QUERI

Evidence Brief: The Quality of Care Provided by Advanced Practice Nurses

SUPPLEMENTAL MATERIALS

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VA | U.S. Department of Veterans Affairs
Veterans Health Administration
Quality Enhancement Research Initiative

SEARCH STRATEGIES

CINAHL Search (November 26, 2013)

Advanced Nursing Practice
(MH "Anesthesia Nursing") OR (MH "Advanced Nursing Practice+") OR (MH "Advanced Practice Nurses+") OR (MH "Scope of Nursing Practice") OR (MH "Nurse Practitioners+") OR (MH "Clinical Nurse Specialists")
AND
Assessment
(MH "Quality of Health Care+") OR (MH "Fatal Outcome") OR (MH "Treatment Failure") OR (MH "Treatment Outcomes+") OR (MH "Outcome Assessment") OR (MH "Nursing Outcomes") OR (MH "Medical Futility") OR (MH "Outcomes (Health Care)+") OR (MH "Quality Assessment") OR (MH "Program Evaluation") OR (MH "Clinical Indicators")

Limits
English Language
Peer Reviewed
Research Article
NOT children
NOT (MH "Midwifery+")
2008 to present

PubMed Search (November 26, 2013)

(((("Outcome and Process Assessment (Health Care)"[Mesh]))
AND
(((((APRN[Title/Abstract]) OR NP[Title/Abstract]) OR CRNA[Title/Abstract])) OR (((((("Nurse Practitioners"[Mesh]) OR "Nurse Clinicians"[Mesh]) OR "Nurse Anesthetists"[Mesh])) OR "Advanced Practice Nursing"[Mesh])))) NOT ("Midwifery"[Mesh] OR "Nurse Midwives"[Mesh])
AND
(((((("Cohort Studies"[Mesh]) OR "Controlled Clinical Trial"[Publication Type]) OR "Case-Control Studies"[Mesh])) OR (("Evaluation Studies"[Publication Type]) OR "Comparative Study"[Publication Type])) OR (("Comparative Study"[Publication Type]) OR "Follow-Up Studies"[Mesh])
OR
evaluation studies[pt] OR evaluation studies as topic[mesh] OR program evaluation[mesh] OR validation studies as topic[mesh] OR (effectiveness[tiab] OR (pre-[tiab] AND post-[tiab])) OR (program*[tiab] AND evaluat*[tiab]) OR intervention*[tiab]
OR
"Case-Control Studies"[Mesh] OR "Control Groups"[Mesh] OR (case[TIAB] AND control[TIAB]) OR (cases[TIAB] AND controls[TIAB]) OR (cases[TIAB] AND controlled[TIAB]) OR (case[TIAB] AND comparison*[TIAB]) OR (cases[TIAB] AND comparison*[TIAB]) OR "control group"[TIAB] OR "control groups"[TIAB]
OR
(("Veterans Health"[Mesh])) OR (((VA OR Veteran OR VAMC OR Veterans)) OR ("Veterans"[Mesh] OR "United States Department of Veterans Affairs"[Mesh] OR "Hospitals, Veterans"[Mesh]))

Limits
NOT children
2008 to present

LIST OF EXCLUDED STUDIES

(testing nurse-led intervention supplemental to usual care, intervention not compared to physician care, study population not relevant to VA, clinical outcomes not reported)

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18. Finucane AM, Stevenson B, Moyes R, Oxenham D, Murray SA. Improving end-of-life care in nursing homes: Implementation and evaluation of an intervention to sustain quality of care. *Palliative Medicine.* 2013;27(8):772-778.

