QUALITY, ACCESS, AND COST OF health care are high-priority global concerns. In the United States, these issues are pressing due to the escalating cost of managing chronic diseases (Department of Health and Human Services, 2009), the variation in quality of care delivered (Kuehn, 2009), and the inadequate number of primary care physicians (Freed & Stockman, 2009; Kuehn, 2009; Lakhan & Laird, 2009). At this critical time, we still do not know which models of care are best, how to integrate advanced practice registered nurses (APRNs) providers, or to what extent APRNs providers can contribute to improved access to and quality of health care. These deficits are untenable when the health care needs of society are great and the health reform debate progresses in legislative arenas. How to expand health care services for the American public, at an affordable cost, is central to this dispute.

Advanced practice registered nurses have assumed an increasing role as providers in the health care system, particularly for underserved populations. The aim of this systematic review was to answer the following question: Compared to other providers (physicians or teams without APRNs) are APRN patient outcomes of care similar?

This systematic review of published literature between 1990 and 2008 on care provided by APRNs indicates patient outcomes of care provided by nurse practitioners and certified nurse midwives in collaboration with physicians are similar to and in some ways better than care provided by physicians alone for the populations and in the settings included.

Use of clinical nurse specialists in acute care settings can reduce length of stay and cost of care for hospitalized patients.

These results extend what is known about APRN outcomes from previous reviews by assessing all types of APRNs over a span of 18 years, using a systematic process with intentionally broad inclusion of outcomes, patient populations, and settings.

The results indicate APRNs provide effective and high-quality patient care, have an important role in improving the quality of patient care in the United States, and could help to address concerns about whether care provided by APRNs can safely augment the physician supply to support reform efforts aimed at expanding access to care.
No systematic reviews of CNS or CRNA outcomes have been published.

Although these reviews provide some information about the effects of APRNs on specific outcomes, an updated comprehensive review of the scientific literature on the care provided by APRNs in the United States is needed to inform educational, public, and organizational policy. This review is the most current and complete assessment of the comparability of APRNs to other providers, strengthening and extending the conclusions drawn from previous reviews by including evidence from over a span of 18 years on all types of APRNs and all outcomes, patient populations, and settings.

This systematic review compared the processes and outcomes of care delivered by APRNs to a comparison provider group, most often physicians. The intent was to consider the broad range of studies and outcome measures across these groups using a systematic, transparent, and reproducible review process.

**Aim.** The aim of this systematic review was to answer the following question: Compared to other providers (physicians or teams without APRNs), are APRN patient outcomes of care similar?

**Methods**

**Design.** A systematic review was conducted following processes specified for Evidence Based Practice Centers funded by the Agency for Healthcare Research and Quality, and guided by an expert co-investigator. Processes were designed to identify and select relevant studies; review, rate, and grade the individual studies; and synthesize the results for outcomes with a sufficient number of studies. Teams were developed for each of the APRN groups, led by a co-investigator. Five Technical Expert Panels (TEPs) were convened: one for each of the APRN groups and one methods panel to review the report of the overall project.

**Search methods.** The following databases were searched systematically: PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Proquest. For each APRN group, specific search strategies were developed with the assistance of a medical librarian and four APRN role-specific TEPs. The search strategy was intentionally broad to improve search sensitivity.

Inclusion criteria were randomized controlled trial (RCT) or observational study of at least two groups of providers (e.g., APRN working alone or in a team compared to other individual providers working alone or in teams without an APRN), conducted in the United States between 1990 and 2008, and reported quantitative data on patient outcomes. Studies prior to 1990 were not included since practice and interventions have changed both in the scientific basis and the organization of health care providers. Studies were excluded if they were non-English, included no quantitative data, or contained only outcomes that could not be affected by APRNs. For example, if the intervention included free medications for one group only, the outcomes could not be attributed to the care of the APRN alone. Only U.S. studies were included because: (a) the education for and implementation of advanced practice roles and scope of practice are different in the United States compared to other countries; and (b) the health care system in the United States (including health care access, health insurance, and costs of care) is very different from health care systems in other countries.

**Search outcome.** Figure 1 depicts the summary of the literature search results and article inclu-
sion and exclusion at each level. A multi-step process was used to conduct the review, proceeding from titles to abstracts and then the full articles. At each step, the citation was reviewed and, if judged to not meet inclusion criteria, the reasons for exclusion were documented. Web-based database software facilitated access to studies and citation management. Standardized abstract forms included in the web-based software were developed by the team specifically for this project.

Data abstraction. Titles, abstracts, and full articles were reviewed by two independent reviewers and included or excluded according to the criteria listed previously. A primary reviewer completed all of the relevant data abstraction forms. The second reviewer checked the first reviewer’s data abstraction forms for completeness and accuracy. Reviewer pairs were formed to include personnel with both clinical and methodological expertise. The reviews were not blinded in terms of the articles’ authors, institutions, or journal. As with article inclusion, differences of opinion that could not be resolved between the reviewers were resolved through consensus adjudication. If articles were deemed to meet inclusion criteria by both reviewers, they were included in the final data abstraction.

Quality assessment. Once a final set of studies were determined, the quality of each indi-
Table 1. Quality Assessment Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were participants in both groups similar?</td>
<td>No (0) Yes (1)</td>
</tr>
<tr>
<td>Was setting of both groups similar?</td>
<td>No (0) Yes (1)</td>
</tr>
<tr>
<td>Was sample size in both groups adequate?</td>
<td>Less than 30 per group (0) 31-60 per group (1) &gt;60 per group (2)</td>
</tr>
<tr>
<td>Were measures reliable and valid?</td>
<td>No (0) Yes (1)</td>
</tr>
<tr>
<td>Was bias controlled?</td>
<td>Yes (2) Partial (1)  No (0)</td>
</tr>
<tr>
<td>Can the outcome be attributed to the APRN?</td>
<td></td>
</tr>
</tbody>
</table>

Potential range: 0-8

Evidence first was classified into one of four baseline categories: high, moderate, low, or very low. A high baseline category was designated if there were at least two RCTs or one RCT and two high-quality observational studies. A moderate baseline category was designated if there was one RCT, one high-quality observational study, and one low-quality observational study or three high-quality observational studies. A low baseline category was designated if there were fewer than three high-quality observational studies.

Next, the overall grading questions in Table 2 were then applied to the body of research for each outcome. Table 3 includes the overall quality categories and definitions. An overall grade category was assigned by considering the number of studies, design, study quality, consistency of results, directness (extent to which results directly addressed the question), and likelihood of reporting bias.

The grade was decreased by one level for each question if indicated by a positive answer to each question. For example, if study results were inconsistent, outcomes with a baseline category of high would be reduced one level to moderate. The final strength-of-evidence grade was then assigned.

In grading the evidence, the direction of effects was evaluated as favoring APRNs, favoring the comparison group, or no significant difference. In many cases, showing equivalence of outcome was considered a good outcome, similar to equivalence trials where the aim is to show the therapeutic equivalence of two treatments (Jones, Jarvis, Lewis, & Ebbutt, 1996). This was the case when comparing care involving NPs, CRNAs, or CNMs with care involving only physicians.

Effect sizes were not calculated for the multiple outcomes, rather the significance or nonsignificance reported by the authors was recorded. Calculating effect sizes for these

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Data synthesis and analysis. A set of detailed evidence tables was created for each APRN group. Information extracted from the eligible studies was rechecked against the original articles for accuracy. If there was a discrepancy between the data abstracted and the data appearing in the article, this discrepancy was addressed by the investigator in charge of the APRN-specific data set and the data were corrected in the final evidence tables.

Outcomes were aggregated for each APRN group when there was a minimum of three studies with the same outcome. The decision to only aggregate studies with three similar outcomes was based on the rational that: (a) One or two studies do not provide adequate evidence to summarize results or assess a body of evidence; and (b) This systematic review was intentionally broad to assess all APRN outcomes, rather than a few outcomes as is common in most systematic reviews.

