

DISCUSSION PAPER:

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Half a century of research definitively demonstrates that nurse practitioners (NPs) provide high-quality primary, acute and specialty health care services across the life span and in diverse settings, including NP-owned practices. NPs have graduate-level education, with master's or doctoral degrees, and possess the knowledge and clinical competency to provide health care beyond their initial registered nurse preparation. As clinicians that blend clinical expertise in diagnosing and treating acute and chronic health conditions with an added emphasis on disease prevention, health management and patient education, NPs bring a comprehensive perspective to health care.

Since the NP role was established in 1965, research has consistently demonstrated the excellent outcomes and high quality of care provided by NPs. The body of literature supports the position that NPs provide care that is safe, effective, patient centered, efficient, equitable and evidenced based. Furthermore, NP care is comparable in quality to that of their physician colleagues, demonstrated by numerous studies that conclude no statistically significant difference across outcome measures. Research has found that patients under the care of NPs have fewer unnecessary hospital readmissions, fewer potentially preventable hospitalizations, higher patient satisfaction and fewer unnecessary emergency room visits than patients under the care of physicians. This paper summarizes several empirical, peer-reviewed articles supporting the quality of NP practice and is presented in two sections: 1) original research and 2) systematic reviews and meta-analyses. These references are listed as an annotated bibliography.

Section 1. Original Research

Borgmeyer, A., Gyr, P.M., Jamerson, P.A., & Henry, L.D. (2008). Evaluation of the role of the pediatric nurse practitioner in an inpatient asthma program. *Journal of Pediatric Health Care*, 22(5), 273-281.

Borgmeyer, et al., evaluated the perception of pediatric nurse practitioners (PNPs) as a direct patient care manager and the pediatric patient outcomes (e.g., length of stay [LOS], costs, readmission rates) between Asthma Intervention Model (AIM) PNP-managed patients, intern-managed patients and peer children's hospitals. Physicians, nurses, pediatric interns and families were surveyed about their experiences between July 1, 2003, and July 30, 2004. The authors conclude that PNPs were effective educators and managed patients appropriately. A comparison of AIM PNP-managed patients and intern-managed patients showed no significant difference in LOS or costs. None of the patients experienced readmission in either group.

Buerhaus, P., Perloff, J., Clarke, S., O'Reilly-Jacob, M., Zolotusky, G., & DesRoches, C. M. (2018). Quality of primary care provided to Medicare beneficiaries by nurse practitioners and physicians. *Medical Care*, 56(6), 484-490.

Quality of care administered by primary care nurse practitioners (PCNPs), primary care physicians (PCMDs) or both types of clinicians was examined using 2012 and 2013 Medicare part A and part B claims. A retrospective cohort design using standard risk-adjustment methodologies and propensity score weighting assessed 16 claims-based quality measures, which were grouped into several primary care domains: chronic disease management, preventable hospitalizations, adverse outcomes and cancer screening. Buerhaus, et al., found that PCNP beneficiaries had lower rates of hospital admissions, readmissions and inappropriate ED use, as well as low-value imaging, compared to PCMDs or jointly attributed clinicians.

DesRoches, C. M., Clarke, S., Perloff, J., O'Reilly-Jacob, M., & Buerhaus, P. (2017). The quality of primary care provided by nurse practitioners to vulnerable Medicare beneficiaries. *Nursing Outlook*, 65(6), 679-688.

To compare quality indicators of Medicare beneficiaries managed by PCNPs and PCMDs, DesRoches, et al., used a retrospective cohort design that examined 2012 and 2013 Medicare claims for three subpopulations amongst beneficiaries: qualifying due to disability, dually eligible for both Medicare and Medicaid and disabled and eligible for both programs. Overall, the authors found that beneficiaries managed by PCNPs had a lower risk of preventable hospitalizations, use of emergency room services and other health care resources.

DISCUSSION PAPER:

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Everett, C.M., Morgan, P., Smith, V.A., Woolson, S., Edelman, D., Hendrix C.C., Berkowitz, T., White, B., & Jackson, G.L. (2019). Primary Care provider type: Are there differences in patients' intermediate diabetes outcomes? *Journal of the American Academy of Physician Assistants*, 32(6), 36-42.