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EVIDENCE TABLES

Data Abstraction of Included Studies by Setting

First Author Year Sponsoring Organization	Country Included in Newhouse Review?	Setting N Participants	Age in Years Female (%) Race/Ethnicity (%)	Target Condition Patient Complexity No. Consultations	Study Duration Outcomes Reported	Intervention and Comparator	APRN Supervision APRN Training	Design
Primary Care								
Arts 2011 No external funding	The Netherlands No	One academic hospital Internist group: 145 patients Nurse Specialist group: 149 patients	Internist group: 58.4 years Nurse Specialist group: 59.5 years Internist group: 64.8% female Nurse Specialist group: 62.4% female Race/ethnicity not reported	Patients with diabetes mellitus types 1 and 2 requiring more extensive monitoring and specialist care than patients in a primary care setting Baseline Characteristics (MD vs Nurse): BMI (kg/m^2): 29.5, 29.9; EQ-5D: 0.82, 0.86; HbA1c: 8.07%, 7.97% Excluded more complex patients Nurses: 1,003 Physicians: 679	2 years Quality of Life (3 point scale (EQ-5D) assessing mobility, self-care, usual activities, pain/discomfort, anxiety/depression) Hospitalizations Mortality	Patients allocated to nurse care (4 Registered Nurse Specialists) Patients allocated to physician care (5 Physicians)	Nurses worked according to a protocol Nurse specialists: doctoral or master's prepared RNs who focused on specific patient populations	RCT
Hemani 1999 No external funding mentioned	US (MD) No	Baltimore VAMC primary care clinic Attending Physician group: 150 patients Resident Physician group: 150 patients Nurse Practitioner group: 150 patients	Attending Physician group: 60 years Nurse Practitioner group: 62 years Attending Physician group: 1% female Nurse Practitioner group: 1% female	New primary care patients Baseline Characteristics (MD vs NP): hypertensive: 52%, 42%; diabetic: 19%, 20%; coronary artery disease: 19%, 18%; congestive heart failure: 7%, 5%; COPD: 9%, 5%; chronic conditions per patient: 1.5, 1.3 Nurses: 5.7 half-day sessions per week Physicians: 2.4 half-day sessions per week	1 year Hospitalizations Mortality	Patients allocated to nurse care (9 Nurse Practitioners w/ > 6 mos experience (mean 13 yrs experience)) Patients allocated to Resident Physician care (35 2nd or 3rd year residents) Patients allocated to Attending Physician care (10 Attending Physicians)	"…newly graduated NPs are required to present every patient to the attending physicians during the first 6 months of their appointment" "…physicians are required to review and countersign all nurse practitioner and resident visit charts. However, approval of the attending physician is not required for referrals, tests, or treatment plans." APRN Training not discussed	Controlled Trial
Mundinger 2000 Division of Nursing, Health Resources and Services Administration, US Department of Health and Human Services; The Fan Fox and Leslie R. Samuels Foundation; and the New York State Department of Health.	US (NY) Yes	Four community-based primary care clinics (MD) and one primary care clinic at an academic medical center (NP) Physician group: 510 patients Nurse practitioner group: 806 patients	Physician group: 46.7 years Nurse Practitioner group: 45.5 years Physician group: 78.2% female Nurse Practitioner group: 75.9% female Physician group: 91.0% Hispanic, 5.5% Black, 1.5% White Nurse Practitioner group: 89.3% Hispanic, 8.1% Black, 0.8% White	New primary care patients eligible for Medicaid Baseline Characteristics: Mean physical function (MD vs NP): 37.2, 37.9 Mean mental health summary score (MD vs NP): 40.2, 41.1 Prevalence of asthma (MD vs NP): 16.1%, 17.9% Prevalence of diabetes (MD vs NP): 14.3%, 11.5% Prevalence of hypertension (MD vs NP): 38.0%, 33.9% No significant difference in number of primary care visits	6 months Health status (SF – 36 Item Short-Form Health Survey) Hospitalizations at 6 mos and 1 yr	Patient allocated to nurse care (7 Nurse Practitioners) Patient allocated to physician care (17 physicians)	"The primary care nurse practitioners and physicians had the same authority to prescribe, consult, refer, and admit patients." "New York State law allows nurse practitioners to practice with a collaboration agreement that requires the physician to respond when the nurse practitioner seeks consultation…requires only quarterly meetings to review cases…" APRN Training not discussed	RCT

First Author Year Sponsoring Organization	Country Included in Newhouse Review?	Setting N Participants	Age in Years Female (%) Race/Ethnicity (%)	Target Condition Patient Complexity No. Consultations	Study Duration Outcomes Reported	Intervention and Comparator	APRN Supervision APRN Training	Design
Primary Care								
Lenz 2004 *Subset of Mundinger 2000* Funded in part by the RWJF and the United Hospital Fund	US (NY) Yes	Four community-based primary care clinics (MD) and one primary care clinic at an academic medical center (NP) Physician group: 184 patients Nurse practitioner group: 222 patients	Physician group: 57.1% 40-64 years Nurse Practitioner group: 57.7% 40-64 years Physician group: 15.2% female Nurse Practitioner group: 20.7% female Physician group: 89.6% Hispanic, 7.7% Black Nurse Practitioner group: 94.5% Hispanic, 4.5% Black	Subset of Mundinger (2000) patients Target conditions (MD vs NP): asthma (16.3%, 19.4%), diabetes (13.0%, 10.4%), hypertension (37.5%, 37.4%) Mean physical function (MD vs NP): 37.49, 38.94 Mean mental health summary score (MD vs NP): 39.88, 38.94 Unknown	2 years Health status Hospitalizations	Patient allocated to nurse care (unclear # Nurse Practitioners) Patient allocated to physician care (unclear # physicians)	"The primary care nurse practitioners and physicians had the same authority to prescribe, consult, refer, and admit patients." "New York State law allows nurse practitioners to practice with a collaboration agreement that requires the physician to respond when the nurse practitioner seeks consultation…requires only quarterly meetings to review cases…" APRN Training not discussed	RCT
Lenz 2002 *Subset of Mundinger 2000* Funding: Division of Nursing, HRSA, Fan Fox and Leslie R. Samuels Foundation, NY State Department of Health	US (NY) Yes	Four community-based primary care clinics (MD) and one primary care clinic at an academic medical center (NP) Physician group: 59 patients Nurse practitioner group: 86 patients	54.8 years 66.2% Female 91.5% Hispanic 84% of subjects were enrolled in Medicaid.	Subset of Mundinger (2000) patients with type 2 diabetes Baseline Characteristics: 64.1% BMI ≥ 27 Mean physical function (MD vs NP): 33.48, 37.11 Mean mental health summary score (MD vs NP): 39.20, 40.91 Unknown	6 months Health status Hospitalizations	Patient allocated to nurse care (unclear # Nurse Practitioners) Patient allocated to physician care (unclear # physicians)	"The primary care nurse practitioners and physicians had the same authority to prescribe, consult, refer, and admit patients." "New York State law allows nurse practitioners to practice with a collaboration agreement that requires the physician to respond when the nurse practitioner seeks consultation…requires only quarterly meetings to review cases…" APRN Training not discussed	RCT
Urgent Care								
Kinnersley 2000 Funding: Welsh Office of Research And Development for Health and Social Care	UK No	10 general practices ranging from 6,000 to 16,300 patients General Practitioner Group: 716 patients Nurse Practitioner Group: 652 patients	GP group: 16-35: 30%; 36-55: 25% NP group: 16-35: 28%; 36-55: 22% GP group: 58% female NP group: 61% female Race/ethnicity not reported	Patients requesting same day appointments Presenting illness (GP, NP): respiratory system (29%, 29%), nervous system and sensory organs (15%, 14%), skin (12%, 11%), musculoskeletal system (9%, 7%), digestive system (9%, 8%), allergic, endocrine, nutritional, and metabolic (6%, 8%), genitourinary (5%, 5%), miscellaneous (16%, 18%) Unknown	2-4 weeks Resolution of symptoms and concerns (5 pt. Likert-type scale (2 wks)) Hospitalizations for same problem (4 wks)	Patients allocated to nurse care (10 NPs) Patients allocated to physician care (unknown # of GPs)	"General practitioners were always available to prescribe when necessary." Nurse practitioners: nurses employed in general practice who had completed the nurse practitioner diploma course at one of two colleges at least one year prior to start of study	Controlled Trial