Grading of evidence. At the completion of the abstraction and the rating of study quality, the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group Criteria (Atkins et al., 2004) was applied to the overall evidence for each aggregated outcome.

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Individual study was assessed using a modified scale informed by the Jadad scale (Jadad et al., 1996). Table 1 includes the quality assessment criteria. Since the Jadad scale was designed for RCTs (e.g., use of double-blinding), additional quality criteria were constructed to account for the observational studies represented in this review (e.g., similarity of groups and settings, group sample sizes, sources of bias). The additional quality criteria included comparability of participants and settings, sample size, reliability and validity of measures, bias control, and attribution of outcome to APRN. Attribution of the outcome to the APRN was assessed by considering if the APRN (a) worked independently, as a team member, or was directly supervised; and (b) if the outcome was directly linked to APRN care.

Study quality was assessed by agreement of at least two team members using an eight-point scale. A score was assigned for each item only if the specific criterion was completely satisfied. Two reviewers independently rated the quality of each study and discussed those items on which they disagreed, and then consensus was reached. A score of ≥5 was considered high quality, and a score of ≤4 was considered low quality.
multiple broad outcomes would be problematic for several reasons. First, for many outcomes the studies represent widely varying populations, definitions, time periods, and study designs. Second, the publications did not consistently include the necessary data to calculate effect size (e.g., Ns and standard deviations for subsamples) since many of the studies were not designed specifically to make APRN comparisons to other providers.

A draft of the evidence report was reviewed by four TEPs, one for each APRN category and one methodological TEP including other stakeholders (consumer statistician and physician leader). Each TEP submitted written comments and recommendations that were addressed by the research team.

**Results**

Across the four APRN groups, 107 studies met inclusion criteria (NP, 49; CNS, 22; CNM, 23; CRNA, 4; and CNS and NP combined, 9). Based on the decision to focus on outcomes with at least three supporting studies, 69 studies (20 RCTs and 49 observational studies) were included in outcome aggregation. The summary of studies and overall strength of evidence grades are included for NPs.
Table 4a.
Summary of Study Characteristics for Nurse Practitioners

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Compared Groups</th>
<th>Disease/Condition</th>
<th>Patient Population</th>
<th>Setting</th>
<th>Study Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RCTs (n=14)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Becker et al., 2005</td>
<td>NP to MD</td>
<td>Coronary artery disease</td>
<td>African Americans, 30-59 y/o, sibling of probands &lt;60 y/o</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Büla et al., 1999</td>
<td>GNP + team to MD</td>
<td>Varied</td>
<td>&gt;74 y/o, without cognitive or functional impairment</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Callahan et al., 2006</td>
<td>GNP + team to MD</td>
<td>Alzheimer's disease</td>
<td>In home with caregiver</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Counsell et al., 2007</td>
<td>NP + team to MD</td>
<td>Varied</td>
<td>&gt;64 y/o; income &lt;200% of federal poverty level</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Fanta et al., 2006</td>
<td>PNP + attending MD to resident + attending MD</td>
<td>Condition requiring inpatient trauma care</td>
<td>Children between 2 months and 17 years of age</td>
<td>Inpatient</td>
<td>Low</td>
</tr>
<tr>
<td>Krichbaum, 2007</td>
<td>GNP to MD</td>
<td>Hip fracture</td>
<td>&gt;64 y/o with hip fracture repair</td>
<td>Inpatient</td>
<td>Low</td>
</tr>
<tr>
<td>Lenz et al., 2004</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Hispanic adults with recent urgent care or ED visit</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Lenz et al., 2002</td>
<td>NP to MD</td>
<td>Diabetes</td>
<td>Adults; primarily Hispanic; no current health care provider</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Litaker et al., 2003</td>
<td>NP to MD</td>
<td>Hypertension and diabetes</td>
<td>Adults without complex medical conditions</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Mundinger et al., 2000</td>
<td>NP to MD</td>
<td>Chronic conditions</td>
<td>Hispanic adults with recent urgent care or ED visit</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Nelson et al., 1991</td>
<td>PNP to usual ED care</td>
<td>Infectious or emergent condition</td>
<td>Children &lt;8 y/o without chronic illness</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Paez &amp; Allen, 2006</td>
<td>NP to MD</td>
<td>Coronary artery disease</td>
<td>Adults undergoing revascularization procedure</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Pioro et al., 2001</td>
<td>NP to MD</td>
<td>Varied medical conditions</td>
<td>18-69 y/o; admitted to general medical units</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Stuck et al., 1995</td>
<td>GNP to MD</td>
<td>Varied conditions</td>
<td>&gt;74 y/o; living at home without preexisting functional impairment</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td><strong>Observational (n=23)</strong></td>
<td></td>
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<td></td>
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<tr>
<td>Ahern et al., 2004</td>
<td>NP to MD</td>
<td>Chronic hepatitis C</td>
<td>Adults</td>
<td>Community</td>
<td>Low</td>
</tr>
<tr>
<td>Aigner et al., 2004</td>
<td>NP to MD</td>
<td>Chronic diseases</td>
<td>Residents in eight nursing homes</td>
<td>Nursing home</td>
<td>High</td>
</tr>
<tr>
<td>Aiken et al., 1993</td>
<td>NP to MD</td>
<td>HIV/AIDS</td>
<td>Adults with HIV/AIDS seen in specialty clinic</td>
<td>Community</td>
<td>High</td>
</tr>
<tr>
<td>Bissinger et al., 1997</td>
<td>NNP to MD</td>
<td>Conditions encountered in low-birthweight infants</td>
<td>Low-birthweight neonates between 500-1,250 grams</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Borgmeyer et al., 2008</td>
<td>PNP to MD</td>
<td>Asthma</td>
<td>Children admitted to general units with exacerbation of asthma</td>
<td>Inpatient</td>
<td>Low</td>
</tr>
<tr>
<td>Dahle et al., 1998</td>
<td>NP to MD</td>
<td>Uncomplicated decompensated heart failure</td>
<td>Adults admitted to hospital</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Author, Year</td>
<td>Compared Groups</td>
<td>Disease/Condition</td>
<td>Patient Population</td>
<td>Setting</td>
<td></td>
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<tr>
<td>-------------</td>
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<td></td>
</tr>
<tr>
<td>Garrard et al., 1990</td>
<td>NP to MD usual care</td>
<td>Varied</td>
<td>Adults admitted to surgical ICU</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Gracias et al., 2008</td>
<td>ACNP to MD</td>
<td>Varied postoperative</td>
<td>Adults receiving mechanical ventilation and admitted to subacute ICU</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Hoffman et al., 2005</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Nursing home residents</td>
<td>Nursing home</td>
<td></td>
</tr>
<tr>
<td>Kanzler &amp; Reiner, 2000</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Extremely low-birthweight infants</td>
<td>Community</td>
<td></td>
</tr>
<tr>
<td>Lamberg et al., 2004</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Heart failure</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Kutzleb &amp; Reiner, 2006</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Adults admitted to NCU</td>
<td>Community</td>
<td></td>
</tr>
<tr>
<td>Lehrman et al., 2001</td>
<td>NNP to MD</td>
<td>Varied</td>
<td>60+ years admitted to geriatric unit or 1 or 2 general medical units</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>McMullen et al., 2001</td>
<td>ACNP to MD</td>
<td>Varied</td>
<td>Adults admitted to medical unit</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Meyer &amp; Miers, 2005</td>
<td>ACNP to MD</td>
<td>Varied</td>
<td>Adults undergoing cardiovascular surgery</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Miller, 1997</td>
<td>GNP to PA</td>
<td>Varied</td>
<td>Adults admitted to medical unit</td>
<td>Community</td>
<td></td>
</tr>
<tr>
<td>Paul, 2000</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Diabetes and hypertension</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Pinkerton &amp; Bash, 2000</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Cystic fibrosis</td>
<td>Community</td>
<td></td>
</tr>
<tr>
<td>Rideout, 2007</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Twins pregnancy</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Ruiz et al., 2001</td>
<td>NNP to MD</td>
<td>Varied</td>
<td>Adults with tracheostomy admitted to neurosurgical unit</td>
<td>Community</td>
<td></td>
</tr>
<tr>
<td>Russell et al., 2002</td>
<td>ACNP to MD</td>
<td>Varied</td>
<td>Adults admitted to transitional care unit</td>
<td>Community</td>
<td></td>
</tr>
<tr>
<td>Schultz et al., 1994</td>
<td>NNP to MD</td>
<td>Varied</td>
<td>Infants admitted to outpatient surgery</td>
<td>Inpatient</td>
<td></td>
</tr>
<tr>
<td>Varughese et al., 2006</td>
<td>NP to MD</td>
<td>Varied</td>
<td>Children scheduled for outpatient surgery</td>
<td>Community</td>
<td></td>
</tr>
</tbody>
</table>
Table 4b. Summary of Study Design, Study Groups, Study Purpose, Patient Population, Outcomes, and Quality for Certified Nurse-Midwives

