



Original Contribution

# Steroids for surgery during cardiopulmonary bypass in adults: a meta-analysis<sup>☆,☆☆</sup>

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Received 22 February 2013; revised 29 August 2013; accepted 29 August 2013

## Keywords:

Cardiopulmonary bypass;  
Hospital length of stay;  
Intensive care unit stay;  
Steroid administration

## Abstract

**Study Objective:** To evaluate the effect of steroid administration on myocardial infarction (MI), stroke, renal insufficiency, death, intensive care (ICU) length of stay (LOS) and hospital LOS of patients undergoing cardiopulmonary bypass (CPB).

**Design:** Meta-analysis of parallel randomized controlled trials.

**Setting:** University hospital.

**Measurements:** A search was conducted in PubMed, EMBASE, MEDLINE(R) and the Cochrane Central Register of Controlled Trials of studies on adults undergoing surgery with CPB who received steroid administration. Effect size (risk ratio or mean difference) for MI, stroke, renal insufficiency, death, ICU LOS, and hospital LOS were evaluated.

**Main Results:** 48 RCTs published between 1977 and 2012 were retained for analysis. Steroids had no effect on the MI risk ratio (RR) 0.91 (95% confidence interval [CI] 0.63, 1.32); death at 30 days RR 0.84 (0.59, 1.20); stroke RR 0.92 (0.60, 1.42) or renal insufficiency RR 0.83 (0.52, 1.32). Administration of steroids reduced ICU LOS ( $P = 0.00001$ ;  $I^2$  87.5%) and hospital LOS ( $P = 0.03$ ;  $I^2$  81.1%). Metaregressions showed that duration of steroid administration was correlated with the reduction in ICU LOS ( $P = 0.0004$ ) and hospital LOS ( $P < 0.00001$ ).

**Conclusions:** Increasing the duration of steroid administration may reduce ICU and hospital LOS greater than increasing the dose.

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## 1. Introduction

Systemic release of proinflammatory cytokines during cardiopulmonary bypass (CPB) may contribute to postoperative organ injury. Steroids have been administered to patients undergoing CPB in the hope of reducing postoperative organ injury. A recent large trial showed a nonstatistically significant trend towards a reduction in a composite outcome that included death, myocardial infarction (MI), stroke, renal failure, or respiratory failure: relative risk 0.83

<sup>☆</sup> The authors have no conflicts of interest to declare.

<sup>☆☆</sup> Supported solely by departmental funding.

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(95% confidence intervals [CI] 0.67 - 1.01) [1]. Due to the low incidence of adverse outcomes, the number of patients who need to be included in a study to show a benefit in any one single outcome is very high. Previous meta-analyses have shown only reduced incidence of atrial fibrillation, mechanical ventilation time, and a marginal reduction in blood loss (200 mL) [2–4]. A small reduction in the time spent in the intensive care unit (ICU) and the hospital also was found, but the two results contained a moderate to high degree of heterogeneity and no satisfactory explanation for the source of the heterogeneity was provided [2,4,5].