First Author Year Sponsoring Organization	Country Included in Newhouse Review?	Setting N Participants	Age in Years Female (%) Race/Ethnicity (%)	Target Condition Patient Complexity No. Consultations	Study Duration Outcomes Reported	Intervention and Comparator	APRN Supervision APRN Training	Design
Urgent Care								
Shum 2000 Funding: The South Thames region of the NHS Executive.	UK No	Five general practices ranging from semi-rural to urban, Physician group: 915 patients Nurse group: 900 patients	Physician group: 29.1 years Nurse group: 26.0 years Physician group: 60.3% female Nurse group: 60.0% female Race/ethnicity not reported	Patients requesting same day appointments (minor illnesses) Presenting condition (GP vs NP): respiratory infection (52.4%, 48.1%), musculoskeletal problems (13.5%, 13.0%), skin condition (9.5%, 11.0%), abdominal pain (4.6%, 4.5%), eye condition (3.6%, 4.6%), diarrhea or vomiting (3.7%, 2.6%), urinary infection (2.4%, 3.7%), gynecological (2.3%, 2.4%), contraception (1.6%, 1.2%). Unknown	2-4 weeks Self-reported health status at two weeks (cured, improved, same, worse) Return to surgery Attendance at an "accident and emergency" out of hours call to emergency Hospitalizations	Patient allocated to nurse care (5 specially trained nurses) Patient allocated to physician care (19 general practitioners)	Prescriptions required a doctor's signature Training: nurses participated in a course on managing minor illnesses over 3mos. Team developed an academically accredited degree level course in managming minor illnesses as none of the nurses had experience in this area.	RCT
Venning 2000 Funding: Welcome Trust	UK No	20 general practices ranging from urban to rural, 1 to >5 partners, and 3,000 to >12,000 practice list size General practitioner group: 651 patients Nurse practitioner group: 641 patients	Physician group: 69.4% > 16 years Nurse Practitioner Group: 64.6% > 16 years Physician group: 57% female Nurse Practitioner group: 58% female Race/ethnicity not reported	Patients requesting same day appointments (points of first contact in primary care) Presenting condition: upper respiratory tract infection (36.8%), viral illness (11.4%), no specific diagnosis (11.0%), minor injuries (9.2%), eye and ear conditions (7.6%) Unknown	2 weeks Health status (SF-36 at baseline and two weeks after appointment)	Patient allocated to nurse care (20 nurse practitioners) Patient allocated to physician care (unknown # GPs)	Prescriptions required a doctor's signature Nurses had a one or two year nurse practitioner training, BSc, or MSc. Median time as nurse practitioners= 3 yrs. Median time as registered nurse=22 yrs.	RCT
Iglesias 2013 Funding: Health Research Fund, Carlos III Health Institute from Ministry of Science and Innovation	Spain No	38 practices belonging to the main primary care provider in Catalonia General practitioner group: 708 patients Nurse group: 753 patients	Physician group: 38.6 years Nurse group: 39.0 years Physician group: 61.2% female Nurse group: 61.0% female Race/ethnicity not reported	Patients requesting same day appointments Presenting condition (GP vs nurse): upper respiratory symptoms (56.2%, 54.6%), acute diarrhea (16.0%, 17.4%), low back pain (11.2%, 10.6%), injury (10.6%, 9.4%) Unknown	15 days Health status improvement (yes/no)	Patient allocated to nurse care (155 specially trained nurses) Patient allocated to physician care (142 general practitioners)	Nurse supervision was not explicitly discussed, although nurses were free to consult with and refer patients to a general practitioner Nurses were trained to follow guidelines developed during the study's preparation phase	RCT