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Compared Groups</th>
<th>Disease/Condition</th>
<th>Patient Population</th>
<th>Setting</th>
<th>Study Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chambliss et al., 1992</td>
<td>CNM vs. MD</td>
<td>Low-risk pregnant women</td>
<td>Admitted in one hospital to unit for physician or unit for midwifery management</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Heins et al., 1990</td>
<td>CNM to MD</td>
<td>Pregnant women</td>
<td>Women attending 1 of 5 state-funded prenatal clinics and considered high risk for low birthweight</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Baruffi et al., 1990</td>
<td>CNM to MD</td>
<td>Pregnant women</td>
<td>Delivering in hospital with CNM care or hospital with residents and physicians</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Blanchette, 1995</td>
<td>CNM to MD</td>
<td>Pregnant women</td>
<td>Women in single clinic cared for by CNM or by MD</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Butler et al., 1993</td>
<td>CNM to MD</td>
<td>Low-risk pregnant women</td>
<td>Women delivered in hospital with CNM or MD care</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Cragin, 2002</td>
<td>CNM to MD</td>
<td>Moderate-risk pregnant women</td>
<td>Women with prenatal care at two sites</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Cragin &amp; Kennedy, 2006</td>
<td>CNM to MD</td>
<td>Low or moderate-risk pregnant women</td>
<td>Women enrolled in obstetric practice who chose either CNM or MD care</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Davis et al., 1994</td>
<td>CNM to MD</td>
<td>Low-risk pregnant women</td>
<td>Women delivering in hospital with both CNM and MD care</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>DeLano et al., 1997</td>
<td>CNM to MD</td>
<td>Low to moderate-risk pregnant women</td>
<td>Women delivering in hospital with both CNM and MD</td>
<td>Inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Fischler &amp; Harvey, 1995</td>
<td>CNM to MD</td>
<td>Retrospective 20-year trend study.</td>
<td>Women cared for in one of three care models and Medicaid, giving birth in single county</td>
<td>Prenatal-inpatient</td>
<td>Low High</td>
</tr>
<tr>
<td>Hueston &amp; Rudy, 1993</td>
<td>CNM to MD</td>
<td>Low-income pregnant women</td>
<td>Women receiving care at medical center primary care group</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Jackson, Lang, Ecker et al., 2003a</td>
<td>CNM to MD</td>
<td>Pregnant women</td>
<td>Women enrolling at study site</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Jackson, Lang, Swartz et al., 2003b</td>
<td>CNM to MD</td>
<td>Low-income and low-risk pregnant women</td>
<td>Women enrolling at study site</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Lenaway et al., 1998</td>
<td>CNM to MD</td>
<td>Low-income and low-risk pregnant women</td>
<td>Women presenting to county health department where CNMs are principal providers</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>Low et al., 2001</td>
<td>CNM to MD</td>
<td>Low-income pregnant women</td>
<td>Women voluntarily chose the CNM group practice or faculty obstetricians</td>
<td>Prenatal-inpatient</td>
<td>High</td>
</tr>
<tr>
<td>MacDorman &amp; Singh, 1998</td>
<td>CNM to MD</td>
<td>Low-risk pregnant women</td>
<td>Women in linked birth/death data</td>
<td>Inpatient</td>
<td>High</td>
</tr>
</tbody>
</table>
in Table 4a, CNMs in Table 4b, and CNSs in Table 4c. A summary of the aggregated outcomes are included for NPs in Table 5a, CNMs in Table 5b, and CNSs in Table 5c.

### Nurse Practitioner Outcomes

Thirty-seven studies (14 RCTs and 23 observational studies) examined patient outcomes of care by NPs (NP care group) compared with care managed exclusively by physicians (attending physicians with or without interns, residents, and/or fellows) in all but one study. Eleven patient outcomes were summarized: patient satisfaction with provider/care, patient self-assessment of perceived health status, functional status, blood glucose, serum lipids, blood pressure, emergency department visits, hospitalization, duration of ventilation, length of stay, and mortality. The number and type of studies for each outcome will be described.

**Patient satisfaction.** Six studies (four RCTs) reported patient satisfaction with the provider. Studies were conducted in primary care settings with adults, and from parents of children who had undergone outpatient surgery or been admitted to the hospital after a traumatic injury. When comparing NP and MD care, there is a high level of evidence to support equivalent levels of patient satisfaction.

**Self-reported perceived health.** Seven studies (five RCTs) examined self-reported perceived health. The instrument used in the studies included the SF-12 or SF-36 physical and mental function scales to rate self-reported perception of health. Studies were conducted with samples of adults cared for in a primary care setting, specialty clinic, or home care in a community setting, and patients hospitalized with general medical conditions. When comparing NP and MD care, there is a high level of evidence to support equivalent levels of self-reported patient perception of health.

**Functional status.** Ten studies (six RCTs) reported activities of daily living (ADL), instrumental activities of daily living (IADL), 6-minute walk test, or patient self-report. Studies were conducted with samples of community-dwelling elders who were recently discharged from hospitals and receiving either home care or inpatient rehabilitation, adults hospitalized for general medical problems, and ambulatory patients diagnosed with HIV/AIDS. When comparing NP and MD care, there is a high level of evidence to support equivalent patient functional status outcomes.

**Glucose control.** Five studies (RCTs) reported glucose control (glycosolated hemoglobin, serum glucose). Studies were conducted with samples of adults in ambulatory primary care settings. When comparing NP and MD care, there is a high level of evidence to support equivalent levels of patient glucose control.

**Lipid control.** Three studies (RCTs) reported lipid control. Studies were conducted with samples of adults in primary care settings. When comparing NP and MD groups, there is a high level of evidence to support better

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<table>
<thead>
<tr>
<th>Disease/Condition</th>
<th>Compared Groups</th>
<th>Disease/Condition</th>
<th>Compared Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-risk pregnant women</td>
<td>CMN vs MD</td>
<td>Low-risk pregnant women</td>
<td>CMN vs MD</td>
</tr>
<tr>
<td>Low-risk pregnant women</td>
<td>CMN vs MD</td>
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<td>CMN vs MD</td>
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<td>CMN vs MD</td>
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<td>CMN vs MD</td>
</tr>
<tr>
<td>Low-risk pregnant women</td>
<td>CMN vs MD</td>
<td>Women initiated care with one of the randomly selected providers</td>
<td>CMN vs MD</td>
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<tr>
<td>Low-risk pregnant women</td>
<td>CMN vs MD</td>
<td>Women cared for in single hospital</td>
<td>CMN vs MD</td>
</tr>
<tr>
<td>Low-risk pregnant women</td>
<td>CMN vs MD</td>
<td>Women initiated care with one of the randomly selected providers</td>
<td>CMN vs MD</td>
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<td>Low-risk pregnant women</td>
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<table>
<thead>
<tr>
<th>Study Quality</th>
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<th>Patient Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Inpatient</td>
<td>Women in one medical center</td>
</tr>
<tr>
<td>High</td>
<td>Inpatient to home</td>
<td>Women entering care at study site</td>
</tr>
<tr>
<td>High</td>
<td>Inpatient</td>
<td>Women initiated care with one of the randomly selected providers</td>
</tr>
<tr>
<td>High</td>
<td>Inpatient</td>
<td>Women cared for in single hospital</td>
</tr>
</tbody>
</table>

