

## Additional file 2. Relevant excluded studies and reasons for exclusion.

| Study               | Journal      | Year | PMID     | Patients' conditions                                                                                                           | Interventions                                                                 | Comparisons                                                                                                   | Reasons for exclusion                                                                                                                               |
|---------------------|--------------|------|----------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Balakrishnan et al. | Anesth Analg | 2000 | 10866905 | Adult patients scheduled for nonemergent surgical treatment of an intracranial space-occupying lesion under general anesthesia | Fentanyl                                                                      | Remifentanyl                                                                                                  | Interventions were excluded because they were only intraoperative and did not mention ICU management                                                |
| Breen et al.        | Crit Care    | 2005 | 15987391 | The target population were patients requiring long-term mechanical ventilation for medical reasons                             | Midazolam-based sedation regime with fentanyl or morphine added for analgesia | Remifentanyl-based sedation regime titrated to response before the addition of midazolam for further sedation | Fentanyl and morphine were mixed in the intervention group, but we could not analyze these 2 opioids separately; therefore, this study was excluded |
| Cheng et al.        | Anesth Analg | 2001 | 11323328 | ASA physical status III-IV subjects undergoing elective CABG surgery, with cardiopulmonary bypass                              | A typical fentanyl/isoflurane/propofol regimen                                | A remifentanyl/isoflurane/propofol regimen                                                                    | This study was excluded because the intervention was only during surgery.                                                                           |

|                 |                 |      |          |                                                                                                                                       |                           |                                                   |                                                                                                                                                                                                        |
|-----------------|-----------------|------|----------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engoren et al.  | Anesth Analg    | 2001 | 11574346 | Adult patients who underwent cardiac surgery                                                                                          | Fentanyl-based anesthetic | Sufentanil-based or remifentanil-based anesthetic | We excluded this study because the number of patients in each group was not specified, and remifentanil appeared to be continued until the time of ICU admission, but fentanyl and sufentanil were not |
| Fleisher et al. | J Clin Anesth   | 2001 | 11578882 | Scheduled for elective surgeries under general endotracheal anesthesia, with an expected duration of unconsciousness of $\geq 30$ min | Fentanyl                  | Remifentanil                                      | This study was excluded because the intervention was only during surgery, and analgesia with morphine or fentanyl was provided in the remifentanil group as transition analgesia                       |
| Howie et al.    | Anesth Analg    | 2001 | 11323327 | Patients scheduled for elective CABG surgery with an ASA physical status of III-IV                                                    | Fentanyl                  | Remifentanil                                      | This study was excluded because the intervention was only during surgery, and the same treatment was conducted during the ICU stay                                                                     |
| Joshi et al.    | J Clin Anesth   | 2002 | 12477583 | Adult patients scheduled for elective surgical procedures with general anesthesia                                                     | Fentanyl treatment        | Remifentanil treatment                            | This study was excluded because the intervention was only during surgery, and the same treatment was conducted during the ICU stay                                                                     |
| Kahn et al.     | J Burn Care Res | 2011 | 21240000 | All burn patients admitted to the burn/trauma ICU                                                                                     | Fentanyl                  | Morphine                                          | This study was excluded because it was a retrospective study. However, there was no mention of the study design in the title and abstract; Therefore, we did not exclude it until the second screening |

|                 |               |      |      |          |                                                                                                                   |                                                                                                                               |          |                                                   |                                                                                                                                    |
|-----------------|---------------|------|------|----------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Khanykin et al. | Heart Forum   | Surg | 2013 | 24370801 | Elective patients scheduled to undergo CABG, aortic valve replacement, or mitral valve surgery for the first time | Low-dose group                                                                                                                | fentanyl | Remifentanyl                                      | This study was excluded because the intervention was only during surgery.                                                          |
| Maddali et al.  | J Clin Anesth |      | 2006 | 17175431 | Primary CABG patients undergoing first-time surgery with cardiopulmonary bypass                                   | Fentanyl                                                                                                                      |          | Remifentanyl                                      | This study was excluded because the intervention was only during surgery.                                                          |
| Möllhoff et al. | Br J Anaesth  |      | 2001 | 11878522 | Elective CABG surgery                                                                                             | Fentanyl                                                                                                                      |          | Remifentanyl                                      | This study was excluded because the intervention was only during surgery.                                                          |
| Murphy et al.   | Anesth Analg  |      | 2009 | 19608797 | Patients who underwent cardiac surgery with cardiopulmonary bypass                                                | Fentanyl (600 µg)                                                                                                             |          | Morphine (40 mg)                                  | This study was excluded because the intervention was only during surgery, and the same treatment was conducted during the ICU stay |
| Myles et al.    | Anesth Analg  |      | 2002 | 12351249 | Eligible patients for elective CABG                                                                               | A fentanyl bolus with a small dose of 12 µg/kg (Group FLD), and a fentanyl bolus with a moderate dose of 24 µg/kg (Group FMD) |          | Remifentanyl infusion at 0.83 µg/kg/min (Group R) | This study was excluded because the intervention was only during surgery, and the same treatment was conducted during ICU stay     |

ICU, intensive care unit; CABG, coronary artery bypass grafting; ASA, American Society of Anesthesiologists.