Using electronic health record data from the Veterans Health Administration (VHA), Everett, et al., examined differences in diabetes outcomes among 609,668 patients being treated at primary care clinics by physicians, physician assistants (PAs) and NPs serving in both primary care provider (PCP) and supplemental provider roles. Outcomes were examined for patients that experienced care provided by medical doctor (MD) PCPs, PA PCPs, NP PCPs or combinations of PCPs with supplemental providers. Everett, et al., found no clinically significant differences in intermediate diabetes outcomes (e.g., A1C, Systolic BP, LDL-C) between provider groups regardless of their role as usual PCP or supplemental providers.

Everett, C., Thorpe, C., Palta, M., Carayon, P., Bartels, C., & Smith, M.A. (2013). Physician assistants and nurse practitioners perform effective roles on teams caring for Medicare patients with diabetes. *Health Affairs (Project Hope)*, 32(11).

To improve the delivery of care, patient-centered medical homes often rely on a team of clinicians with common goals and defined roles. Everett, et al. (2013), examined Medicare data from a large physician group to compare the outcomes of two groups of adult Medicare patients with diabetes at various levels of complexity who received primary care from PA and NP teams and physician-only teams. Everett, et al., found that most PA and NP outcome measurements were comparable or better than physician-only care.

Gracias, V. H., Sicoutris, C. P., Stawicki, S.P., Meredith, D. M., Horan, A. D., Gupta, R., Schwab, C.W. (2008). Critical care nurse practitioners improve compliance with clinical practice guidelines in "semiclosed" surgical intensive care unit. *Journal of Nursing Care Quality*, 23(4), 338-344.

This study addresses if the integration of acute care nurse practitioners (ACNPs) in a "semiclosed" critical care delivery system would increase clinical practice guidelines (CPGs) compliance. It was conducted in two phases, in which 1,380 admissions took place at the surgical intensive care unit (SICU) at the Hospital of the University of Pennsylvania: 1) patients were admitted to the "mandatory consultation"/non-ACNP team (standard care) or to the "semiclosed"/ACNP team (new model) (January-May 2003), and 2) surgical critical care service (SCCS) teams crossed over to "semiclosed"/ACNP model (June-December 2003). Critical care patients were prospectively assigned to a NP or non-NP team. Findings indicate that clinical practice guideline adherence was significantly higher among patients belonging to the NP team.

Jackson, G.L., Smith, V.A., Edelman, D., Woolson, S.L., Hendrix, C.C., Everett, C.M., Berkowitz, T.S., White, B.S., & Morgan, P.A. (2018). Intermediate diabetes outcomes in patients managed by physicians, nurse practitioners, or physician assistants: A cohort study. *Annals of Internal Medicine*, 169(12), 825-835.

Jackson, et al. (2018), wanted to examine if any differences existed in intermediate diabetes patient outcomes between physicians, NPs or PAs within a primary care setting. The authors conducted a cohort study using administrative data from the U.S. Department of Veterans Affairs (VA) electronic health record. The sample included 368,481 patients from 568 VA primary care facilities. Jackson, et al., did not find any significant differences in diabetes outcomes across provider groups, providing further evidence that NPs, PAs and MDs provide comparable care.

Kippenbrock, T., Emory, J., Lee, P., Odell, E., Buron, B., & Morrison, B. (2019). A national survey of nurse practitioners' patient satisfaction outcomes. *Nursing Outlook*, 67(6), 707-712.

To expand upon previous studies conducted that examine patient satisfaction among NPs and MDs, the authors analyzed responses from the Consumer Assessment of Healthcare Providers and Systems survey (n=53,885), which included several provider types: NP, MD, doctor of osteopathy (DO) and PA. Kippenbrock, et al., found that patient satisfaction was higher for NPs than other provider types.

Kuo, Y. F., Goodwin, J. S., Chen, N. W., Lwin, K. K., Baillargeon, J., & Raji, M. A. (2015). Diabetes mellitus care provided by nurse practitioners vs primary care physicians. *Journal of the American Geriatrics Society*, 63(10), 1980-1988.

Using data from a national sample of 64,354 Medicare beneficiaries, a retrospective cohort study was used to compare process and cost of care for patients with diabetes mellitus in 2009 who had received primary care from an NP or primary care physician. The authors conclude that low-density lipoprotein cholesterol testing and nephropathy monitoring rates were similar between both providers. Between the two provider types, there was no statistically significant difference in adjusted Medicare spending.