§ Represents same study data
|| Represents same study data

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**Table 4b. (continued)**

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Compared Groups</th>
<th>Disease/Condition</th>
<th>Patient Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oakley et al., 1995</td>
<td>CMN vs MD</td>
<td>Low-risk pregnant women</td>
<td>Women in one medical center</td>
</tr>
<tr>
<td>Oakley et al., 1996</td>
<td>CMN vs MD</td>
<td>Low-risk pregnant women</td>
<td>Women in one medical center</td>
</tr>
<tr>
<td>Robinson et al., 2000</td>
<td>CMN vs MD</td>
<td>Low-risk pregnant women</td>
<td>Women entering care at study site</td>
</tr>
<tr>
<td>Rosenblatt et al., 1997</td>
<td>CMN vs MD</td>
<td>Low-risk pregnant women</td>
<td>Women initiated care with one of the randomly selected providers</td>
</tr>
<tr>
<td>Sze et al., 2008</td>
<td>CMN vs MD</td>
<td>Low-risk pregnant women</td>
<td>Women cared for in single hospital</td>
</tr>
</tbody>
</table>

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**Table 5a. (continued)**

<table>
<thead>
<tr>
<th>Study Quality</th>
<th>Setting</th>
<th>Patient Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Inpatient</td>
<td>Women in one medical center</td>
</tr>
<tr>
<td>High</td>
<td>Inpatient</td>
<td>Women entering care at study site</td>
</tr>
<tr>
<td>High</td>
<td>Inpatient</td>
<td>Women initiated care with one of the randomly selected providers</td>
</tr>
<tr>
<td>High</td>
<td>Inpatient</td>
<td>Women cared for in single hospital</td>
</tr>
</tbody>
</table>
management of patient serum lipid levels by NPs.

**Blood pressure.** Four studies (RCTs) reported blood pressure control. Studies were conducted with samples of adults in primary care settings. When comparing NP and MD groups, there is a high level of evidence to support equivalent levels of BP control.

**Emergency department (ED) or urgent care visits.** Five studies (three RCTs) reported utilization outcomes through ED or urgent care visits. Studies were conducted with samples of ambulatory patients with diabetes, hypertension, dyslipidemia, asthma, and heart failure; community-dwelling elders; nursing home residents; and otherwise healthy children who had recently been seen in the ED for an emergent condition. When comparing NP and MD groups, there is a high level of evidence to support equivalent rates of ED visits.

**Hospitalization.** Eleven studies (three RCTs) reported the utilization outcome hospitalization. Studies were conducted with samples of adult patients with heart failure managed in ambulatory care settings, older adults receiving care in nursing homes, or patients discharged home after acute care hospitalizations (premature infants, children with asthma, adults with heart failure, and older adults with general medical conditions). When comparing NP and MD groups, there is a high level of evidence to support equivalent rates of hospitalization.

**Duration of mechanical ventilation.** Three studies (0 RCTs) reported duration of mechanical ventilation. Studies were conducted with samples in acute care settings with adults or low-birthweight neonates. When comparing NP and MD groups, there is a low level of evidence to support equivalent duration of mechanical ventilation.

**Length of stay (LOS).** Sixteen studies (two RCTs) reported patient LOS. Studies were conducted with samples in high-risk neonates, children (admitted for exacerbation of asthma, pulmonary complications of cystic fibrosis, or non-thoracic or CNS traumatic injuries), critically ill adults (requiring endotracheal intubation or tracheostomy and mechanical ventilation for respiratory failure), adults (admitted with general medical problems or for cardiovascular surgery), and older adults (admitted from home or a nursing home with general medical problems). When comparing NP and MD groups, there is a moderate level of evidence to support equivalent LOS.

### Table 4c. Summary of Study Design, Study Groups, Study Purpose, Patient Population, Outcomes, and Quality for Clinical Nurse Specialists

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Compared Groups</th>
<th>Disease/Condition</th>
<th>Setting</th>
<th>Study Quality</th>
<th>RCTs (n=4)</th>
<th>Observational (n=7)</th>
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</thead>
<tbody>
<tr>
<td>Allen et al., 2002</td>
<td>CNS to usual care</td>
<td>Stroke and transient ischemic attack</td>
<td>Community</td>
<td>High</td>
<td>Adults discharged to home from hospital or rehabilitation</td>
<td>Adults at high risk of dying</td>
</tr>
<tr>
<td>Duffy-Durnin &amp; Campbell-Heider, 1994</td>
<td>CNS to usual care</td>
<td>Medical-surgical admission &amp; Depression</td>
<td>Hospital</td>
<td>High</td>
<td>Women referred during first hospital admission</td>
<td>Patients at high risk of dying</td>
</tr>
<tr>
<td>Swindle et al., 2003</td>
<td>CNS to usual care</td>
<td>High-risk pregnancy</td>
<td>Community</td>
<td>High</td>
<td>Women recruited during first hospital admission</td>
<td>Adults undergoing retroperitoneal prostatectomy</td>
</tr>
<tr>
<td>York et al., 1997</td>
<td>CNS to usual care</td>
<td>End-of-life care</td>
<td>Community</td>
<td>High</td>
<td>Women referred during first hospital admission</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
</tr>
<tr>
<td>Ahrens et al., 2003</td>
<td>CNS to standard care</td>
<td>Varied conditions</td>
<td>Inpatient</td>
<td>High</td>
<td>Adults admitted to critical care units</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
</tr>
<tr>
<td>Hamerman et al., 1993</td>
<td>CNS to usual care</td>
<td>Radicular prostatitis &amp; Acute myocardial infarction</td>
<td>Inpatient</td>
<td>High</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
<td>Adults undergoing endoscopic procedures</td>
</tr>
<tr>
<td>Koch &amp; Smith, 1994</td>
<td>CNS to usual care</td>
<td>Coronary bypass graft</td>
<td>Inpatient</td>
<td>Low</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
<td>Adults undergoing endoscopic procedures</td>
</tr>
<tr>
<td>Lombres, 1994</td>
<td>CNS to usual care</td>
<td>Colorectal resection</td>
<td>Inpatient</td>
<td>Low</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
<td>Adults undergoing endoscopic procedures</td>
</tr>
<tr>
<td>Micheels et al., 1995</td>
<td>CNS to usual care</td>
<td>Oncology conditions</td>
<td>Inpatient</td>
<td>Low</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
<td>Adults undergoing endoscopic procedures</td>
</tr>
<tr>
<td>Sherman &amp; Johnson, 1994</td>
<td>CNS to usual care</td>
<td>Total knee replacement</td>
<td>Inpatient</td>
<td>Low</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
<td>Adults undergoing endoscopic procedures</td>
</tr>
<tr>
<td>Wheeler, 2000</td>
<td>CNS to usual care</td>
<td>Varied conditions</td>
<td>Inpatient</td>
<td>High</td>
<td>Men undergoing retroperitoneal prostatectomy</td>
<td>Adults undergoing endoscopic procedures</td>
</tr>
</tbody>
</table>
Table 5a. Summary of Outcomes and Evidence for Nurse Practitioners