First Author Year Sponsoring Organization	Country Included in Newhouse Review?	Setting N Participants	Age in Years Female (%) Race/Ethnicity (%)	Target Condition Patient Complexity No. Consultations	Study Duration Outcomes Reported	Intervention and Comparator	APRN Supervision APRN Training	Design
Inpatient Care								
Silber 2000 Funding: Methodology development partially supported by a grant from AHRQ and a grant from the American Board of Anesthesiology	US (Pennsylvania) No	Pennsylvania Medicare general and orthopedic surgical admissions claims 1991-1994 245 hospitals	9.9% older than 85 years 34.7% male Race/ethnicity not reported	Elderly Medicare patients general and orthopedic surgical admissions History of: congestive heart failure (2.6%), arrhythmia (2.9%), aortic stenosis (1.8%), hypertension (6.6%), cancer (24.2%), COPD (12.1%), type 2 diabetes (10.6%), type 1 diabetes (1.7%) ED admission: 34.4% Unknown	Mortality within 30 days of admission (identified vial HCFA Vital Status file) Failure-to-rescue (deaths after complications) identified using a set of 41 events – ICD-9-CM	194,430 patients whose surgery was directed by an anesthesiologist 23,010 patients whose surgery was undirected by an anesthesiologist	Adjusted for: 11 hospital characteristics (> 200 beds, RNs/bed ratio, % anesthesiologist staff board certified, % surgical staff board certified, trauma center, lithotripsy facility, MRI facility, solid organ/kidney transplant, bone marrow transplant unit, residency training program, council of teaching hospitals member), 64 patient characteristics and interaction terms (demographics, history, transfer, ER admissions, 42 diagnosis-related group categories)	Retrospective
Pine 2003 Funding: The American Association of Nurse Anesthetists Foundation	US (22 states) No	Medicare surgical admissions claims 1995-1997 in 22 states obtained from part B Medicare billing data (404,194 cases)	Patient Characteristics not reported	Patients undergoing 1 of 8 procedures: Carotid endarterectomy (14.09%), Cholecystectomy (13.53%), Herniorrhaphy uncomplicated (3.90%), Hysterectomy for benign disease (7.56%), Knee replacement (27.49%), Laminectomy (7.17%), Mastectomy (6.78%), Prostatectomy (19.47%) Unknown	Inpatient mortality (risk-adjusted)	Anesthesiologist alone (33.2% of cases) Certified Registered Nurse Anesthetists alone (8.2% of cases) Team of an anesthesiologist and CRNA (58.6% of cases)	Adjusted for: case mix, clinical risk factors*, hospital characteristics, geographic location *used NY SPARCS database to screen potential clinical risk factors (used Medicare dataset to verify)	Retrospective
Dulisse and Cromwell 2010 Funding: The American Association of Nurse Anesthetists	US (14 opt-out states, unknown # non-opt-out states) No	Medicare surgical admissions claims 1999-2005 in opt-out and non-opt-out states (481,440 cases)	Opt-out states: CRNA solo: 51% ≥ 75; MDA solo: 48% ≥ 75; Team: 45% ≥ 75 years Non-opt-out states: CRNA solo: 44% ≥ 75; MDA solo: 47% ≥ 75; Team: 44% ≥ 75 years Opt-out states: CRNA solo: 41%; 45%; Team: 44% male Non-opt-out states: CRNA solo: 43%; MDA solo: 45%; Team: 44% male Opt-out states: CRNA solo: 1%; MDA solo: 2%; Team: 2% African American Non-opt-out states: CRNA solo: 8%; MDA solo: 7%; Team: 11% African American	All Medicare surgical diagnosis-related groups Procedure Base Units: Opt-out states: CRNA solo: 7.2; MDA solo: 8.3; Team: 7.6 Non-opt-out states: CRNA solo: 7.2; MDA solo: 8.4; Team: 7.6 Excluded patients with more than one hospitalization in a quarter Unknown	Inpatient mortality	In opt-out and non-opt-out states: Anesthesiologist alone (42%, 44.5%) Certified Registered Nurse Anesthetists alone (21%, 9.7%) Team of an anesthesiologist and CRNA (37.0%, 45.8%)	Adjusted for: patient characteristics (age, sex, race), procedure complexity (anesthesia base units), year, opt-out status, indicators for the ten highest-mortality diagnosis-related groups	Retrospective

