

Table 5b.
Summary of Outcomes for Certified Nurse-Midwives

Outcome	Number of Studies	Author, Year (Study Quality Rating), Significance	Synthesis of Studies	Evidence Grade
Cesarean	15 (1 RCT)	Baruffi et al., 1990 (6) [†] Blanchette, 1995 (5) [†] Butler et al., 1993 (6) [†] Chambliss et al., 1992 (7) ⁺ Cragin, 2002 (6) [†] Cragin et al., 2006 (5) [†] Davis et al., 1994 (6) [†] DeLano et al., 1997 (5) [†] Fischler & Harvey, 1995 (4) [†] Hueston & Rudy, 1993 (7) [†] Jackson, Lang, Ecker et al., 2003 (5) Jackson, Lang, Swartz et al., 2003 (5) [†] Lenaway et al., 1998 (5) Oakley et al., 1995 (6) [†] Rosenblatt et al., 1997 (7)	The only RCT did not show a significant difference. The purpose was to determine if the differences in cesarean rates between the CNMs and obstetricians were due to selection bias. However, it should be noted the baseline cesarean section rates were very low: 2% for CNMs and 9% for obstetricians. Thirteen of the 14 observational studies were high quality. Thirteen of the 15 studies favor CNMs, and the others are equivalent. There is a high level of evidence that CNM patients have lower rates of cesarean sections compared to MD patients.	High: Lower rates of cesarean sections for CNMs than other providers.
Low Apgar score	11 (1 RCT)	Blanchette, 1995 (5) Butler et al., 1993 (6) Chambliss et al., 1992 (7) ⁺ Davis et al., 1994 (6) Fischler & Harvey, 1995 (4) Hueston & Rudy, 1993 (7) Jackson, Lang, Ecker et al., 2003 (7) Jackson, Lang, Swartz et al., 2003 (5) Lenaway et al., 1998 (5) [†] Oakley et al., 1996 (6) Rosenblatt et al., 1997 (7)	The majority of studies measured as Apgar <7. One of these was a RCT (Chambliss et al., 1992) with a quality rating of 7. For the observational studies, nine were high quality and one was low quality. Since equivalent Apgar scores are desirable, having 10 of the 11 studies with non-significant differences and the remaining study favoring the CNM group was considered acceptable. However, it should be noted several studies included deliveries that might be at risk for low Apgar, while others do not, and there was inconsistent use of statistical control. A high level of evidence indicates CNM and MD Apgar scores are comparable.	High: Comparable rates of low Apgar scores between CNM and other provider groups in all studies but one.
Epidural	10 (0 RCTs)	Blanchette, 1995 (5) [†] Butler et al., 1993 (6) Cragin, 2006 (5) [†] Davis et al., 1994 (6) [†] Hueston & Rudy, 1993 (7) Jackson, Lang, Swartz et al., 2003 (7) [†] Oakley et al., 1995 (6) [†] Robinson et al., 2000 (6) [†] Rosenblatt, 1997 (7) [†] Sze et al., 2008 (6) [†]	Nine of the 10 observational studies showed CNMs used less epidural anesthesia. For births in hospitals, women do have access to regional anesthesia (epidural) during labor even when attended by a CNM. Regional anesthesia may not be available in birthing centers. While there was consistency of findings, there were no RCTs, so the evidence of lower or comparable epidural use was graded as moderate.	Moderate: Less epidural use by CNMs than other providers.
Labor augmentation	9 (1 RCT)	Blanchette, 1995 (5) [†] Chambliss et al., 1992 (7) ⁺ Davis et al., 1994 (6) [†] Hueston & Rudy, 1993 (7) [†] Jackson, Lang, Swartz et al., 2003 (7) [†] Lenaway et al., 1998 (5) [†] Oakley et al., 1995 (6) Robinson et al., 2000 (6) [†] Rosenblatt et al., 1997 (7) [†]	One observational study that did not favor the CNM (Oakley et al., 1995) was from a single institution. One study comparing a county-level CNM intervention to two control counties favored the women in the control counties (Lenaway et al., 1998). The authors noted this was contrary to published reports and suggested it may be related to differences in risk or differences in obstetrical practices in institutions. Considering the inclusion of an RCT and the consistency of evidence, the evidence of lower rates of labor augmentation for CNM was graded as high.	High: Lower or comparable use of labor augmentation between CNM and other providers.
Labor induction	9 (0 RCTs)	Blanchette, 1995 (5) [†] Davis et al., 1994 (6) [†] Hueston & Rudy, 1993 (7) [†] Jackson, Lang, Swartz et al., 2003 (7) [†] Lenaway et al., 1998 (5) [†] Oakley et al., 1995 (6) Robinson et al., 2000 (6) [†] Rosenblatt et al., 1997 (7) [†] Sze et al., 2008 (6)	One of the nine studies showed no significant difference. Seven favored the CNM, while one favored the women in the control counties (Lenaway et al., 1998) similar to labor augmentation. Based on the lack of an RCT study and the inconsistency of the findings, the evidence of lower rates of labor induction for CNM was graded as moderate.	Moderate: Comparable or lower rates of labor induction compared to other providers.