DISCUSSION PAPER:

QUALITY OF NURSE PRACTITIONER PRACTICE

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Kuo, Y., Chen, N., Baillargeon, J., Raji, M. A., & Goodwin, J. S. (2015). Potentially preventable hospitalizations in Medicare patients with diabetes: A comparison of primary care provided by nurse practitioners versus physicians. *Medical Care*, 53(9), 776-783.

The rate of potentially preventable hospitalizations of Medicare beneficiaries with a diagnosis of diabetes were compared between patients of NPs and physicians. Patients with a diagnosis of diabetes between 2007 and 2010 (n=345,819), who received all primary care from an NP only or a physician only, were selected from a sample of Medicare beneficiaries. The NP cohort and physician cohort was selected from national Medicare data using diabetes indicator data from the CMS Chronic Disease Data Warehouse, while additional data was captured by administrative claims. Several statistical methods demonstrated that receipt of care from NPs decreased the risk of potentially preventable hospitalizations. These findings suggest that NPs are exceptionally effective at treating diabetic patients.

Kurtzman, E.T. & Barnow, V.S. (2017). A comparison of nurse practitioners, physician assistants, and primary care physicians' patterns of practice and quality of care in health centers. *Medical Care*, 55(6), 615-622.

The authors compared the quality of care and practice patterns of NPs, PAs and primary care physicians within community health centers (CHCs) using data from the National Ambulatory Medical Care Survey (2006-2011). Analyses were composed of 23,704 patient visits to 1,139 practitioners within CHCs, examining nine patient-level outcomes such as smoking cessation, depression treatment, statin for hyperlipidemia and imaging services. Findings suggest that NPs were more likely to provide recommended smoking cessation counseling and more health education compared to MDs; however, no significant differences were found in any other outcome measure examined across provider groups.

Landsperger, J. S., Semler, M. W., Wang, L., Byrne, D. W., & Wheeler, A. P. (2016). Outcomes of nurse practitioner-developed critical care: A prospective cohort study. *Chest*, 149(5), 1146-1154.

A prospective cohort study of adult medical intensive care unit (ICU) admissions at an academic tertiary-care center was conducted between 2011 and 2013. Landsperger, et al., compared 90-day survival between care administered to patients by ACNPs and resident teams using Cox proportional hazards regression. Among the 9,066 admissions the study addresses that patients cared for by ACNPs had lower ICU mortality rates and shorter lengths of hospital stay. Hospital mortality and ICU length of stay was similar between the two providers.

Lenz, E.R., Mundinger, M.O., Kane, R.L., Hopkins, S.C., & Lin, S.X. (2004). Primary care outcomes in patients treated by nurse practitioners or physicians: Two-year follow-up. *Medical Care Research and Review* 61(3), 332-351.

The purpose of this study was to collect follow-up data from a randomized trial described in Mundinger, et al. (2000), that compared outcomes of patients seen by an NP versus a physician. Eligible participants were interviewed by mail, phone calls or home visits. Data was also collected from medical center billing records for the 2-year period after the initial visit. No significant differences were found in self-reported health status; satisfaction; disease-specific physiologic measures; or use of specialist, emergency room or hospital care between the two groups. However, physicians' patients had a higher average primary care utilization than NPs' patients.

Liu, C. F., Hebert, P. L., Douglas, J. H., Neely, E. L., Sulc, C. A., Reddy, A., & Wong, E. S. (2020). Outcomes of primary care delivery by nurse practitioners: Utilization, cost, and quality of care. *Health Services Research*, 55(2), 178-189.

The authors examined differences in utilization, costs and clinical outcomes between NP-assigned patients and MD-assigned patients. VA administrative data containing the characteristics, outcomes and provider assignments of 806,434 patients from 530 VA facilities assigned to an MD PCP who left their position within the VA in 2010 and 2012 was used. To compare patients reassigned to MD and NP PCPs, a difference-in-difference approach was selected. Liu, et al., found that patients assigned to NPs were less likely to utilize primary care, specialty care and inpatient services; had no difference in costs; and experienced similar chronic disease management compared to MD-assigned patients.