Quality Assessment of Included Controlled Trials

Author Year	Was the allocation sequence generated adequately (e.g., random number table, computer-generated randomization)?	Was the allocation of treatment adequately concealed (e.g., pharmacy-controlled randomization or use of sequentially numbered sealed envelopes)?	Were the groups comparable at baseline on key prognostic factors (e.g., by restriction or matching)?	Were the outcome assessors blinded to the intervention or exposure status of participants?	Were outcomes assessed/ defined using valid and reliable measures, implemented consistently across all study participants?	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Was attrition unacceptably high? Was attrition unacceptably differential? Was intention-to-treat analysis performed?	Quality Rating
Arts 2011	Yes "Patients who were considered eligible for participation and who gave written informed consent were enrolled in the study by unrestricted randomization, i.e. drawing lots."	Yes "Researchers were blinded with regard to allocation."	Yes, except for the percentage of participants with diabetes-related complications was higher in the intervention group (47%) than in the control group (42%).	Deaths and hospitalizations: No "Adverse events [including hospitalizations and deaths] were registered per patient visit by the participating physicians and nurse specialist." Quality of life: Unclear	Deaths and hospitalizations "were registered per patient visit by the participating physicians and nurse specialist." Quality of life: EQ-5D generic health index, ascertainment unclear.	Intervention (nurse) group: Randomized: 169 Enrolled: 169 (100%) Used in analysis (per outcome): 149/169 (88%) Control (physician) group: Randomized: 168 Enrolled: 168 (100%) Used in analysis (per outcome): 145/168 (86%)	No No No	Deaths: Fair Hospitalizations: Fair Quality of life: Fair
Kinnersley 2000	No "In practices using randomization by day, all patients consulting on a particular day saw the same type of practitioner.". "Some of the practices that chose to randomize patients within day had appointments for same day patients fitted in throughout the day while others had unbooked consulting sessions." Order of appointments was organized according to block randomization.	Not reported	Yes Adjusted for the effect of cluster randomization.	Resolution of symptoms: No, self-report. Hospitalizations: Unclear	Resolution of symptoms: Use of a self-administered questionnaire at two week-follow-up. Likert-type scales. Hospitalizations: Yes. "…patients medical records were checked for reattendance or hospital admission for the same problem.	Total sample: Requesting same day consultation: 1757 Randomized: 1465/1757 (83%) Used in analysis: 1368/1757 (78%) Intervention group: Enrolled: 652 Used in analysis (per outcome): Resolution of symptoms: 491/652 (75%) completed postal questionnaire (two week follow-up). Hospitalizations: 583/652 (89%) audit sheet competed from medical records. Control group: Enrolled: 716 Used in analysis (per outcome): Resolution of symptoms: 533/716 (74%) completed postal questionnaire (two-week follow-up). Hospitalizations: 639/716 (89%) audit sheet completed from medical records.	No No No	Resolution of symptoms: Fair Hospitalizations: Fair

Author Year	Was the allocation sequence generated adequately (e.g., random number table, computer-generated randomization)?	Was the allocation of treatment adequately concealed (e.g., pharmacy-controlled randomization or use of sequentially numbered sealed envelopes)?	Were the groups comparable at baseline on key prognostic factors (e.g., by restriction or matching)?	Were the outcome assessors blinded to the intervention or exposure status of participants?	Were outcomes assessed/ defined using valid and reliable measures, implemented consistently across all study participants?	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Was attrition unacceptably high? Was attrition unacceptably differential? Was intention-to-treat analysis performed?	Quality Rating
Shum 2000	Yes "Allocation to being seen by a doctor or nurse was determined using random permuted blocks of four, with sequentially numbers, non-relsealable, opaque envelopes."	Yes	Yes, except for the percentage of patients classified as having "other" conditions in each group.	Resolution of symptoms: No, self-report. Hospitalizations: Unclear.	Health status: Yes "Self-reported health status was measured using the scale developed by Murphy et al." Critical events: "Data on critical events, attendance at accident and emergency departments, and out of hours calls were collected from the medical records of those who did not respond to the postal questionnaire."	Intervention group: Randomized: 900 Enrolled: 860/900 (96%) Used in analysis (per outcome): health status: 672/900 (75%) critical events: 675/900 (75%) Control group: Randomized: 915 Enrolled: 853/915 (93%) Used in analysis (per outcome): health status: 661/915 (72%) Critical events: 664/915 (73%)	No No Resolution of symptoms: No Hospitalizations: Yes	Resolution of symptoms: Fair Hospitalizations: Fair
Mundinger 2000	Yes	Yes	Yes	Health status: No Hospitalizations: Unclear	Health status: "Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)." (self-reported) Hospitalizations: "…obtained from the medical center computer records" at 6 months and at one year.	Intervention group: Randomized: 1181 Enrolled: 806/1181 (68%) Used in analysis (per outcome): Health status at 6 month follow-up 649/1181 (55%) Hospitalization data: 800/1181 (68%) Control group: Randomized: 800 Enrolled: 510/800 (63%) Used in analysis (per outcome): Health status at 6 month follow-up 391/800 (49%) Hospitalization data: 509/800 (64%)	No No Health status: No Hospitalizations: Yes	Health status: Fair Hospitalizations: Good
Lenz 2004 *Subset of Mundinger 2000*	Yes	Yes	Yes, except for Medicaid status at baseline.	Heath status: No Hospitalizations: Unclear	Health status: "Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)." (self-reported) Hospitalizations: "…obtained from the medical center computer records" at 6 months and at one year.	Intervention group: Randomized: 1181 Enrolled: 806/1181 (68%) Used in analysis (per outcome): 222/1181 (19%) Control group: Randomized: 800 Enrolled: 510/800 (63%) Used in analysis (per outcome): 184/800 (23%)	Yes No Health status: No Hospitalizations: No	Poor