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Studies</th>
<th>Author, Year (Study Quality Rating), Significance</th>
<th>Synthesis of Studies</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient satisfaction</td>
<td>6 (4 RCTs)</td>
<td>Lenz et al., 2004 (6)* Fanta et al., 2006 (3)*</td>
<td>Six studies reported patient satisfaction with the provider. Four of the studies were of high quality (Lenz et al., 2004; Litaker et al., 2003; Mundinger et al., 2000; Pinkerton &amp; Bush, 2000). Five studies were conducted in primary care settings with adults (Lenz et al., 2004; Litaker et al., 2003; Mundinger et al., 2000; Pinkerton &amp; Bush, 2000). The other two studies collected data from parents of children who had undergone outpatient surgery or been admitted to the hospital after a traumatic injury (Fanta et al., 2006; Varughese et al., 2006). When comparing NP and MD care, there is a high level of evidence to support equivalent levels of patient satisfaction.</td>
<td>High: Satisfaction is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td>Self-reported perceived health</td>
<td>7 (5 RCTs)</td>
<td>Coursell et al., 2007 (7)* Litaker et al., 2003 (8)* Pioro et al., 2001 (5)* Mundinger et al., 2000 (8)* Ahern et al., 2004 (3) McMullen et al., 2001 (4)</td>
<td>All used the SF-12 or SF-36 physical and mental function scales to rate self-reported perception of health. Five were judged high-quality RCTs (Coursell et al., 2007; Litaker et al., 2003; Lenz et al., 2002; Mundinger et al., 2000; Pioro et al., 2001). Four of the studies were conducted with adults cared for in a primary care setting (Lenz et al., 2002; Litaker et al., 2003; Mundinger et al., 2000) and one used a sample of adults diagnosed with hepatitis C managed in a specialty clinic (Ahern et al., 2004). A sixth study collected data from older adults receiving home care in a community setting (Coursell et al., 2007). The last two studies reported on results obtained from adults hospitalized with general medical conditions (McMullen et al., 2001; Pioro et al., 2001). One RCT (Coursell et al., 2007) found higher health status in patients cared for by NPs as part of a comprehensive care management team, and the rest of the studies did not find any difference in health status depending on provider type, though two were powered to do so. When comparing NP and MD care, there is a high level of evidence to support equivalent levels of self-reported patient perception of health status.</td>
<td>High: Self-assessed health status is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td>Functional Status ADL/IADL</td>
<td>10 (6 RCTs)</td>
<td>Coursell et al., 2007 (7)* Krichbaum, 2007 (3)* Callahan et al., 2006 (5)* Pioro et al., 2001 (5)* Bülə et al., 1999 (5) Stuck et al., 1995 (8) Kutzbühler &amp; Reiner, 2002 (2) Aiken et al., 1993 (2) Ahern et al., 2004 (3) Garrard et al., 1990 (3)</td>
<td>Ten studies evaluated the impact of provider (NP vs. MD) on patient functional status in terms of scores on measures of ADL or IADL, 6-minute walk test, or patient self-report. Five of the studies were high quality (Bülə et al., 1999; Callahan et al., 2006; Coursell et al., 2007; Pioro et al., 2001; Stuck et al., 1995) and two found NP care was associated with higher functional status (Bülə et al., 1999; Stuck et al., 1995). Community-dwelling elders who were recently discharged from hospitals and receiving either home care or inpatient rehabilitation were the focus of five of these studies (Bülə et al., 1999; Callahan et al., 2006; Coursell et al., 2007; Krichbaum, 2007; Stuck et al., 1995). One study included adults hospitalized for general medical problems (Pioro et al., 2001) and another included ambulatory patients diagnosed with HIV/AIDS (Aiken et al., 1993). When comparing NP and MD groups, there is a high level of evidence to support equivalent levels of patient functional status.</td>
<td>High: Functional status measured as ADL/IADL is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td>Glucose control</td>
<td>5 (5 RCTs)</td>
<td>Becker et al., 2005 (5)* Lenz et al., 2004 (6) Litaker et al., 2003 (8) Lenz et al., 2002 (6) Mundinger et al., 2000 (8)</td>
<td>Blood glucose control (glycosolated hemoglobin, serum glucose) was an outcome in four studies, all high-quality RCTs. All of the studies were conducted in ambulatory primary care settings using samples of adults (Lenz et al., 2004; Lenz et al., 2002; Litaker et al., 2003; Mundinger et al., 2000). When comparing NP and MD care, there is a high level of evidence to support equivalent levels of patient glucose control.</td>
<td>High: Blood glucose levels/control among patients cared for by NPs was comparable or better than that of patients cared for by other providers.</td>
</tr>
</tbody>
</table>
### Table 5a. (continued)
Summary of Outcomes and Evidence for Nurse Practitioners

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Studies</th>
<th>Author, Year (Study Quality Rating), Significance</th>
<th>Synthesis of Studies</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipid control</td>
<td>3 (3 RCTs)</td>
<td>Paez &amp; Allen, 2006 (8)*†</td>
<td>Three studies examined the effect of provider on serum lipids. All of the studies were conducted in ambulatory primary care settings using samples of adults (Becker et al., 2005; Litaker et al., 2003; Paez &amp; Allen, 2006). The three RCTs were high quality and also provided evidence NP care was associated with better lipid control compared to care from other providers (Paez &amp; Allen, 2006). When comparing NP and MD groups, there is a high level of evidence to support better management of patient serum lipid levels by NPs (Becker et al., 2005; Litaker et al., 2003).</td>
<td>High: Serum lipid levels/control among patients cared for by NP group was better than the MD comparison group.</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>4 (4 RCTs)</td>
<td>Becker et al., 2005 (5)*†</td>
<td>Blood pressure control was an outcome of four RCTs. All of the studies were conducted in ambulatory primary care settings using samples of adults. All four RCTs were high quality, and two of those RCTs found patients cared for by the NP had better-controlled BP than patients cared for by other providers (Becker et al., 2005). When comparing NP and MD groups, there is a high level of evidence to support equivalent levels of BP control.</td>
<td>High: Blood pressure levels/control among patients is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td>ED or urgent care visits</td>
<td>5 (3 RCTs)</td>
<td>Counsell et al., 2007 (7)*†</td>
<td>Five studies reported rates of ED visits. All three RCTs were judged to be high quality (Counsell et al., 2007; Lenz et al., 2002; Nelson et al. 1991). Study samples included ambulatory patients with diabetes, hypertension, dyslipidemia, asthma, and heart failure (Lenz et al., 2002; Paul, 2000); community-dwelling elders and nursing home residents (Aigner et al., 2004; Counsell et al., 2007); and otherwise healthy children who had recently been seen in the ED for an emergent condition (Nelson et al., 1991). When comparing NP and MD groups, there is a high level of evidence to support equivalent rates of ED visits.</td>
<td>High: Rates of ED or urgent care visits are equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>11 (3 RCTs)</td>
<td>Counsell et al., 2007 (7)*†</td>
<td>Eleven studies reported rates of hospitalization. Adult patients with heart failure, managed in ambulatory care settings, were the focus of one study (Paul, 2000). Three studies evaluated older adults receiving care in nursing homes (Aigner et al., 2004; Garrard et al., 1990; Kane et al., 2004). The remaining five studies collected data from a variety of individuals discharged home after acute care hospitalizations (premature infants, children with asthma, adults with heart failure, and older adults with general medical conditions) (Borgmeyer et al., 2008; Dahle et al., 1998; Lambing et al., 2004; Schultz et al., 1994). When comparing NP and MD groups, there is a high level of evidence to support equivalent rates of hospitalization.</td>
<td>High: Rates of hospitalization/rehospitalization visits are equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td>Duration of ventilation</td>
<td>3 (0 RCTs)</td>
<td>Hoffman et al., 2005 (7)</td>
<td>Duration of ventilation was an outcome in three studies. Two found the substitution of an NP for pulmonary fellows and neurosurgical house staff had no deleterious effect on patient duration of ventilation (Hoffman et al., 2005; Russell et al., 2002). Low-birthweight neonates whose care was provided by a neonatal NP or medical residents spent similar lengths of time supported by mechanical ventilation (Bissinger et al., 1997). When comparing NP and MD groups, there is a low level of evidence to support equivalent duration of mechanical ventilation.</td>
<td>Low: Duration of ventilation is comparable among patients cared for by NPs in collaboration with attending MDs compared to duration of ventilation in patients cared for by house-staff MDs in collaboration with attending MDs.</td>
</tr>
</tbody>
</table>
Mortality. Eight studies (one RCT) reported patient mortality. Studies were conducted with samples of high-risk infants (twins, pre-term, or low birthweight), adults with acute and chronic medical conditions, older adult residents of nursing homes, and critically ill adults (diagnosed with respiratory failure, multiple-cause critical illnesses, and after complex neurosurgery). When comparing NP and MD groups, there is a high level of evidence to support equivalent mortality rates.