DISCUSSION PAPER:

QUALITY OF NURSE PRACTITIONER PRACTICE

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Lutfiyya, M.L., Tomai, L., Frogner, B., Cerra, F., Zismer, D., & Parente, S. (2017). Does primary care diabetes management provided to Medicare patients differ between primary care physicians and nurse practitioners? *Journal of Advanced Nursing*, 73(1), 240–252.

Lutfiyya, et al. (2017), wanted to examine if Medicare patients who received primary care type two diabetes management differed in scope and outcomes by provider type: NP or physician. A cross-sectional quantitative analysis of 2012 U.S. Medicare National Claims History, also known as the five percent Standard Analytic File (SAF), was conducted. For patient comparison, a medical productivity index (MPI) was used to stratify Medicare DM2 patients, which was defined by least healthy and most healthy. Lower cost and better quality of care was attributed to chronic care patient management by NPs.

Mafi, J. N., Wee, C. C., Davis, R. B., & Landon, B. E. (2016). Comparing use of low-value health care services among U.S. advanced practice clinicians and physicians. *Annals of internal medicine*, 165(4), 237-244.

The authors used National Ambulatory Medical Care Survey (NAMCS) data and National Hospital Ambulatory Medical Care Survey (NHAMCS) data from 1997 to 2011 to compare the use of low-value services (e.g., upper respiratory infections, back pain and headache) commonly seen within the primary care setting between advanced practice providers (APPs [NPs and PAs]) and physicians. The authors found that both clinician groups provided equivalent low-value services.

Melillo, K.D., Remington, R., Lee, A.J., Abdallah, L., Van Etten, D., Gautam, R. & Gore, R. (2015). Comparison of nurse practitioner and physician practice models in nursing facilities. *Annals of Long-Term Care*, 23(12), 19-24.

Melillo, et al., investigated the differences in NP and physician practice models in long-term care (LTC) nursing facilities. The data for this study was taken from the Medicare Current Beneficiary Survey for the years 2006–2010, and the comparison cohorts consisted of patients who received all primary care (PC) from an MD or patients who received PC from an NP during the year reported. The reported health status of patients did not differ between comparison groups; however, the cohort with NP involvement had higher completion rates of advance directives than the MD-only cohort. The authors suggest that, "By having a higher completion rate of do not resuscitate [DNR] orders, the inclusion of NPs in LTC nursing facility care teams potentially increases resident quality of life and reduces the cost of care by minimizing the use of costly, unwanted treatments." Overall, NPs provided comparable care to that of MDs in LTC facilities.

Muench, U., Guo, C., Thomas, C., & Perloff, J. (2019). Medication adherence, costs, and ER visits of nurse practitioner and primary care physician patients: evidence from three cohorts of Medicare beneficiaries. *Health Services Research*, 54(1), 187-197.

Muench, et al., used weighted propensity score matching combined with logistic regression to examine differences in good medication adherence, office-based and specialty care costs and ER visits between patients seen by NPs and primary care physicians using Medicare Part A, B and D claims between 2009 and 2013. The three drug class cohorts for analysis consisted of anti-diabetics, renin-angiotensin system antagonists (RASA) and statins. Muench, Guo and Perloff found no differences in good medication adherence for anti-diabetics or RASA amongst NP and primary care physician provider type. Across all three medications, beneficiaries seeing NPs experienced lower office-based and specialty care costs and ER visits.

Mundinger, M.O., Kane, R.L., Lenz, E.R., Totten, A.M., Tsai, W.Y., Cleary, P.D., Friedewald W.T., Siu A.L., & Shelanski, M.L. (2000). Primary care outcomes in patients treated by nurse practitioners or physicians: A randomized trial. *Journal of the American Medical Association*, 283(1), 59-68.

The purpose of the study was to compare outcomes of primary care delivered by NPs and physicians for patients receiving follow-up care after visiting the emergency department or urgent care. Adults were recruited from an urgent care and two emergency departments that were part of the Columbia Presbyterian Medical Center system. Patients were randomly assigned to either an NP or physician clinic for care between August 1995 to October 1997. Data was collected from telephone and in-person interviews and health services utilization data. Patient satisfaction, health status, physiological tests and health service utilization had no significant differences between the two provider groups at six months. NPs' patients with hypertension had statistically significant lower diastolic values. Overall, when NPs were in the same setting and held similar authority as physicians, patient outcomes for NPs and physicians were found to be comparable.

