute blunt chest injury, e.g. non-invasive ventilation, analgesia. Thoracostomy, and emergency thoracotomy studies were not included
Comparator	Not limited by any specified comparator
Outcome	Any patient outcome, e.g. mortality, morbidity, respiratory depression, pneumonia; and hospital outcomes such as cost

Fig. 1. The PICO framework used for inclusion of studies.

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