Author Year	Was the allocation sequence generated adequately (e.g., random number table, computer-generated randomization)?	Was the allocation of treatment adequately concealed (e.g., pharmacy-controlled randomization or use of sequentially numbered sealed envelopes)?	Were the groups comparable at baseline on key prognostic factors (e.g., by restriction or matching)?	Were the outcome assessors blinded to the intervention or exposure status of participants?	Were outcomes assessed/ defined using valid and reliable measures, implemented consistently across all study participants?	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Was attrition unacceptably high? Was attrition unacceptably differential? Was intention-to-treat analysis performed?	Quality Rating
Lenz 2002 *Subset of Mundinger 2000*	Yes	Yes	Unclear, no data given. "NP and MD patients with type 2 diabetes did not differ demographically and were similar to the larger sample."	Health status: No Hospitalizations: Unclear	Health status: "Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)." Self-reported. Hospitalizations: "…obtained from the medical center computer records" at 6 months and at one year.	Total sample: (subset of a larger study) Randomized: 1981 Eligible: 1316/1981 (66%) Total sample: Used in analysis: 145/1981 (7%) Intervention group: Randomized: 1181 Enrolled: 806/1181 (68%) Used in analysis (per outcome): Completed MOS SF-36 questionnaire at 6 month follow-up: 71/1181 (6%) Hospitalizations at 6 months after baseline: 86/1181 (7%) Control group: Randomized: 800 Enrolled: 510/800 (63%) Used in analysis (per outcome): Completed MOS SF-36 questionnaire at 6 month follow-up: 48/800 (6%) Hospitalizations at 6 months after baseline: 59/800 (7%)	Yes No Health status: No Hospitalizations: No	Poor
Venning 2000	Yes "A method of coded block randomization was developed … neither the receptionist nor the patient could determine the group to which a patient had been allocated at the time of booking. … generated from random number tables." For walk-in: "…randomized patients after they had consented..."	Yes "The randomization code was broken by one of the researchers at the start of each experimental session, at which point it became apparent which patient would see which practitioner."	Yes	No	Health status: Yes Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36). Self-reported.	Intervention group: Randomized: 651 Enrolled: 641/651 (98%) Used in analysis (per outcome): 503/651 (77%) Control group: Randomized: 665 Enrolled: 651/665 (98%) Used in analysis (per outcome): 502/665 (75%)	No No No	Health status: Fair

Author Year	Was the allocation sequence generated adequately (e.g., random number table, computer-generated randomization)?	Was the allocation of treatment adequately concealed (e.g., pharmacy-controlled randomization or use of sequentially numbered sealed envelopes)?	Were the groups comparable at baseline on key prognostic factors (e.g., by restriction or matching)?	Were the outcome assessors blinded to the intervention or exposure status of participants?	Were outcomes assessed/ defined using valid and reliable measures, implemented consistently across all study participants?	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Was attrition unacceptably high? Was attrition unacceptably differential? Was intention-to-treat analysis performed?	Quality Rating
Hemani 1999	No "All new primary care referrals were reviewed by a nurse practitioner who assigned them to a physician, nurse practitioner, or any available provider, depending on the severity of the problems listed on the referral." "Patients assigned to "any available provider" who fulfilled the eligibility criteria… were divided into two groups."	Unclear	Yes, except for chronic renal insufficiency.	Unclear	Hospitalizations: Yes. VA medical records.	Intervention group: Randomized: 150 Enrolled: 150 (100%) Used in analysis (per outcome): 150 (100%) Control group: Randomized: 150 Enrolled: 150 (100%) Used in analysis (per outcome): 150 (100%)	No No Yes	Deaths: Fair Hospitalizations: Fair
Iglesias 2013	Yes "Participants were randomly assigned… using an automatic probabilistic function which assigns one group or another using a probability of 0.5."	Yes "The sequence was concealed until groups were assigned because the application generated the sequence just after the patient gave oral and written consent…"	Yes	Health status: No	Health status: self-report of symptom resolution (yes/no)	Intervention group: Randomized: 753 Enrolled: 753 Used in analysis (per outcome): 710/753 (94%) Control group: Randomized: 708 Enrolled: 708 Used in analysis (per outcome): 641/708 (91%)	No No No	Health status: Good