DISCUSSION PAPER:

QUALITY OF NURSE PRACTITIONER PRACTICE

Ohman-Strickland, P.A., Orzano, A.J., Hudson, S.V., Solberg, L.I., DiCiccio-Bloom, B., O'Malley, D., et al. (2008). Quality of diabetes care in family medicine practices: Influence of nurse-practitioners and physician's assistants. *Annals of Family Medicine, 6(1), 14-22. doi:10.1370/afm.758*

The purpose of the study was to evaluate if the quality of diabetes care differs between physician-only practices and practices with APPs (NPs or PAs) and to identify any contributing characteristics related to differences in care. The authors conducted a cross-sectional analysis of baseline data of adult patients treated for type 1 or type 2 diabetes in the past year from 46 practices, measuring adherence to American Diabetes Association clinical guidelines. The study addresses that family medicine practices with NPs performed better than physician-only practices and significantly better than practices with PAs regarding quality measures of diabetic care (e.g., monitoring hemoglobin A1C, lipid and microalbumin levels). Practices with NPs were also more likely to have patients attain lipid targets than practices with PAs.

Rantz, M. J., Popejoy, L., Vogelsmeier, A., Galambos, C., Alexander, G., Flesner, M., & Petroski, G. (2018). Impact of advanced practice registered nurses on quality measures: The Missouri quality initiative experience. *Journal of the American Medical Directors Association, 19(6), 541-550.*

To examine the impact of advanced practice registered nurses (APRNs) on quality measure (QM) scores within the Missouri Quality Initiative (MOQI) intervention, Rantz, et al., conducted a two-group comparison analysis, in which a matched group was selected from facilities within the same county as the intervention nursing homes that were similar in QM scores, size and ownership between September 2013 and September 2016. Rantz, et al., found that QM scores for the APRN intervention group were better than the comparison group.

Ritsema, T. S., Bingenheimer, J. B., Scholting, P., & Cawley, J. F. (2014). Differences in the delivery of health education to patients with chronic disease by provider type, 2005-2009. *Preventing Chronic Disease, (11)33.*

This original Centers for Disease Control and Prevention (CDC) research evaluated the rate of health education provided by NPs/certified midwives, PAs and physicians to patients with chronic diseases. A secondary analysis was conducted using a sample of 136,432 adult patient visits (2005-2009) with chronic conditions (asthma, chronic obstructive pulmonary disease [COPD], depression, diabetes, hyperlipidemia, hypertension, ischemic heart disease and obesity) drawn from the National Hospital Ambulatory Medical Care Survey (NHAMCS). The authors found that health education delivery to patients with chronic conditions was higher among NPs and PAs than physicians.

Roblin, D.W., Becker, R., Adams, E.K., Howard, D. H., & Roberts, M.H. (2004). Patient satisfaction with primary care: Does type of practitioner matter? *Medical Care, 42(6), 606-623.*

This study evaluates the relationship between patient satisfaction and practitioner type during primary care visits at a managed-care organization. A retrospective observational study of 41,209 patient satisfaction surveys randomly sampled between 1997 and 2000 for visits by pediatric and medicine departments identified higher satisfaction with NP and/or PA interactions than those with physicians, for the overall sample and by specific conditions.

Sackett, D.L., Spitzer, W. O., Gent, M., & Roberts, M. (1974). The Burlington randomized trial of the nurse practitioner: Health outcomes of patients. *Annals of Internal Medicine, 80(2), 137-142.*

A sample of 1,598 families were randomly allocated, so that two-thirds continued to receive primary care from a family physician and one-third received care from an NP. Four outcome measurements (i.e., mortality rates and physical, emotional and social function) were applied to patients in the trial to observe clinical effectiveness and safety. Results demonstrated comparable outcomes. Mortality rates had no significant differences between the two study groups. The measurements of physical, emotional and social function in both groups had similar levels after one year of care.