Certified Nurse-Midwife Outcomes

Outcomes from 21 studies (two RCTs and 19 observational studies) were aggregated for 13 outcomes of care managed by certified nurse-midwives (CNMs).

### Table 5a. (continued) Summary of Outcomes and Evidence for Nurse Practitioners

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Studies</th>
<th>Author, Year (Study Quality Rating, Significance)</th>
<th>Synthesis of Studies</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOS</td>
<td>16</td>
<td>Fanta et al., 2006 (3)*</td>
<td>High-risk neonates, children (admitted for exacerbation of asthma, pulmonary complications of cystic fibrosis, or non-thoracic or CNS traumatic injuries), adults (admitted with general medical problems or for cardiovascular surgery), and older adults (admitted from home or a nursing home with general medical problems) were included in these studies. In addition, two studies examined outcomes in critically ill adults requiring endotracheal intubation or tracheostomy and mechanical ventilation for respiratory failure. One study was conducted in a neonatal critical care unit with high-risk newborns (excluding those with congenital malformations). Ten were judged high quality. Results of five of the studies favored the NP (Fanta et al., 2006; Miller, 1997; Ruiz et al., 2001; Russell et al., 2002; Schultz et al., 1994) but one low-quality study favored MDs (Lambing et al., 2004). However, the elderly patients cared for by the NPs in that study had higher acuity scores than patients in the MD group. This difference in acuity may have influenced the subsequent patient LOS. Studies in which NP patients had lower LOS included neurosurgical patients, elders, pediatric trauma patients, and low-birthweight and twin neonates. Ten studies found no difference in LOS depending on the provider (NP outcome comparable to physicians). These studies included adults and elderly patients hospitalized in a subacute MICU, cardiovascular surgical patients, and adults diagnosed with a variety of diagnoses, including heart failure, in addition to low-birthweight neonates and children with acute exacerbations of asthma and cystic fibrosis. When comparing NP and MD groups, there is a moderate level of evidence to support equivalent LOS.</td>
<td>Moderate: LOS is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pioro et al., 2001 (5)*</td>
<td>High-risk neonates, children (admitted for exacerbation of asthma, pulmonary complications of cystic fibrosis, or non-thoracic or CNS traumatic injuries), adults (admitted with general medical problems or for cardiovascular surgery), and older adults (admitted from home or a nursing home with general medical problems) were included in these studies. In addition, two studies examined outcomes in critically ill adults requiring endotracheal intubation or tracheostomy and mechanical ventilation for respiratory failure. One study was conducted in a neonatal critical care unit with high-risk newborns (excluding those with congenital malformations). Ten were judged high quality. Results of five of the studies favored the NP (Fanta et al., 2006; Miller, 1997; Ruiz et al., 2001; Russell et al., 2002; Schultz et al., 1994) but one low-quality study favored MDs (Lambing et al., 2004). However, the elderly patients cared for by the NPs in that study had higher acuity scores than patients in the MD group. This difference in acuity may have influenced the subsequent patient LOS. Studies in which NP patients had lower LOS included neurosurgical patients, elders, pediatric trauma patients, and low-birthweight and twin neonates. Ten studies found no difference in LOS depending on the provider (NP outcome comparable to physicians). These studies included adults and elderly patients hospitalized in a subacute MICU, cardiovascular surgical patients, and adults diagnosed with a variety of diagnoses, including heart failure, in addition to low-birthweight neonates and children with acute exacerbations of asthma and cystic fibrosis. When comparing NP and MD groups, there is a moderate level of evidence to support equivalent LOS.</td>
<td>Moderate: LOS is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hoffman et al., 2005 (7)</td>
<td>Samples included high-risk infants (twins, pre-term, or low birthweight) (Bissinger et al., 1997; Karlowicz &amp; McMurray, 2000; Ruiz et al., 2001), adults with acute and chronic medical conditions (Pioro et al., 2001), older adult residents of nursing homes (Kane et al., 2004), and critically ill adults (diagnosed with respiratory failure, multiple-cause critical illnesses, and after complex neurosurgery) (Gracias et al., 2008; Hoffman et al., 2005; Russell et al., 2002). Seven of the studies were judged high quality (Bissinger et al., 1997; Gracias et al., 2008; Hoffman et al., 2005; Karlowicz &amp; McMurray, 2000; Pioro et al., 2001; Ruiz et al., 2001; Russell et al., 2002). A high-quality quasi-experimental study found mortality rates were lower in patients cared for by NPs (Gracias et al., 2008). The remaining seven studies found no differences in mortality rates. When comparing NP and MD groups, there is a high level of evidence to support equivalent mortality rates.</td>
<td>High: Mortality is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ruiz, 2001 (5)</td>
<td>Samples included high-risk infants (twins, pre-term, or low birthweight) (Bissinger et al., 1997; Karlowicz &amp; McMurray, 2000; Ruiz et al., 2001), adults with acute and chronic medical conditions (Pioro et al., 2001), older adult residents of nursing homes (Kane et al., 2004), and critically ill adults (diagnosed with respiratory failure, multiple-cause critical illnesses, and after complex neurosurgery) (Gracias et al., 2008; Hoffman et al., 2005; Russell et al., 2002). Seven of the studies were judged high quality (Bissinger et al., 1997; Gracias et al., 2008; Hoffman et al., 2005; Karlowicz &amp; McMurray, 2000; Pioro et al., 2001; Ruiz et al., 2001; Russell et al., 2002). A high-quality quasi-experimental study found mortality rates were lower in patients cared for by NPs (Gracias et al., 2008). The remaining seven studies found no differences in mortality rates. When comparing NP and MD groups, there is a high level of evidence to support equivalent mortality rates.</td>
<td>High: Mortality is equivalent in NP and MD comparison groups.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Karlowicz &amp; McMurray, 2000 (5)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Gracias et al., 2008 (7)*</td>
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<td></td>
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<td>Kane, 2004 (4)</td>
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<td>Russell et al., 2002 (5)</td>
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<td></td>
<td></td>
<td>Bissinger et al., 1997 (5)</td>
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</tbody>
</table>

* RCT
† Favors APRN
‡ Favors comparison group
### Table 5b. Summary of Outcomes for Certified Nurse-Midwives

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Studies</th>
<th>Author, Year (Study Quality Rating, Significance)</th>
<th>Synthesis of Studies</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cesarean</td>
<td>15 (1 RCT)</td>
<td>Baruffi et al., 1990 (6)†</td>
<td>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.</td>
<td>High: Lower rates of cesarean sections for CNMs than other providers.</td>
</tr>
<tr>
<td>Low Apgar score</td>
<td>11 (1 RCT)</td>
<td>Blanchette, 1995 (5)</td>
<td>The majority of studies measured as Apgar &lt;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.</td>
<td>High: Comparable rates of low Apgar scores between CNM and other provider groups in all studies but one.</td>
</tr>
<tr>
<td>Epidural</td>
<td>10 (0 RCTs)</td>
<td>Blanchette, 1995 (5)</td>
<td>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.</td>
<td>Moderate: Less epidural use by CNMs than other providers.</td>
</tr>
<tr>
<td>Labor augmentation</td>
<td>9 (1 RCT)</td>
<td>Blanchette, 1995 (5)</td>
<td>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.</td>
<td>High: Lower or comparable use of labor augmentation between CNM and other providers.</td>
</tr>
<tr>
<td>Labor induction</td>
<td>9 (0 RCTs)</td>
<td>Blanchette, 1995 (5)</td>
<td>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.</td>
<td>Moderate: Comparable or lower rates of labor induction compared to other providers.</td>
</tr>
</tbody>
</table>
Table 5b. (continued)  
Summary of Outcomes for Certified Nurse-Midwives

