# INPLASY PROTOCOL

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**Conflicts of interest:**
**None.**

# The effectiveness of acute normovolemic hemodilution reduces allogeneic blood transfusion during hepatectomy: A meta-analysis of randomized controlled trials

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**Review question / Objective:** **To study the effectiveness of using acute normovolemic hemodilution to reduce allogeneic blood transfusion in hepatectomy..**
**Condition being studied:** **At present, acute normovolemic hemodilution is widely used in liver surgery. Our country accounts for about half of the deaths of liver tumors in the world every year, while liver tumors and hepatectomy are major operations with high mortality. The main treatment of perioperative blood loss is allogeneic blood transfusion. Although the quality of allogeneic blood continues to improve, the risk of transfusion of allogeneic blood still exists. In addition to the spread of infectious diseases, blood transfusion-related febrile reactions and acute lung injury, blood transfusion can also lead to suppression of the immune system, resulting in increased incidence of postoperative infection, delayed wound healing, increased hospital stay and waste of medical resources. Rational use of ANH blood protection technology during operation can greatly save clinical blood and alleviate the current tense phenomenon of blood use.**

**INPLASY registration number:** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 03 April 2020 and was last updated on 03 April 2020 (registration number INPLASY202040011.

## INTRODUCTION

**Review question / Objectives:** **To study the effectiveness of using acute normovolemic hemodilution to reduce allogeneic blood transfusion in hepatectomy.**

**Condition being studied:** **At present, acute normovolemic hemodilution is widely used in liver surgery. Our country accounts for about half of the deaths of liver tumors in the world every year, while liver tumors and hepatectomy are major operations with high mortality. The main treatment of perioperative blood loss is allogeneic blood**

transfusion. Although the quality of allogeneic blood continues to improve, the risk of transfusion of allogeneic blood still exists. In addition to the spread of infectious diseases, blood transfusion-related febrile reactions and acute lung injury, blood transfusion can also lead to suppression of the immune system, resulting in increased incidence of postoperative infection, delayed wound healing, increased hospital stay and waste of medical resources. Rational use of ANH blood protection technology during operation can greatly save clinical blood and alleviate the current tense phenomenon of blood use.

## METHODS

**Participant or population:** Patients older than 18 years old who underwent hepatectomy.

**Intervention:** Patients used ANH during hepatectomy.

**Comparator:** Patients used blank or standard control during hepatectomy.

**Study designs to be included:** A randomized controlled trial to evaluate the effect of ANH on blood transfusion products.

**Eligibility criteria:** The inclusion criteria were in the order of PICOS: (1) population: patients older than 18 years old who underwent hepatectomy; (2) intervention: patients used ANH during hepatectomy; (3) comparative intervention: patients used blank or standard control during hepatectomy; (4) outcome indicators: at least one of the following outcome indicators: blood product infusion volume, hemoglobin value, blood coagulation function, adverse events and hospital stay; (5) study design: randomized controlled trial (RCT) or quasi-randomized controlled trial (QRCT). Exclusion criteria: articles that did not evaluate the above results or did not directly compare ANH with blanks or standards were not included in the meta-analysis. Duplicate reports and meeting summaries are excluded. Case reports, biochemical tests, letters and reviews were also cancelled. Preoperative use of autologous blood preservation or erythropoietin was excluded.

**Information sources:** We performed a comprehensive search to identify published, in press, and unpublished studies. The search included the following databases: MEDLINE; EMBASE; Cochrane Central Register of Controlled Trials (CENTRAL) ;Web of Science; PubMed ;Sinomed. The reference lists of the included studies were also checked for additional studies that were not identified with the database search. The search was conducted from database inception to March 20, 2020. No restriction was applied to language or publication status.

**Main outcome(s):** Main outcome is Intraoperative red blood cell infusion volume and the measures of effect is evaluate the transfusion volume between the two groups after using ANH.

**Additional outcomes:** Infusion volume of other blood products during operation, hemoglobin difference before and after operation, PT, APTT, adverse events, hospital stay.

**Data management:** The studies retrieved during the searches will be assessed for relevance, and those identified as being potentially eligible fully assessed against the inclusion/exclusion criteria. The two researchers read the literature and use the standard form in Microsoft excel to perform data extraction separately; differences in the process of data extraction are resolved through discussion.

**Quality assessment / Risk of bias analysis:** Two reviewers independently performed risk-of-bias assessment. Cochranehandbook was used to evaluate the included literature. It mainly includes: the generation of random series (selection bias); distributive blindness (selection bias); study and subject blindness (implementation bias); outcome blindness (measurement bias); outcome data integrity

(follow-up bias); selective reporting outcome bias (reporting bias); other biases. For missing or ambiguous data, contact the author of the trial to obtain this information. If all the quality evaluation criteria are fully met, the possibility of bias in the study is the least, and the literature is grade A; if any one or more quality evaluation criteria are only partially satisfied, the possibility of corresponding bias in the study is moderate, grade B; if any one or more quality evaluation criteria are not satisfied at all, the possibility of bias in the study is high, grade C.

**Strategy of data synthesis:** The data to be extracted from the literature are: name of the first author; year of publication; country; preoperative diagnosis, age, sex, ASA grade, anesthetic methods, intervention, blood collection volume, outcomes. The two researchers read the literature and use the standard form in Microsoftexcel to perform data extraction separately; differences in the process of data extraction are resolved through discussion. The present study was performed by Review Manager Software(RevMan Version 5.3, The Cochrane Collaboration, Copenhagen, Denmark) and Stata16(StataCorp LLCStata 16).Standardized mean differences (SMD) with a 95% con-fidence interval were assessed for continuous outcomes. $P < 0.05$ was set as the significance level. The heterogeneity was assessed by using the Q test and I2statistic. We calculated the odds ratios(OR) with 95% credible intervals (CrI) for the binary outcomes, mean differences (MD) with 95% CrI for continuous outcomes, and rate ratios with 95% CrI for count outcomes, using a fixed-effect model or random-effects model according to model-fit. We also conducted the sensitivity analysis to evaluate whether any single study had the weight to skew on the overall estimate and data. Begg's funnel plot was used to assess publication bias. If publication bias exists, the Begg's funnel plot is asymmetric.

**Subgroup analysis:** If the main outcome show that there are statistically significant differences between treatment groups subgroup analysis will be performed. The following subgroup analyses are planned: hemoglobin levels at baseline (divided into groups based on data); age (classified into categories based on data); and gender.

**Sensibility analysis:** Depends on the heterogeneity of the literature.

**Language:** There are no restrictions.

**Coutries involved:** There are no restrictions.

**Keywords:** "Acute normovolemic hemodilution", hepatectomys.

**Contributions of each author:**
Author 1 - Conception/design and data acquisition/analysis and data interpretation and article drafting.
Author 2 - Data acquisition/analysis and data interpretation and article drafting.
Author 3 - Data acquisition/analysis and data interpretation and article drafting.
Author 4 - Conception/design and article drafting.