Spitzer, W.O., Sackett, D.L., Sibley, J.C., Roberts, M., Gent, M., Kergin, D.J., Hackett, B.D., & Olynich, A. (1974). The Burlington randomized trial of the nurse practitioner. *New England Journal of Medicine, 290(3), 252-256.*

From July 1971 to July 1972, a randomized controlled trial was conducted in two family practices in Burlington to compare the effects of utilizing NPs or physicians to provide primary care services. The purpose of this paper was to detail the study design, logistics, data and summary of results, also described in Sackett, et al. The chosen unit for randomization was families; 1,598 families were eligible for the trial, and two-thirds were assigned to standard care with a family physician and the other third to care with NPs. A household survey was conducted before and after the experimental period to collect health status and medical services utilization. During this one-year period, management of preselected indicator conditions and drug prescriptions were assessed for quality of care.

DISCUSSION PAPER:

QUALITY OF NURSE PRACTITIONER PRACTICE

Tapper, E. B., Hao, S., Lin, M., Mafi, J. N., McCurdy, H., Parikh, N. D., & Lok, A. S. (2020). The quality and outcomes of care provided to patients with cirrhosis by advanced practice providers. *Hepatology*, 71(1), 225-234.

Tapper, et al., examined the effect of care quality and outcomes for adult cirrhosis patients managed by APPs (NPs or PAs). A retrospective analysis was conducted using Optum, an American commercial claims database, which yielded 389,257 unique patients. APP patients had higher rates of hepatocellular carcinoma (HCC) screening and varices screening, increased use of rifaximin after discharge for hepatic encephalopathy, lower risk of readmission within 30 days and lower risk of death. When working with gastroenterologists/hepatologists, APPs were associated with improved quality of care and patient outcomes.

Virani, S. S., Akeroyd, J. M., Ramsey, D. J., Chan, W. J., Frazier, L., Nasir, K., & Petersen, L. A. (2016). Comparative effectiveness of outpatient cardiovascular disease and diabetes care delivery between advanced practice providers and physician providers in primary care: Implications for care under the Affordable Care Act. *American Heart Journal*, 181, 74-82.

Virani, et al., compared the quality of care delivered by APPs (NPs or PAs) and physicians to patients with diabetes and cardiovascular disease (CVD) within a primary care setting. Clinical and administrative data was used to identify diabetes or CVD patients from all 130 VA facilities who sought care during the 2014 fiscal year (October 2013–September 2014). Quality of care for diabetes and CVD patients delivered in a primary care setting was comparable between APPs and physicians, noting no significant differences.

Virani, S. S., Maddox, T. M., Chan, P. S., Tang, F., Akeroyd, J. M., Risch, S. A., & Petersen, L. A. (2015). Provider Type and Quality of Outpatient Cardiovascular Disease Care: Insights from the NCDR PINNACLE Registry. *Journal of the American College of Cardiology*, 66(16), 1803-1812.

The purpose of the study was to determine if there were any clinical differences in quality of care given by APPs (NPs or PAs) versus physicians. Performance measures compared for care included: quality of coronary artery disease (CAD), heart failure (HF) and atrial fibrillation (AF) care. Patients enrolled in the registry who had an outpatient cardiology visit in 2012 were included in the study and two analyses were conducted: 1) comparing patients receiving care from APPs to patients receiving care from physicians in a practice with physicians and APPs, and 2) comparing patients receiving care in practices with physicians and APPs to patients receiving care from physician-only practices. Patient data was extracted from the American College of Cardiology's PINNACLE (Practice Innovation and Clinical Excellence) registry and National Provider Identifier (NPI) numbers were used to determine if the treating practitioner was a physician or APP. Quality measures were comparable among both groups, and smoking cessation screening intervention was higher among the APP group for CAD patients.

Wright, W.L., Romboli, J.E., DiTulio, M.A., Wogen, J., & Belletti, D.A. (2011). Hypertension treatment and control within an independent nurse practitioner setting. *American Journal of Managed Care*, 17(1), 58-65.

To compare the proportion of hypertensive patients with controlled blood pressure (BP) being treated by NPs to the proportion of comparable patients with controlled BP being treated by primary care physicians, Wright, et al., conducted a cross-sectional retrospective medical record review at 21 physician-based practices across the U.S. and three independent NP-based practices in northeastern U.S. between December 2007 and November 2009. Wright, et al., found comparable controlled blood pressure rates across provider groups.