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Studies</th>
<th>Author, Year (Study Quality Rating), Significance</th>
<th>Synthesis of Studies</th>
<th>Evidence Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episiotomy</td>
<td>8 (1 RCT)</td>
<td>Blanchette, 1995 (5)† Chambliss et al., 1992 (7)*† Hueston &amp; 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)†</td>
<td>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.</td>
<td>High: Episiotomy rates are lower for CNMs than other providers in all studies.</td>
</tr>
<tr>
<td>Low birthweight (&lt;2,500 g)</td>
<td>8 (1 RCT)</td>
<td>Blanchette, 1995 (5) Fischler &amp; Fischler, 1995 (4) Heins et al., 1990 (6)* Jackson, Lang, Swartz et al., 2003 (7) Lenaway et al., 1998 (5) MacDorman &amp; Singh, 1998 (6)† Oakley et al., 1996 (6)† Sze et al., 2008 (6)†</td>
<td>The common measure was proportion with low birthweight (&lt;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.</td>
<td>High: Comparable rates of low birthweight between CNMs and other providers.</td>
</tr>
<tr>
<td>Vaginal operative delivery (forceps, vacuum, or both)</td>
<td>8 (1 RCT)</td>
<td>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)†</td>
<td>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.</td>
<td>High: Lower or comparable vaginal operative deliveries between CNMs and other providers.</td>
</tr>
<tr>
<td>Labor analgesia</td>
<td>6 (1 RCT)</td>
<td>Blanchette, 1995 (5) Chambliss et al., 1992 (7)* Davis et al., 1994 (6)† Hueston &amp; Rudy, 1993 (7) Jackson et al., 2003 (7)† Oakley et al., 1995 (6)†</td>
<td>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.</td>
<td>High: Less analgesia use by CNMs than other providers.</td>
</tr>
<tr>
<td>Perineal lacerations</td>
<td>5 (1 RCT)</td>
<td>Chambliss et al., 1992 (7)* Hueston &amp; Rudy, 1993 (7)† Low et al., 2000 (6)† Oakley et al., 1996 (6)† Robinson et al., 2000 (6)†</td>
<td>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 (Carrol &amp; 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.</td>
<td>High: Rates of third and fourth-degree perineal lacerations are lower for CNMs than other providers.</td>
</tr>
<tr>
<td>Vaginal birth after cesarean (VBAC)</td>
<td>5 (0 RCTs)</td>
<td>Blanchette, 1995 (5) Cragin, 2002 (6)† Davis et al., 1994 (6)† DeLano et al., 1997 (5)† Lenaway et al., 1998 (5)</td>
<td>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.</td>
<td>Moderate: Comparable or higher rates of VBAC for CNMs compared to other providers.</td>
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</tbody>
</table>
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 induction. 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
### Table 5c. Summary of Outcomes for Clinical Nurse Specialists

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Number of Studies</th>
<th>Author, Year (Study Quality Rating), Significance</th>
<th>Synthesis of Studies</th>
<th>Evidence Grade</th>
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<tbody>
<tr>
<td><strong>Satisfaction</strong></td>
<td>3 (2 RCTs)</td>
<td>Johnson &amp; Sherman, 1994 (4)†</td>
<td>Only one low-quality observational study found a significant difference favoring the CNS group in satisfaction with care in a pre-test post-test inpatient oncology CNS case-management study (Johnson &amp; Sherman, 1994). A high level of evidence supports comparable satisfaction scores, indicating that the CNS may not have a direct effect on patient satisfaction.</td>
<td>High: Satisfaction among patients on units with a CNS was similar to comparison group.</td>
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<td></td>
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<td>Swindle et al., 2003 (7)*</td>
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<td></td>
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<td>York et al., 1997 (7)*</td>
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<tr>
<td></td>
<td></td>
<td>Swindle et al., 2003 (7)*</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>York et al., 1997 (7)*</td>
<td></td>
<td></td>
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<tr>
<td><strong>Length of stay</strong></td>
<td>7 (2 RCTs)</td>
<td>Ahrens et al., 2003 (6)†</td>
<td>Four of the five observational studies demonstrated lower LOS for patients on units with CNS-enhanced care for populations of post-coronary bypass surgery, patients in end-of-life care, patients undergoing radical prostatectomy, and patients who had a total knee replacement. Two RCTs found no significance difference in LOS when the CNS was involved in the care. However, one of those studies (York et al., 1997) explored CNS in postpartum care, and postpartum LOS is generally fixed, resulting in non-significance. Three high- and one low-quality observational studies demonstrated a difference favoring the CNS group.</td>
<td>High: LOS is comparable or better than patients cared for by a CNS as compared to non-CNS.</td>
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<td></td>
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<td>Duffy-Durnin &amp; Campell-Heider, 1994 (5)*</td>
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<tr>
<td></td>
<td></td>
<td>Koch &amp; Smith, 1994 (3)†</td>
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<td>Lombness, 1994 (6)†</td>
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<tr>
<td></td>
<td></td>
<td>Micheels et al., 1995 (4)</td>
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<td></td>
<td></td>
<td>Wheeler, 2000 (8)†</td>
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<tr>
<td></td>
<td></td>
<td>York et al., 1997 (7)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>4 (2 RCTs)</td>
<td>Ahrens, 2003 (6)†</td>
<td>Three of the studies reported a significantly lower cost; however, the comparisons in each of the three studies were different. The comparisons were between CNS postpartum care and standard care (York et al., 1997) CNS and MD, with MDs in a population of patients at risk to die (Ahrens et al. 2003) and pre-post CNS with guideline implementation (Koch et al., 1994). One RCT reported no difference in the cost of care when utilizing a MD/CNS intervention for patients with major depression in an ambulatory setting (Swindle et al. 2003). A high level of evidence supports utilization of the CNS role decreases costs of care.</td>
<td>High: Cost is lower in CNS group care.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Koch &amp; Smith, 1994 (3)†</td>
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<td>Swindle et al., 2003 (7)*</td>
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<tr>
<td></td>
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<td>York et al., 1997 (7)†</td>
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<tr>
<td><strong>Complications</strong></td>
<td>3 (1 RCT)</td>
<td>Allen et al., 2002 (6)†</td>
<td>In the RCT of post-discharge care management by a team with a CNS, stroke and transient ischemic attack patients experienced lower complications than usual care. (Allen et al., 2002). In one observational study, patients in a surgical intensive care experienced less endotracheal tube malposition and inadvertent extubation (Hanneman et al. 1993). In two observational studies, no difference in complication rates were found for postoperative cardiac surgery patients managed by a PA or CNS (Lombness, 1994), and in pre- and post-surgical patient pulmonary complications (Hanneman et al. 1993). Because of the predominance of the pretest post-test design and inconsistency in results, a moderate level of evidence supports that CNSs affect lower complication rates.</td>
<td>Moderate: Complications are lower or comparable when CNS is involved in care as compared to non-CNS staff.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hanneman et al., 1993 (6) (Medical)†</td>
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<tr>
<td></td>
<td></td>
<td>Hanneman et al., 1993 (6) (Surgical)</td>
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<tr>
<td></td>
<td></td>
<td>Lombness, 1994 (6)</td>
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</tbody>
</table>

*RCT  † Favors APRN  ‡ Favors comparison group

A moderate level of evidence to support comparable levels or higher rates of vaginal births after cesarean sections in the CNM group.

