International Journal of Nursing Studies 51 (2014) 251–260

Contents lists available at SciVerse ScienceDirect

International Journal of Nursing Studies

journal homepage: www.elsevier.com/ijns

Review

Preadmission interventions to prevent postoperative complications in older cardiac surgery patients: A systematic review

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ARTICLE INFO

Article history:
Received 20 September 2012
Received in revised form 15 May 2013
Accepted 17 May 2013

Keywords:
Cardiac surgical procedure
Preadmission preventive measures
Postoperative complications
Older patients

ABSTRACT

Objective(s): The literature on postoperative complications in cardiac surgery patients shows high incidences of postoperative complications such as delirium, depression, pressure ulcer, infection, pulmonary complications and atrial fibrillation. These complications are associated with functional and cognitive decline and a decrease in the quality of life after discharge. Several studies attempted to prevent one or more postoperative complications by preoperative interventions. Here we provide a comprehensive overview of both single and multiple component preadmission interventions designed to prevent postoperative complications.
Methods: We systematically reviewed the literature following the PRISMA statement guidelines.
Results: Of 1335 initial citations, 31 were subjected to critical appraisal. Finally, 23 studies were included, of which we derived a list of interventions that can be applied in the preadmission period to effectively reduce postoperative depression, infection, pulmonary complications, atrial fibrillation, prolonged intensive care unit stay and hospital stay in older elective cardiac surgery patients. No high quality studies were found describing effective interventions to prevent postoperative delirium. We did not find studies specifically targeting the prevention of pressure ulcers in this patient population.
Conclusions: Multi-component approaches that include different single interventions have the strongest effect in preventing postoperative depression, pulmonary complications, prolonged intensive care unit stay and hospital stay. Postoperative infection can be best prevented by disinfection with chlorhexidine combined with immune-enhancing nutritional supplements. Atrial fibrillation might be prevented by ingestion of N-3 polyunsaturated fatty acids. High quality studies are urgently needed to evaluate preadmission preventive strategies to reduce postoperative delirium or pressure ulcers in older elective cardiac surgery patients.

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0020-7489/$ – see front matter
http://dx.doi.org/10.1016/j.ijnurstu.2013.05.011

What is already known about the topic?

- Postoperative complications in older elective cardiac surgery patients are high prevalent.
- And are often associated with functional and cognitive decline and a decrease in the quality of life after discharge.

What this paper adds

- In this systematic review preadmission interventions where identified that have been shown to reduce postoperative depression, infection and pulmonary complications.
- To date there is no high quality evidence for measures aimed at preventing delirium and pressure ulcers in cardiac surgical patients applicable in the preadmission period.

1. Introduction

Over the recent decades, the patient population undergoing cardiac surgery has become older, sicker and higher-risk (Bacchetta et al., 2003; Litovski et al., 2008; Northrup et al., 2004). Patients of 65 years and older account for almost 60% of cardiac surgeries (Northrup et al., 2004) and show substantial heterogeneity in postoperative outcomes (Ettema et al., 2011). Whereas some older people have little increased risk of adverse events compared to the general population (Ettema et al., 2011; Zangrillo et al., 2004), vulnerable older patients (who are susceptible to physical or emotional injury) are more likely to experience adverse intra- and postoperative events (Norkiene et al., 2007; Scott et al., 2005).

The reported incidence of postoperative complications after cardiac surgery patients is high: ranging from 17% to 43.1% for delirium (Gamberini et al., 2009; Rudolph et al., 2010); from 17.5% to 28.7% for depression (Hata et al., 2006; Krannich et al., 2007); from 14.3% to 18% for pressure ulcer (Feuchtinger et al., 2006; Gomez et al., 2009); from 10.6% to 54.5% for hospital infection (DeRiso et al., 1996; Segers et al., 2008; Tepaske et al., 2001, 2007); from 10.6% to 12.1% for postoperative pulmonary complications (Al-Sarraf et al., 2009; Hulzebos et al., 2006; Zarbock et al., 2009) and from 15.2% to 33.3% for atrial fibrillation (Calò et al., 2005). These complications are associated with functional and cognitive decline and a decrease in quality of life and well-being after discharge (Hoogerduijn et al., 2007; Rudolph et al., 2010).

Already in the nineties, Recker (1994) concluded that preoperative teaching might facilitate admission of the cardiac surgical patient on the day of surgery, which could shorten the length of hospital stay. Other attempts have been made to prepare patients for cardiac surgery in the preadmission period (Cupples, 1991; Boyer et al., 2000; Lamarche et al., 1998; Watt-Watson et al., 2004) in order to prevent adverse events in the postoperative period. Many common and comorbid health problems, particularly in older persons, are multifactorial in etiology. These multifactorial syndromes are health conditions in which more than one risk factor is related to the outcome (Allore et al., 2005; Milisen et al., 2005). A good example of a multifactorial geriatric syndrome is delirium, which results from a complex and dynamic interplay between the various risk factors in a vulnerable patient. An effective intervention should therefore properly address this multifactorial origin (Milisen et al., 2005). Also, due to the multifactorial origin of syndromes more postoperative complications can occur at the same time in one vulnerable patient and risk factors are often related to more complications (Allore et al., 2005). However, in the literature several interventions that showed evidence of effectiveness aimed at preventing a single adverse outcome (Calò et al., 2005; DeRiso et al., 1996; Hulzebos et al., 2006; Segers et al., 2008; Tepaske et al., 2001), while others reported effectiveness of a combined multifactorial approach targeted at preventing multiple adverse outcomes simultaneously (Allore et al., 2005; Furze et al., 2009; Milisen et al., 2005; Shuldham et al., 2002). As a consequence, it is still unclear how older cardiac surgery patients can best be prepared for their cardiac surgery. Therefore, the purpose of the present systematic review is to provide an overview of both single and multi-component preadmission interventions designed to prevent single and multiple postoperative complications in older elective cardiac surgery patients.

2. Methods

We used the PRISMA statement recommendations in the design, literature search, analysis, and reporting of our systematic review (Moher et al., 2009).

2.1. Search strategy

In a first round, two authors (RE, HvK) independently searched for studies that satisfied the inclusion criteria. In a second round, also reference lists of identified articles were studied for relevant studies which were not revealed in the first round. This snowball technique was primarily performed by one of the authors (HvK).

Studies were included if they examined patients scheduled for elective cardiac surgery, who underwent a preoperative intervention aimed to prevent postoperative adverse events, complications or prolonged length of hospital stay. The exact search query and the accompanied electronic search strategy using the PICO framework (Schardt et al., 2007), is presented in Appendix E1. Searches were performed using the MEDLINE, EMBASE, Cochrane, Cinahl and PsychINFO databases for the period from January 1980 to March 2011.

The primary outcome assessed was the effectiveness of a preoperative intervention in preventing a postoperative complication, i.e. a decreased incidence of delirium, depression, pressure ulcer, infection, postoperative pulmonary complication or atrial fibrillation in the intervention group. We also assessed length of hospital stay as a secondary outcome, as a prolonged hospital stay could indicate a complicated postoperative hospital course.

Every effort was made to obtain the full text of all relevant papers. The two first authors (RE, HvK) individually read each of these articles and summarized the results in an Excel file for subsequent analysis.