Yang, Y., Long, Q., Jackson, S. L., Rhee, M. K., Tomolo, A., Olson, D., & Phillips, L. S. (2018). Nurse practitioners, physician assistants, and physicians are comparable in managing the first five years of diabetes. *The American Journal of Medicine*, 131(3), 276-283.

Yang, et al., examined hemoglobin A1c levels over the course of natural diabetes in patients cared for by NPs, PAs and physicians at the VHA, all of which who practice under a similar scope of practice within this integrated health care system. A retrospective cohort study was comprised of veterans who had been newly diagnosed with diabetes in 2008, experienced the continuation of primary care between 2008 and 2012 and had 75% or greater percentage of primary care visits with one of the three provider types. The authors conclude that patient care administered by NPs and PAs was comparable to physicians at diagnosis and during the four-year follow-up period.

DISCUSSION PAPER:

QUALITY OF NURSE PRACTITIONER PRACTICE

Section II. Systematic Reviews and Meta-Analyses

Bakerjian, D. (2008). Care of nursing home residents by advanced practice nurses: A review of the literature. *Research in Gerontological Nursing*, 1(3), 177-185. doi: 10.3928/00220124-20091301-01.

Bakerjian conducted an extensive review of the literature, particularly of NP-led care, and found that long-term care patients managed by NPs were less likely to have avoidable geriatric complications such as falls, urinary tract infections (UTIs), pressure ulcers, etc. They also had improved functional status, as well as better managed chronic conditions.

Brown, S.A. & Grimes, D.E. (1995). A meta-analysis of nurse practitioners and nurse midwives in primary care. *Nursing Research*, 44(6), 332-9.

A meta-analysis of 38 studies, comparing a total of 33 patient outcomes of NPs with those of physicians, demonstrated that NP outcomes were equivalent to or greater than those of physicians. NP patients had higher levels of compliance with recommendations in studies where provider assignments were randomized and when other means to control patient risks were used. Patient satisfaction and the resolution of pathological conditions were greatest for NPs. NP and physician outcomes were equivalent on all other outcomes.

Carter, A., Chochinov, A. (2007). A systematic review of the impact of nurse practitioners on cost, quality of care, satisfaction and wait times in the emergency department. *Canadian Journal of Emergency Medicine*, 9(4), 286-95.

This systematic review of 36 articles examines if the hiring of NPs in emergency rooms can reduce wait time, improve patient satisfaction and result in the delivery of cost-effective, quality care. Results showed that hiring NPs can result in reduced wait times, leading to higher patient satisfaction. NPs were found to be equally as competent as physicians at interpreting x-rays and more competent at following up with patients by phone, conducting physical examinations and issuing appropriate referrals.

Congressional Budget Office. (1979). Physician extenders: Their current and future role in medical care delivery. Washington, D.C.: US Government Printing Office.

As early as 1979, the Congressional Budget Office reviewed findings of the numerous studies of NP performance in a variety of settings and concluded that NPs performed as well as physicians with respect to patient outcomes, proper diagnosis, the management of specified medical conditions and the frequency of patient satisfaction.

Kleinpell, R. M., Grabenkort, W. R., Kapu, A. N., Constantine, R., & Sicoutris, C. (2019). Nurse practitioners and physician assistants in acute and critical care: a concise review of the literature and data 2008–2018. *Critical care medicine*, 47(10), 1442.

Kleinpell, et al., conducted a concise review of the literature published on NP and PA utilization and outcomes in intensive care units and acute care settings over the 10-year period between 2008 and 2018. More than 50 individual studies and reviews were identified including those that examined care outcomes such as LOS, mortality and decreased admission rates. The authors conclude, "Overall, the studies demonstrate impact of the APP role through improved patient flow and clinical outcomes including reducing complications and improved patient care management with reduced time on mechanical ventilation, increased use of clinical practice guidelines, improved laboratory test use and increased palliative care consultations, among other areas of impact."

Laurant, M., Reeves, D., Hermens, R., Braspenning, J., Grol, R., & Sibbald, B. (2006). Substitution of doctors by nurses in primary care. *Cochrane Database of Systematic Reviews*. Issue 1. CD001271.