REVIEW COMMENTS/RESPONSES

REVIEWER	COMMENT	RESPONSE
1. Are the objectives, scope, and methods for this review clearly described?		
1	Yes.	N/A
2	No. 1. The language of the primary question seems somewhat vague: the phrase "comparative quality of care" seems less than precise. A more precise question might be: "Do independent advanced practice nurses and physicians provide equivalent quality of care?" Note that this specific wording implies an equivalence test, rather than either an inferiority or superiority perspective. 2. Additionally, it's not clear to me, given the phrase "independent advanced practice nurses" in the main question why level of supervision would pertain. Are you treating "independence" as a continuous variable, or as a binary one? Some other term may be necessary to suggest that there is a continuum (as there is in fact) in degree of autonomy. 3. Finally, it's not clear to me why the initial questions did not include workload as a factor that might mediate the comparison between APRN and physician care.	1. We changed the phrasing of Key Question 1 to reflect that we did not hypothesize physician or APRN care to be either inferior or superior. 2. We changed Key Question 3 to include the phrase "degree of autonomy." 3. None of the included studies explicitly considered workload as a mediating factor between provider care and patient outcomes. We information in the Supplemental Materials detailing the number of consultations completed in each provider group.
3	Yes. One minor suggestion is to make the Key questions 1, 2 and 3. It's not a problem, but just a bit easier for the reader.	Key Questions were renumbered 1,2, and 3.
4	AHRQ quality indicators were purportedly used to assess quality of studies, but the resulting "grades" don't measure up to what I know of some of the studies; because quality of the study is so crucial and central to everything else, it would be wise to show on a grid how and why each study was graded on the AHRQ measures	We show the details and rationale for the grades on a quality assessment table located in the Supplemental Materials. In preparing this grid, we reconsidered the grades and changed some grades through consensus.
2. Is there any indication of bias in our synthesis of evidence?		
1	No.	N/A
2	Yes. I'm not sure this really constitutes bias, but the lack of any information about the physicians against whom the APRNs providing care were contrasted suggests a lack of concern about the comparator. There is some range in the type of physicians providing care, and in many of the settings described in the report, there would be a need to care for all ages, for example, in contrast to VA care where only adults receive care. I think the report would be somewhat richer if there were some brief discussion about the physician comparators, rather than assuming they all are equally comparable.	Unfortunately, none of the included studies provided information specifically on the physician comparators apart from those outlined in the Supplemental Materials. We directed the reader to the Supplemental Materials in the overview of the results.
3	No. Not that I can identify. Your methods and synthesis appear to be thorough and of high quality.	N/A

4	Not sure if there was a lot of "adjudication" to reach consensus among the 4 authors or not. Perhaps initial individual author perspectives should have been noted	We resolve disputes regarding grading via consensus.
3. Are there any published or unpublished studies that we may have overlooked?		
1	No.	N/A
2	No. I think the report is primarily evidence of how little rigorous work has been done in this field.	N/A
3	For inclusion in your analyses, none that I can identify. I've provided suggestions below for references in your introduction and discussion.	N/A
4	None that I know of	N/A
4. Please write additional suggestions or comments below. If applicable, please indicate the page and line number from the draft report.		
1	1. Page 3, Line 20: what does "type of care being provided" mean? (also seen on p.4, L.2; p.12, L21; p.12,L25). Does it refer to cardiac care, diabetic care, anesthesia care, etc? I couldn't find any citations that explain that, which is a part of Question 1(a).	1. We changed Key Question 1(a) to clarify the meaning of "type of care being provided."
	2. Another important factor would be objective risk profiling of the patients, so comorbidities would be known. Was that done? If not, that is information that would help evaluate results. Were the sicker patients excluded from controlled trials? The RCTs apparently did not have the same potential exclusion/inclusion bias. However, all the studies (except the ones involving CRNAs) were done in outpatient offices or urgent care clinics – a somewhat self-selected sample of lower-complexity medical issues, one would think, given the low incidence of hospitalizations and mortalities.	2. We added detail on the reported comorbidities in the discussion section. While one of the primary care studies was conducted in a VAMC, comorbidities in the urgent care studies were not reported. It is unknown whether these populations are comparable to VA populations in need of urgent care services.
	3. P. 11 ff: I found the whole discussion of opt-in, opt-out states and the results presented in the subsequent paragraphs confusing and hard to follow, although I read it several times trying to understand the differences that were being described. Does that entire discussion help with the policy questions being considered?	3. We revised this discussion to clarify the findings of the study.
	4. P. 14, Line 16: "…in no way suggest that there is a difference" seems too strongly worded and smacks of political correctness. How about using "…did not demonstrate a difference"? I have no trouble with the wording on P. 15, Line 19-22.	4. We changed this sentence to: "…did not demonstrate a difference…"
	5. P.16, L1-3 seems awkwardly worded. How about: "The available evidence is insufficient to draw strong conclusions or support policy changes relating to extension of independent NP practice. Although no differences in four outcome measures (health status, quality of life, mortality, hospitalizations) were detected, current evidence is not sufficient to rule out such differences."	5. We changed this phrase to: "Although no differences in four outcome measures (health status, quality of life, mortality, hospitalizations) were detected, the evidence reviewed here is not sufficient to rule out such differences."