**Neonatal intensive care unit (NICU) admission.** Five studies (0 RCTs) reported NICU admission. When comparing CNM and MD care, there is a moderate level of evidence to support comparable levels or lower rates of infant NICU admission in the CNM group.

**Breastfeeding.** Three studies (0 RCTs) reported maternal breastfeeding post delivery. When comparing CNM and MD care, there is a moderate level of evidence to support comparable levels or higher rates of breastfeeding in the CNM group.

### Clinical Nurse Specialist Outcomes

Outcomes from 11 studies (four RCTs and seven observational) were aggregated for four outcomes: satisfaction, hospital length of stay, hospital costs, and complications. The number and type of studies for each outcome are described.

**Satisfaction.** Three studies (two...
RCTs) reported satisfaction. Studies were conducted with samples in inpatient oncology or community settings. When comparing CNS and non-CNS groups, a high level of evidence supports equivalent group satisfaction scores, indicating the CNS does not have a direct effect on patient satisfaction.

**Length of stay.** Seven studies (two RCTs) reported patient LOS. Studies were conducted with inpatient samples of patients post-coronary bypass surgery, in end-of-life care, undergoing radical prostatectomy, and post total knee replacement. When comparing CNS and non-CNS groups, there is a high level of evidence to support equivalent or lower LOS for patients cared for in the CNS group.

**Cost.** Four studies (two RCTs) reported cost outcomes. Studies were conducted with samples of CNS postpartum care, a population of patients at risk to die, and guideline implementation for patients with radical prostatectomy. When comparing CNS and non-CNS groups, there is a high level of evidence to support that the CNS group has lower cost of care.

**Complications.** Three studies (one RCT) reported patient complications. Studies were conducted with samples of patients discharged with a diagnosis of stroke and transient ischemic attack, a surgical intensive care unit, post-operative cardiac surgery, and a pregnancy wellness program. When comparing CNS and non-CNS groups, there is a moderate level of evidence to support that the CNS decreases complication rates.

**Certified Registered Nurse Anesthetists**

For studies of CRNAs, no outcomes met the criteria for aggregation. Although numerous studies have reported on CRNA clinical interventions, very few studies have compared the outcomes of care involving CRNAs with other providers. Sparse data from single observational studies of low quality suggest equivalent complication rates and mortality when comparing care involving CRNAs with care involving only physicians.

**Discussion**

This systematic review of published literature between 1990 and 2008 on care provided by APRNs indicates patient outcomes of care provided by NPs and CNMs in collaboration with physicians are similar to and in some ways better than care provided by physicians alone for the populations and in the settings included. Use of CNSS in acute care settings can reduce length of stay and cost of care for hospitalized patients.

These results extend what is known about APRN outcomes from previous reviews by assessing all types of APRNs over a span of 18 years, using a systematic process with intentionally broad inclusion of outcomes, patient populations, and settings. The results indicate APRNs provide effective and high-quality patient care, have an important role in improving the quality of patient care in the United States, and could help address concerns about whether care provided by APRNs can safely augment the physician supply to support reform efforts aimed at expanding access to care.

The results of this systematic review should be interpreted while considering limitations in the bodies of research reviewed. Limitations include the heterogeneity of study designs and measures, multiple time points for measuring outcomes, the limited number of randomized designs, inadequate statistical data for calculating effect sizes, failure to describe the nature of the APRN and physician roles and the responsibilities or relationships of team members, including collaboration with physicians. Attribution of the APRN to specific outcomes was often difficult because of the complexity of the intervention, which sometimes included several components and multiple providers. In addition, attribution was also clouded by the fact APRNs often practice as part of a team or in collaboration with other providers. Despite these limitations, the aim of the review was to summarize the evidence for a broad range of outcomes. The quality assessment and score included transparent, systematic methods to strengthen the process, including assessment of differences in comparison groups, settings, participants, and attribution to address some of these limitations.

The results of this systematic review indicate APRNs can have an expanded role in health care systems, and should be incorporated to the fullest extent possible. One major professional organization, the American College of Physicians (2009), supports appropriate use of NPs as part of its commitment to promote teams of care. APRNs and other providers can use these results to spark interdisciplinary conversations to better understand one another’s roles and capabilities. A collaborative effort will ultimately lead to higher quality health care and better health care systems.

There are many policy implications to these results (Newhouse, 2011). Research to test models of care involving APRNs should be expanded to additional settings and populations based on the needs of priority populations and health policy goals. Restrictions on APRN practice and reimbursement must be modified to allow new models of care to be tested. Health care reform initiatives should include APRNs as providers who are used to the full extent of their scope of practice. Billing data need to indicate the actual provider of care (NP, CNM, CNS, CRNA, or physician). Pay-for-performance initiatives should make provision for incorporating
APRNs and other health care providers in the development of initiatives, indicators, and participation for direct and equitable reimbursement.

Conclusion
The ideal health system comprises multiple providers who communicate with and are accountable to each other to deliver coordinated care (Shih & Fund, 2008). This systematic review supports a high level of evidence that APRNs provide safe, effective, quality care to a number of specific populations in a variety of settings. APRNs, in partnership with physicians and other providers, have a significant role in the promotion of health. American health care professionals will need to move forward with evidence-based and more collaborative models of care delivery to promote national unified health goals. $


their effectiveness. Manuscript submitted for publication.


Objective:
This continuing nursing educational (CNE) activity is designed for nurse leaders and other health care professionals who are interested in advanced practice nurse outcomes. For those wishing to obtain CNE credit, an evaluation follows. After studying the information presented in this article, the nurse leader will be able to:

1. Describe the expanded role of advanced practice nurses (APNs) as providers in the health care system.
2. Detail a systematic review of the effectiveness of care between APNs and other health care providers.
3. Discuss the results of this systematic review and the role of APNs in the health care system, including policy implications.

Answer Form:
1. If you applied what you have learned from this activity into your practice, what would be different?

_____________________________________________________________
_____________________________________________________________
_____________________________________________________________
_____________________________________________________________

2. By completing this activity, I was able to meet the following objectives:
   a. Describe the expanded role of advanced practice nurses (APNs) as providers in the health care system. 1 2 3 4 5
   b. Detail a systematic review of the effectiveness of care between APNs and other health care providers. 1 2 3 4 5
   c. Discuss the results of this systematic review and the role of APNs in the health care system, including policy implications. 1 2 3 4 5
3. The content was current and relevant. 1 2 3 4 5
4. The objectives could be achieved using the content provided. 1 2 3 4 5
5. This was an effective method to learn this content. 1 2 3 4 5
6. I am more confident in my abilities since completing this material. 1 2 3 4 5
7. The material was (check one) □ new □ review for me
8. Time required to complete the reading assignment: ______ minutes
I verify that I have completed this activity: _____________________________
Comments _______________________________________________________
________________________________________________________________

CNE Instructions:
1. To receive continuing nursing education credit for individual study after reading the article, complete the answer/evaluation form to the left.
2. Photocopy and send the answer/evaluation form along with a check or credit card order payable to Anthony J. Jannetti, Inc. to Nursing Economic$, CNE Series, East Holly Avenue/Box 56, Pitman, NJ 08071–0056; or visit www.nursingeconomics.net
3. Upon completion of the answer/evaluation form, a certificate for 1.6 contact hour(s) will be awarded and sent to you.

This independent study activity is provided by Anthony J. Jannetti, Inc. (AJJ). AJJ is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation (ANCC-COA).

Anthony J. Jannetti, Inc. is a provider approved by the California Board of Registered Nursing, Provider Number, CEP 5387.

Licenses in the state of California must retain this certificate for four years after the CNE activity is completed.

Accreditation status does not imply endorsement by the provider or ANCC of any commercial product.

This article was reviewed and formatted for contact hour credit by Donna M. Nickitas, PhD, RN, NEA-BC, CNE, Nursing Economic$ Editor; and Rosemarie Marmion, MSN, RN-BC, NE-BC, Anthony J. Jannetti, Inc., Education Director.