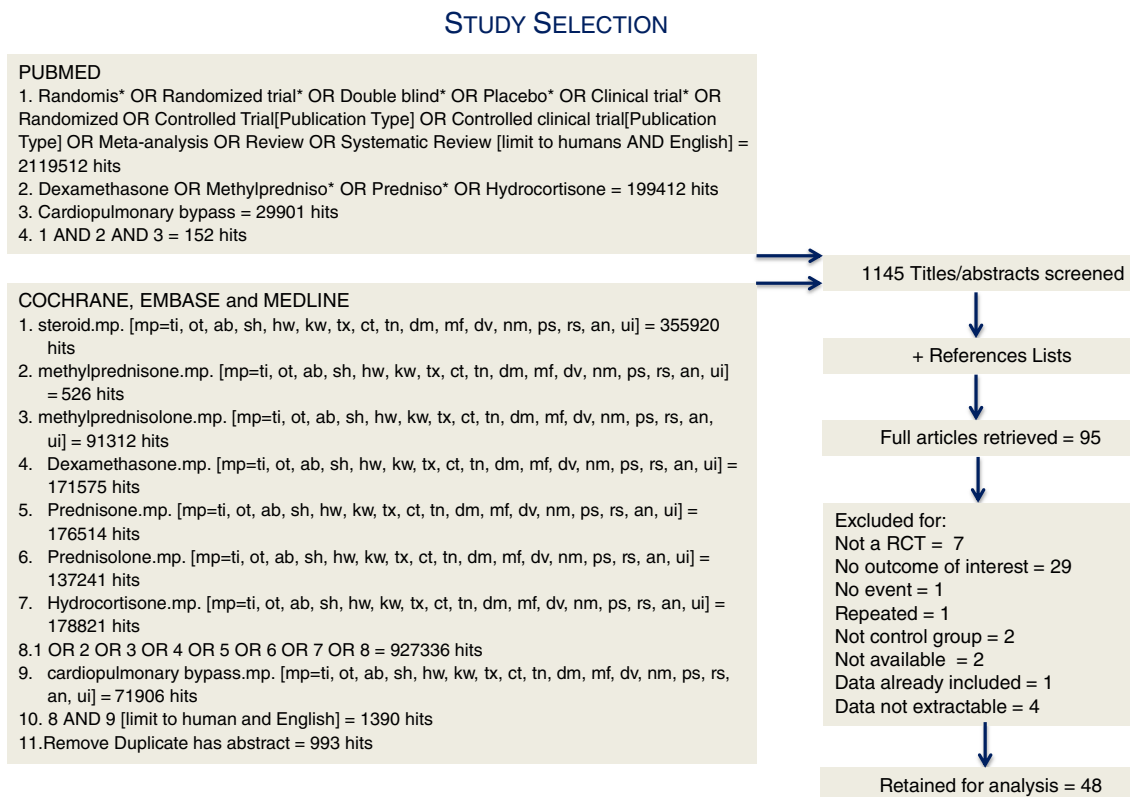
The aim of this meta-analysis was to reevaluate the effects of steroids in adult patients undergoing surgery with CPB on major outcomes while including the most recent trials, and to reassess the reasons for heterogeneity of the effects of steroids on ICU and hospital lengths of stay (LOS).

## 2. Materials and methods

The intervention was administration of systemic steroids. The primary objective was perioperative (0–30 days):MI as defined by the authors of the included studies. Secondary objectives were stroke, renal insufficiency, death at 30 days and one year (all causes), length of tracheal intubation, ICU and hospital LOS, and costs of the procedure. The

population was any adult ( $\geq 18$  yrs of age) undergoing any type of procedure with CPB with the exception of organ transplantation.

A search was conducted in PubMed (up to December 10, 2012), EMBASE (1974 to Week 49, 2012), MEDLINE (1946 to November, Week 3, 2012), and the Cochrane Central Register of Controlled Trials (November 2012) for all randomized controlled trials (RCTs) comparing the intervention with no intervention. The reference lists of all studies retained and those of the recent ( $\geq 2009$ ) previous meta-analysis on the topic also were checked [2–5]. The exact search strategy is provided in Fig. 1. When data were published in more than one report, available reports were consulted, but the study (not the report) was considered the unit; therefore, no study was considered more than once. As recommended by the Cochrane Collaboration, the RCTs were judged on the information contained in the reports without any assumption of the following: (1) adequate sequence generation (quasi-randomized studies were rejected); (2) allocation concealment (inability of the person who was recruiting the pt to know in advance to which group the pt would be assigned); (3) blinding of patients, personnel, and assessor for the outcomes of interest; (4) incomplete outcome data addressed (clear description of the fate of all pts included in the study); (5) papers that were free of selective reporting (outcomes of interest specified in the methods of the study clearly available for all pts included in



**Fig. 1** Details of the search and selection of the studies.

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