Table 5b. (continued)
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Outcome	Number of Studies	Author, Year (Study Quality Rating), Significance	Synthesis of Studies	Evidence Grade
Episiotomy	8 (1 RCT)	Blanchette, 1995 (5) [†] Chambliss et al., 1992 (7) ^{††} Hueston & Rudy, 1993 (7) [†] Jackson, Lang, Swartz et al., 2003 (7) [†] Low et al., 2000 (6) [†] Oakley et al., 1995 (6) [†] Robinson et al., 2000 (6) [†] Rosenblatt et al., 1997 (7) [†]	All studies were rated as high quality and all favored CNMs. Overall, it was concluded there is a high level of evidence to support that episiotomy rates are lower for CNMs than MDs.	High: Episiotomy rates are lower for CNMs than other providers in all studies.
Low birthweight (<2,500 g)	8 (1 RCT)	Blanchette, 1995 (5) Fischler & Fischler, 1995 (4) Heins et al., 1990 (6) [*] Jackson, Lang, Swartz et al., 2003 (7) Lenaway et al., 1998 (5) MacDorman & Singh, 1998 (6) [†] Oakley et al., 1996 (6) Sze et al., 2008 (6) [†]	The common measure was proportion with low birthweight (<2,500 Gms). All remaining observational studies were rated as high quality. While six of the studies reported no significant differences in low-birthweight rates, the other two favored CNMs. There is a high level of evidence that there are comparable rates of low birthweight between CNMs and other providers.	High: Comparable rates of low birthweight between CNMs and other providers.
Vaginal operative delivery (forceps, vacuum, or both)	8 (1 RCT)	Blanchette, 1995 (5) Butler et al., 1993 (6) [†] Chambliss et al., 1992 (7) [*] Cragin, 2002 (6) [†] Davis et al., 1994 (6) [†] DeLano et al., 1997 (5) Oakley et al., 1995 (6) [†] Rosenblatt et al., 1997 (7) [†]	Eight high-quality studies reported vaginal operative delivery use, including forceps use, vacuum use, or both. The RCT (Chambliss et al., 1992) showed no significant difference in forceps use but was significant for vacuum use. It should be noted the RCT excluded cases with significant maternal or fetal complications. Five of the remaining seven observational studies favored the CNM. The evidence of lower or comparable vaginal operative deliveries among CNMs was graded as high.	High: Lower or comparable vaginal operative deliveries between CNMs and other providers.
Labor analgesia	6 (1 RCT)	Blanchette, 1995 (5) Chambliss et al., 1992 (7) ^{††} Davis et al., 1994 (6) [†] Hueston & Rudy, 1993 (7) Jackson et al., 2003 (7) [†] Oakley et al., 1995 (6) [†]	Analgesia (narcotic) use during labor was reported in six studies, one of which was an RCT (Chambliss et al., 1992). The RCT and five of the six observational studies favored the CNM. The studies were all rated as high quality. All women have access to analgesia during labor, but some women prefer to use non-pharmacologic approaches to manage pain. There is a high level of evidence there is less analgesia use by CNMs than MDs.	High: Less analgesia use by CNMs than other providers.
Perineal lacerations	5 (1 RCT)	Chambliss et al., 1992 (7) ^{††} Hueston & Rudy, 1993 (7) [†] Low et al., 2000 (6) [†] Oakley et al., 1996 (6) [†] Robinson et al., 2000 (6) [†]	All studies favored the CNM. Perineal lacerations are associated with episiotomy use. A Cochrane review comparing routine versus restricted use of episiotomy found restricted use was associated with less-severe perineal trauma, less suturing, and fewer healing complications (Carroli & Belizan, 1999). Overall, it was concluded there is a high level of evidence rates of third and fourth-degree perineal lacerations are lower for CNMs than MDs.	High: Rates of third and fourth-degree perineal lacerations are lower for CNMs than other providers.
Vaginal birth after cesarean (VBAC)	5 (0 RCTs)	Blanchette, 1995 (5) [†] Cragin, 2002 (6) [†] Davis et al., 1994 (6) [†] DeLano et al., 1997 (5) [†] Lenaway et al., 1998 (5)	Four of the five studies favored CNMs. The one study that showed no difference (Lenaway et al., 1998) did have a higher proportion but it was not significant in random-effects testing. Not all of the studies excluded women who may not be eligible for VBAC, and there were no RCTs. A moderate level of evidence supports comparable or higher rates of VBAC for CNMs compared to MDs.	Moderate: Comparable or higher rates of VBAC for CNMs compared to other providers.

