

**Universal Comments (apply across all studies):**

- 2 of the 3 pro-physician studies (in **green**) were independently funded. 4 of the 5 pro-nurse anesthetist studies (in **red**) were funded by the American Association of Nurse Anesthetists. The Cochrane Collaboration 2014 Review (in **gray**) is neither pro-physician nor pro-nurse anesthetist.
- Fully independent nurse anesthetist practice generally occurs only with low-risk patients undergoing low-risk procedures, so these studies should not be used for policy decisions spanning the full spectrum of anesthesia care.
- In all research, it is much easier to find “no difference” between two groups than to find a difference. The level of evidence needed to find a difference is much higher, similar to requirements for a “guilty” verdict in a court of law.

**Silber et al 2000**

Published in *Anesthesiology*  
Outcomes Study

**What the study says:**

“After adjustments for severity of illness and other confounding variables, we found higher mortality and failure-to-rescue rates for patients who underwent operations without medical direction by an anesthesiologist.”

**Key Points:**

- Found 2.5 excess deaths within 30 days of admission and 6.9 excess failures-to-rescue (deaths) per thousand cases when an anesthesiologist was not involved.
- Independently funded.
- Contains better risk adjustment than any of the pro-nurse studies, including detailed statistical validation.
- The results may actually be understated due to the authors’ generous definition of an “undirected” case.

**Staffing data source** ..... Medicare 1991-1994

**Outcomes data source** .... HCFA Vital Status File 1991-1994  
ICD-9 and CPT codes 1991-1994

**Study sample** ..... 194,430 cases in 1 state (Pennsylvania)

**Memtsoudis et al 2012**

Published in *Journal of Clinical Anesthesia*  
Outcomes Study

**What the study says:**

“Factors independently increasing the risk for unexpected disposition [a research term associated with adverse outcomes and increased costs] included ... anesthesia provided by nonanesthesiology professionals and certified registered nurse-anesthetists versus anesthesiologists.”

**Key Points:**

- The odds of “unexpected disposition” after ambulatory surgery were 80% higher when the anesthesia care was provided by a nurse anesthetist as opposed to a physician anesthesiologist.
- Independently funded.
- Uses data that are more recent than any pro-nurse study, and includes the most cases out of all of the studies.
- Found differences for relatively low-risk procedures (outpatient knee and shoulder surgery).
- The results mirror those seen in a comparable 2005 study, strengthening the validity of the results.

**Staffing data source**..... National Survey of Ambulatory Surgery (NSAS) 1996 and 2006

**Outcomes data source**..... NSAS 1996 and 2006

**Study sample** ..... 2,470,978 cases nationwide

**Miller et al 2015 (QZ Study)**

Published in *A&A Case Reports*  
Case Study

**What the study says:**

“Of the 538 hospitals that reported only the modifier QZ, 47.5% had affiliated physician anesthesiologists ... The modifier QZ does not seem to be a valid surrogate for no anesthesiologist being involved in the care provided.”

**Key Points:**

- Physician anesthesiologists were affiliated with almost half of hospitals that exclusively reported billing modifier QZ.
- Modifier QZ does not accurately represent solo nurse anesthetist practice.
- Dulisse and Cromwell 2010 (Health Affairs study) and Pine et al 2003 use modifier QZ to represent solo nurse anesthetist practice. Therefore, the conclusions of these studies are likely invalid.

**Billing data source** ..... 2013 Medicare Claims

**Staffing data source** ..... 2014 Physician Compare

**Study sample** ..... 538 hospitals across the U.S.

**Dulisse and Cromwell 2010 (Health Affairs study)**

Published in *Health Affairs*  
Sometimes AKA “Research Triangle Institute” study  
Outcomes Study

**What the study says:**

“No evidence to suggest that there is an increase in patient risk associated with anesthesia provided by unsupervised CRNAs.”