2	1. In Table 1, the Mundinger 2000 study is recorded twice with exactly the same information.	1. Corrected.
	2. I think the issue of degree of supervision (or, conversely, degree of autonomy) is interesting, but the fact that there is really no evidence on the topic isn't sufficiently made clear in the report. I think this needs to be more clearly highlighted. The inconsistency across the US, at least, in scope of practice and autonomy, limits our ability to do rigorous studies in this area. In the supplemental materials, it becomes clear that the definition of "independence" or "supervision" is not entirely clear. Does "works under protocol" mean the same as "all notes must be signed by a supervising physician"? I would suggest not; and a key question is where the protocol comes from, who defines it, and whether it's one that is also, perhaps, used by physicians in the same setting?	2. We clarified the findings of Key Question 3 to highlight the lack of evidence on this topic, including the following statement: "The variation in scope-of-practice regulations throughout the US may hinder the feasibility of such a study." Again, we changed the phrase "level of supervision" to "degree of autonomy" as suggested above.
3	1. I would recommend in your background adding in the IOM report on nursing and their suggestion to have nurses of all levels practice to the full extent of their training.	1. We added a sentence to the introduction: "The National Governors Association and the Institute of Medicine have criticized variation in scope-of-practice regulations among the states, and both argue that nurses should be able to practice to the "full extent of their education and training" in order to adapt to the changing health care system after the implementation of the Affordable Care Act…"
	2. In your introduction you also include the nurse midwife, however this seems to disappear. Were there no studies on midwives vs. physicians? It would be good to introduce this back in the discussion.	2. We did not include studies comparing Nurse Midwife and physician care since the VA does not employ NMs. This was clarified in the scope.
	3. To help give context it would be useful to include a couple sentences on the changes in federal health policy, such as the Affordable Care Act, that are providing more access to medical care for people.	3. We added a sentence: "The Institute of Medicine has criticized scope-of-practice regulations, arguing that nurses should be able to practice to the full extent of their education and training in order to adapt to the changing health care system after the implementation of the Affordable Care Act."
	4. I feel it is important to discuss the difference between the NP and CNS scope of practice. You lump them together, but they aren't quite the same. Many CNS do not have prescriptive rights, though some do. That may make a significant difference in being able to make a comparison with the decision making and authority of a physician. The NP performs much more like a physician than a CNS.	4. We grouped outcomes by setting, rather than by APRN title. We added the following language to the inclusion criteria: "A nurse or nurses practicing primary care, urgent care, or anesthesia with a high degree of autonomy. We included advanced practice nurses (including nurse practitioners (NP), clinical nurse specialists (CNS), specially-trained nurses, and certified registered nurse anesthetists (CRNA))." We include a discussion of degree of autonomy in KQ 3.
	5. The discussion sets the reader up to focus on primary care settings and the comparison between the NP and physician. You briefly talk about primary care and its importance, but nothing on the acute care setting where many NPs also work. This makes the following section on CRNAs and anesthesiologists not fit.	5. We clarified this in the discussion section. We removed the first sentence in the second discussion paragraph referring to primary care as the paragraph refers to the body of evidence in primary and urgent care.
	6. In the discussion paragraph on the difference between anesthesiologists and CRNAs, you say that your findings are similar to those of Newhouse et al. and that there is sparse data to make conclusions. However, you need to guide the reader here. A sentence is needed saying what studies do suggest. For example, the study by Dulisse, 2010 (your reference 28) suggests no additional harm to patients.	6. We added two sentences in the discussion: "We identified three observational studies, the largest and most recent of which suggest that there is not an increased risk of mortality due to CRNA care. However, these studies have a number of limitations, as described above."
	7. You briefly discuss team models of care. Some mention of the PACT model is warranted in both the introduction and discussion.	7. We added the example of the VA PACTs in the discussion.

4	1. I don't believe the review group is sufficiently aware of the scope of Mundinger (2000); clearly it was a large study of undifferentiated patients, and the NP's were explicitly using the same scope of practice as the MD's with whom they were compared. It is the only RCT to date that has the scope and comparability and size of population to be influential.	1. We added a paragraph to page 10 that better describes the strengths of this study.
	2. Why do you say Mundinger (2000) was six months in duration in one box of statistics, and one year in another? One of the Lenz pubs is over more than one year…	2. In this study, health status follow-up was 6 months while hospitalizations follow-up was 1 year. We rated the Lenz papers low quality and did not consider the results in our synthesis.
	3. Mortality in a short term study, especially in primary care, is not a valid measure of primary care effectiveness. Health status is an important measure of assuring comparable populations in NP and MD practice, but it is not a valid measure of outcomes; health status takes a long time to change, and is related to education, financial resources, culture and a lot more. Looking at compliance, or other indicators (change in blood glucose for diabetics) that are related to the medical care are far better. Leaving out resource use and process of care and intermediate outcomes take away from a valid comparison of NP's and MD's. These are the most important indicators of short term effectiveness.	3. We agree that mortality is not an ideal outcome in primary care and short term studies. We include a statement in the discussion that other outcomes, such as resource use, processes of care, and intermediate outcomes, are important considerations to healthcare providers and policy makers and were not included in this brief.
	4. Why in your intro do you state on p.1 line 29 that the public is wary of NP's practicing beyond their training?	4. We don't say that the public is wary, but do cite a study of VA provider attitudes about the role of APNs.