This meta-analysis included 25 articles, relating to 16 studies, comparing outcomes of primary care nurses (nurses, NPs, clinical nurse specialists or other APRNs) and physicians. The quality of care provided by nurses was as high as that of the physicians. Overall, health outcomes and outcomes such as resource utilization and cost were equivalent for nurses and physicians. The satisfaction level was higher for nurses. Studies included a range of care delivery models, with nurses providing first contact, ongoing care and urgent care for many of the patient cohorts.

DISCUSSION PAPER:

QUALITY OF NURSE PRACTITIONER PRACTICE

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Naylor, M.D. and Kurtzman, E.T. (2010). The Role of Nurse Practitioners in Reinventing Primary Care. *Health Affairs*, (5), 893-99.

This meta-analysis of studies comparing the quality of primary care services of physicians and NPs demonstrates the role NPs play in reinventing how primary care is delivered. The authors found that comparable outcomes are obtained by both providers, with NPs performing better in terms of time spent consulting with the patient, patient follow ups and patient satisfaction.

Newhouse, R.P., Stanik-Hutt, J., White, K.M., Johantgen, M., Bass, E.B., Zangaro, G., Wilson, R.F., Fountain, L., Steinwachs, D.M., Heindel, L., & Weiner, J.P. (2011). Advanced practice nurse outcomes 1999-2008: A systematic review. *Nursing Economics*, 29(5), 1-22.

The outcomes of NP care were examined through a systematic review of 37 published studies, most of which compared NP outcomes with those of physicians. Outcomes included measures such as patient satisfaction; patient perceived health status; functional status; hospitalizations; emergency department visits; and biomarkers such as blood glucose, serum lipids and blood pressure. Newhouse, et al., conclude that NP patient outcomes are comparable to those of physicians.

Office of Technology Assessment. (1986). Nurse practitioners, physician assistants, and certified nurse midwives: A policy analysis. Washington D.C.: US Government Printing Office.

The Office of Technology Assessment reviewed studies comparing NP and physician practice, concluding that, "NPs appear to have better communication, counseling and interviewing skills than physicians have," and that malpractice premiums and rates supported patient satisfaction with NP care, pointing out that successful malpractice rates against NPs remained extremely rare.

Prescott, P.A. & Driscoll, L. (1980). Evaluating nurse practitioner performance. *Nurse Practitioner*, 5(4), 28-32.

The authors reviewed 26 studies comparing NP and physician care, concluding that NPs scored higher in many areas. These included: amount/depth of discussion regarding child health care, preventative health and wellness; amount of advice, therapeutic listening and support offered to patients; completeness of history and follow up on history findings; completeness of physical examination and interviewing skills; and patient knowledge of the management plan given to them by the provider.

Safriet, B. J. (1992). Health care dollars and regulatory sense: The role of advanced practice nursing. *Yale Journal on Regulation*, 9(2).

The full Summer 1992 issue of this journal was devoted to the topic of advanced practice nursing (APN), including documenting the cost-effective and high-quality care provided, and to call for eliminating regulatory restrictions on their care. Safriet summarized the U.S. Office of Technology Administration study concluding that NP care was equivalent to that of physicians and pointed out that 12 of the 14 studies reviewed in this report, which showed differences in quality, reported higher quality for NP care. Reviewing a range of data on NP productivity, patient satisfaction and prescribing, Safriet concludes, "APNs are proven providers, and removing the many barriers to their practice will only increase their ability to respond to the pressing need for basic health care in our country."

Stanik-Hutt, J., Newhouse, R., (2013). The quality and effectiveness of care provided by Nurse Practitioners. *The Journal for Nurse Practitioners*, 9(8). doi:10.1016/j.nurpra.2013.07.004

Evidence regarding the impact of NPs compared to MDs on health care quality, safety and effectiveness was systematically reviewed. Data from 37 of 27,993 articles published from 1990-2009 were summarized into 11 aggregated outcomes. Outcomes for NPs compared to MDs are comparable or better for all 11 outcomes reviewed. A high level of evidence indicated better serum lipid levels in patients cared for by NPs in primary care settings. A high level of evidence also indicated that patient outcomes on satisfaction with care, health status, functional status, number of emergency department visits and hospitalizations, blood glucose, blood pressure and mortality are similar for NPs and MDs.