**Key Points:**

- Funded by the American Association of Nurse Anesthetists.
- Did not adequately account for differences in patient “sickness” (weak risk adjustment).
- Uses a flawed approach to identify nurse anesthetist-solo cases (QZ Modifier).

**Staffing data source**..... Medicare 1999-2005

**Outcomes data source** ..... Medicare 1999-2005

**Study sample** ..... 481,440 cases nationally

**Hogan et al 2010**

Published in *Nursing Economic\$*  
 Sometimes AKA “The Lewin Group” study  
 Cost-Effectiveness Analysis

**What the study says:**

“These results support the conclusion that the most cost-effective delivery model is CRNAs practicing independently.”

**Key Points:**

- Funded by the American Association of Nurse Anesthetists.
- Did not include any original data or directly measure differences in cost-effectiveness. It is a **simulation** based entirely on a set of assumptions.
- The biggest assumption is that there is no difference in care quality between nurse anesthetists and physician anesthesiologists. This assumption is based primarily on Pine 2003 and Simonson 2007 (see reverse side).
- Did not account for differences in productivity between nurse anesthetists and physician anesthesiologists.

**Pine et al 2003**

Published in *AANA Journal*  
 Outcomes Study

**What the study says:**

“Hospitals without anesthesiologists had results similar to hospitals where anesthesiologists provided or directed anesthesia care.”

**Key Points:**

- Funded in part by the AANA Foundation.
- Uses a flawed approach to identify nurse anesthetist-solo cases (QZ Modifier).
- Provides few details about its risk adjustment methods.

**Staffing Data Source** ..... Medicare 1995-1997

**Outcomes data source**..... Medicare 1995-1997

**Study sample** ..... 404,194 cases in 22 states

**Needleman and Minnick 2009**

Published in *Health Services Research*  
 Outcomes Study

**What the study says:**

“Hospitals that use only CRNAs, or a combination of CRNAs and anesthesiologists, do not have systematically poorer maternal outcomes compared with hospitals using anesthesiologist-only models.”

**Key Points:**

- Funded by the American Association of Nurse Anesthetists.
- Ignores the fact that sicker patients are more likely cared for in physician anesthesiologist-only facilities vs. nurse anesthetist-only facilities.
- These same authors found in 2008 that “CRNA-only” facilities were far more likely to be Level 1 (low complexity) obstetric facilities than facilities using other anesthesia provider models.
- Includes disproportionately healthy patients that do not accurately represent the U.S. population.
- ICD-9 codes are an unreliable outcome measure due to “under-coding” in smaller (nurse anesthetist-staffed) hospitals.

**Staffing Data Source** ..... 2004 survey of hospitals

**Outcomes data source**..... ICD-9 codes 1999-2001

**Study sample** ..... 1,141,000 cases in 6 states

**Cochrane Collaboration Review 2014**

Published in *The Cochrane Library*  
 Literature Review

**What the review says:**

“No definitive statement can be made about the possible superiority of one type of anaesthesia care over another.”

**What the American Association of Nurse Anesthetists says about this review:**

“Researchers find no differences in care provided by CRNAs and Anesthesiologists.”

**Key Points:**

- The authors’ actual conclusion is that currently available scientific evidence is unable to definitively answer this question. (pp. 2, 3, 15)
- Did not collect any original data. The authors considered more than 8,000 studies, but only 6 were included in the review.
- No randomized controlled trials – patients randomly assigned to a physician anesthesiologist or nurse anesthetist for care (research gold standard) – were included. The authors state that “randomization may be unacceptable to health service providers, research ethics committees and patients, particularly for high-risk patients and procedures.”
- The authors state that it is possible that many cases using “independent” nurse anesthetist care may actually involve physician anesthesiologists.
- Reports important differences between patients from nurse anesthetist-solo cases and from cases involving a physician anesthesiologist.
- Determined that the Dulisse 2010 *Health Affairs* study (reverse side) was at “high risk” for bias due to its funding source.