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[Intervention Review]

# Physician anaesthetists versus non-physician providers of anaesthesia for surgical patients

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## ABSTRACT

### Background

With increasing demand for surgery, pressure on healthcare providers to reduce costs, and a predicted shortfall in the number of medically qualified anaesthetists it is important to consider whether non-physician anaesthetists (NPAs), who do not have a medical qualification, are able to provide equivalent anaesthetic services to medically qualified anaesthesia providers.

### Objectives

To assess the safety and effectiveness of different anaesthetic providers for patients undergoing surgical procedures under general, regional or epidural anaesthesia. We planned to consider results from studies across countries worldwide (including developed and developing countries).

### Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EMBASE and CINAHL on 13 February 2014. Our search terms were relevant to the review question and not limited by study design or outcomes. We also carried out searches of clinical trials registers, forward and backward citation tracking and grey literature searching.

### Selection criteria

We considered all randomized controlled trials (RCTs), non-randomized studies (NRS), non-randomized cluster trials and observational study designs which had a comparison group. We included studies which compared an anaesthetic administered by a NPA working independently with an anaesthetic administered by either a physician anaesthetist working independently or by a NPA working in a team supervised or directed by a physician anaesthetist.

### Data collection and analysis

Three review authors independently assessed trial quality and extracted data, contacting study authors for additional information where required. In addition to the standard methodological procedures, we based our risk of bias assessment for NRS on the specific NRS risk of bias tool presented at the UK Cochrane Contributors' Meeting in March 2012. We considered case-mix and type of surgical procedure, patient co-morbidity, type of anaesthetic given, and hospital characteristics as possible confounders in the studies, and judged how well the authors had adjusted for these confounders.

## Main results

We included six NRS with 1,563,820 participants. Five were large retrospective cohort studies using routinely collected hospital or administrative data from the United States (US). The sixth was a smaller cohort study based on emergency medical care in Haiti. Two were restricted to obstetric patients whilst the others included a range of surgical procedures. It was not possible to combine data as there was a degree of heterogeneity between the included studies.

Two studies failed to find a difference in the risk of death in women undergoing caesarean section when given anaesthesia by NPs compared with physician anaesthetists, both working independently. One study reported there was no difference in mortality between independently working provider groups. One compared mortality risks between US states that had, or had not, 'opted-out' of federal insurance requirements for physician anaesthetists to supervise or direct NPs. This study reported a lower mortality risk for NPs working independently compared with physician anaesthetists working independently in both 'opt-out' and 'non-opt out' states.

One study reported a lower mortality risk for NPs working independently compared with supervised or directed NPs. One reported a higher mortality risk for NPs working independently than in a supervised or directed NP group but no statistical testing was presented. One reported a lower mortality risk in the NP group working independently compared with the supervised or directed NP group in both 'opt-out' and 'non-opt out' states before the 'opt-out' rule was introduced, but a higher mortality risk in 'opt-out' states after the 'opt-out' rule was introduced. One reported only one death and was unable to detect a risk in mortality. One reported that the risk of mortality and failure to rescue was higher for NPs who were categorized as undirected than for directed NPs.

Three studies reported the risk of anaesthesia-related complications for NPs working independently compared to physician anaesthetists working independently. Two failed to find a difference in the risk of complications in women undergoing caesarean section. One failed to find a difference in risk of complications between groups in 'non-opt out' states. This study reported a lower risk of complications for NPs working independently than for physician anaesthetists working independently in 'opt-out' states before the 'opt-out' rule was introduced, but a higher risk after, although these differences were not tested statistically.

Two studies reported that the risk of complications was generally lower for NPs working independently than in the NP supervised or team group but no statistical testing was reported. One reported no evidence of increased risk of postoperative complications in an undirected NP group versus a directed NP group.

The risk of bias and assessment of confounders was particularly important for this review. We were concerned about the use of routine data for research and the likely accuracy of such databases to determine the intervention and control groups, thus judging four studies at medium risk of inaccuracy, one at low and one, for which there was insufficient detail, at an unclear risk. Whilst we expected that mortality would have been accurately reported in record systems, we thought reporting may not be as accurate for complications, which relied on the use of codes. Studies were therefore judged as at high risk or an unclear risk of bias for the reporting of complications data. Four of the six studies received funding, which could have influenced the reporting and interpretation of study results. Studies considered confounders of case-mix, co-morbidity and hospital characteristics with varying degrees of detail and again we were concerned about the accuracy of the coding of data in records and the variables considered during assessment. Five of the studies used multivariate logistic regression models to account for these confounders. We judged three as being at low risk, one at medium risk and one at high risk of incomplete adjustment in analysis.

## Authors' conclusions

No definitive statement can be made about the possible superiority of one type of anaesthesia care over another. The complexity of perioperative care, the low intrinsic rate of complications relating directly to anaesthesia, and the potential confounding effects within the studies reviewed, all of which were non-randomized, make it impossible to provide a definitive answer to the review question.

## PLAIN LANGUAGE SUMMARY

### Physician anaesthetists versus nurse anaesthetists for surgical patients

#### Background

There is an increasing demand for surgery, pressure on healthcare providers to reduce costs, and a predicted shortfall in the number of medically qualified anaesthetists. This review aimed to consider whether anaesthesia can be provided equally effectively and safely by nurse anaesthetists (without medical qualifications) as by medically qualified anaesthetists with specialist training.

#### Study characteristics

The evidence was current up to 13 February 2013. We found six relevant studies, five of which were large observational studies from the US with a comparison group and with study durations from two to 11 years, and one was a much smaller 12 week study from Haiti. There were over 1.5 million participants in the studies. Information for these studies was taken from American insurance databases (Medicare) and from hospital records. The small study was based on emergency medical care after the 2008 hurricanes in Haiti.

### **Key results**

Most studies stated that there was no difference in the number of people who died when given anaesthetic by either a nurse anaesthetist or a medically qualified anaesthetist. One study stated that there was a lower rate of death for nurse anaesthetists compared to medically qualified anaesthetists. One study stated that the risk of death was lower for nurse anaesthetists compared to those being supervised by an anaesthetist or working within an anaesthetic team, whilst another stated the risk of death was higher compared to a supervised or team approach. Other studies gave varied results. Similarly, there were variations between studies for the rates of complications for patients depending on their anaesthetic provider.

### **Quality of the evidence**

Much of the data came from large databases, which may have contained inaccuracies in reporting. There may also be important differences between patients that might account for variation in study results, for example, whether patients who were more ill were treated by a medically qualified anaesthetist, or whether nurse anaesthetists worked in hospitals that had fewer resources. Several of the studies had allowed for these potential differences in their analysis, however it was unclear to us whether this had been done sufficiently well to allow us to be confident about the results. There was also potential confounding from the funding sources for some of these studies.

### **Conclusion**

As none of the data were of sufficiently high quality and the studies presented inconsistent findings, we concluded that it was not possible to say whether there were any differences in care between medically qualified anaesthetists and nurse anaesthetists from the available evidence.