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Outcome	Number of Studies	Author, Year (Study Quality Rating), Significance	Synthesis of Studies	Evidence Grade
NICU admission	5 (0 RCTs)	Butler et al., 1993 (6) [†] Fischler & Harvey, 1995 (4) Hueston & Rudy, 1993 (7) Jackson, Lang, Swartz et al., 2003 (7) Oakley et al., 1996 (6) [†]	Two of the studies (Butler et al., 1993; Oakley et al., 1996) reported lower admission for the CNM group. One of these (Butler et al., 1993) used statistical control for age, race, year of delivery, infant size, and parity. Based on the lack of RCTs and inconsistent results, the evidence supporting lower NICU admission was considered moderate.	Moderate: Comparable or lower rates of NICU admission for CNM compared to other providers.
Breastfeeding	3 (0 RCTs)	Cragin, 2002 (6) [†] Jackson, Lang, Swartz et al., 2003 (7) [†] Oakley et al., 1996 (6) [†]	Three observational studies reported differences in initiation of breastfeeding. All were rated as high quality and favored CNMs. There is a moderate level of evidence CNM patients have higher breastfeeding rates than MDs.	Moderate: CNM patients have higher breastfeeding rates than other providers.

* RCT

† Favors APRN

‡ Favors comparison group

CNMs compared to outcomes of care managed exclusively by physicians. Infant outcomes reported in the studies included Apgar score, birthweight less than 2,500 grams, admission to neonatal intensive care, and breastfeeding. Maternal outcomes reflected both invasive interventions (cesarean section, epidural anesthesia, labor induction/augmentation, episiotomy, forceps, vacuum use, perineal lacerations) and less-invasive interventions thought to be underused (non-pharmacologic pain relief, vaginal birth after cesarean [VBAC]). The number and type of studies for each outcome will be further described.

Cesarean. Fifteen studies (one RCT) reported differences in cesarean rates between the CNMs and MD patients. When comparing CNM and MD care, there is a high level of evidence CNM groups have lower rates of cesarean sections.

Low APGAR score. Eleven studies (one RCT) reported low infant APGAR scores. When comparing CNM and MD care, CNM

have similar infant APGAR scores.

Epidural. Ten studies (0 RCTs) report epidural use. When comparing CNM and MD care, there is a moderate level of evidence CNM groups have lower rates of epidural use.

Labor augmentation. Nine studies (one RCT) reported labor augmentation. When comparing CNM and MD care, there is a high level of evidence to support equivalent levels of labor augmentation.

Labor induction. Nine studies (0 RCTs) reported labor augmentation. When comparing CNM and MD care, there is a moderate level of evidence to support equivalent or lower levels of labor induction of CNM the group.

Episiotomy. Eight studies (one RCT) reported episiotomy rates. When comparing CNM and MD care, there is a high level of evidence to support lower rates of episiotomy for the CNM group.

Low birthweight (<2500 g). Eight studies (one RCT) reported low birthweight infants. When comparing CNM and MD care, there is a high level of evidence to

support equivalent levels of low birthweight infants.

Vaginal operative delivery (forceps, vacuum, or both). Eight studies (one RCT) reported vaginal operative delivery. When comparing CNM and MD care, there is a high level of evidence to support comparable levels or lower levels in the CNM group of vaginal operative delivery.

Labor analgesia. Six studies (one RCT) reported labor analgesia. When comparing CNM and MD care, there is a high level of evidence to support lower levels of labor analgesia in the CNM group.

Perineal lacerations. Five studies (one RCT) reported perineal laceration outcomes. When comparing CNM and MD care, there is a high level of evidence to support lower levels of third and fourth-degree perineal laceration rates for the CNM group.

Vaginal birth after cesarean section. Five studies (0 RCTs) reported rates of vaginal birth after cesarean sections. When comparing CNM and MD care, there is a