**Supplemental Digital Content 1: Annotated Bibliography**

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| Bakerjian, D., & Harrington, C. (2012). Factors associated with the use of advanced practice nurses/physician assistants in a fee-for-service nursing home practice: a comparison with primary care physicians. *Research in Gerontological Nursing*, 5(3), 163-173. doi:10.3928/19404921-20120605-01. Correlational study involving secondary analysis of Medicare claim data examining factors associated with the use of APRNs and PAs in nursing homes. Concluded that greater autonomy and third party reimbursement capability increased the likelihood that a patient in the nursing home would be seen by an APRN or PA. Limiting assumptions related to scope-of-practice may affect data interpretation. Level III, grade C. |
| Barnes, H., Maier, C., Sarik, D., Germack, H., Aiken, L., & McHugh, M. (2016). Effects of Regulation and Payment Policies on Nurse Practitioners' Clinical Practices. *Medical Care Research and Review*, 1-21. doi: 10.1177/1077558716649109. Cross-sectional study using 2012 SK&A marketing research data files of physician and NPs in ambulatory care practices. Sample consisted of 252,657 ambulatory practices with NPs employed at 14.8% of practices. 6% of practices were in fully enabled states with full scope-of-practice (SOP) and 100% Medicaid reimbursement for NPs. 35% of practices were in states without either full SOP or 100% NP reimbursement. 58.3% of practices were in states with either full SOP or full Medicaid reimbursement. In fully enabled states 19.4% of practices hired NPs. In full SOP states 18.4% of practices hired NPs, and in states with 100% Medicaid reimbursement 13.9 % of practices hired NPs. 15.1% of practices in states with neither full SOP or 100% Medicaid reimbursement hired NPs. In fully enabled states there were a higher percentage of NPs working in primary care and in primary care practices. Also, in fully enabled states a higher number of practices with NPs accepted Medicaid compared to practices without NPs. Primary care practices with NPs were significantly more likely to be in rural settings and high poverty areas. NPs in states with full SOP had 13% higher odds of working in primary care, and NPs had a 6% higher odds of working in primary care in states with 100% Medicaid reimbursement. In states with both full SOP and full Medicaid reimbursement NPs had a 20% higher odds of working in primary care. Practices had a 17% higher odds of accepting Medicaid if an NP was employed there, and a 13% higher odds of accepting Medicaid if NP reimbursement was at 100% of physician reimbursement. Level III, grade A. |
| Bellot, J., Valdez, B., Altdoerffer, K., Quiaoit, Y., Bronzell-Wynder, T., & Cunningham, P. (2017). Does contracting with managed care organizations remain a barrier for nurse practitioners? *Nursing Economics*, 35(2), 57-63. Two part, cross-sectional mixed method study using survey data from 212 managed care organizations across all fifty states and the District of Columbia. This study replicated the 2012 study by Hansen-Turton, Ware, Bond, Doria, & Cunningham. Response rate was 81%, and 75% of managed care organizations reported contracting with NPs as PCPs at least some of the time. Of these 34.6% reported placing restrictions on contracting with NPs based on geographic borders, provider shortage areas, practice within Federally Qualified Health Centers, product line (Medicare, Medicaid, private), or by requirements for supervisory or collaborative practice. Compensation for NPs was the same rate as physicians for 22% of the MCOs; 20.8% reported sometimes compensating NPs at the same rate as physicians, 35.2% reported reimbursing at a lower rate, and 11.3% refused to answer while 10.7% stated they did not know this information. The trend of contraction with NPs as PCPs, though it increased from 2006 to 2012, appears to have stabilized since 2012 with about one quarter of MCOs who still do not contract with NPs. Level III, grade B. |
| Benitez, J., Coplan, B., Dehn, R., & Hooker, R. (2015). Payment source and provider type in the US healthcare system. *Journal of the American Academy of Physician Assistants*, 28(3), 46-53. doi:10.1097/01.JAA.0000460924.36251.eb. Retrospective multinomial logistic regression analysis of National Hospital Ambulatory Care Survey (NHAMCS) data with type of provider as the dependent variable and reimbursement type as the independent variable yielding predicted probabilities of being seen by a physician, NP, or PA. Sample included 74,428,390 visits: physician visits = 62,358,638; PA visits = 3,973,755; NP visits = 8,095,998. This study looked at the correlation between provider type and reimbursement source. NPs and PA s were more likely to care for patients with lower reimbursement sources such as Medicaid and out-of-pocket payments versus private insurance and Medicare. PAs and NPs spent the largest share of their efforts treating Medicaid patients: NPs (42%), PA (34%), and physicians (38%). Patients whose primary source of payment was Medicaid were 32% more likely to see an NP and 16% more likely to see a PA than a physician. Patients paying out of pocket were 60% more likely to see an NP and 42% more likely to see a PA than a physician. Level III, grade A. |
| Currie, J., Chiarella, M., & Buckley, T. (2013). An investigation of the international literature on nurse practitioner private practice models*. International Nursing Review*, 60(4), 13p. doi:10.1111/inr.12060. Integrative literature review including 30 articles internationally looking at private NP practice. Major themes identified in the articles included challenges related to reimbursement, collaborative practice requirements, legislation, models of care, and acceptability of the NP role. US reports showed that legislation was poorly understood by NPs, variable across localities with different programs and payers, models such as nurse-managed health centers faced increased reimbursement and funding difficulties. Reimbursement was noted key consideration as a barrier to sustainability requiring NPs to see more patients to cover the same expenses as a physician counterpart. Collaborative agreements were seen as an added expense. Level IV, grade B. |
| DesRoches, C. M., Gaudet, J., Perloff, J., Donelan, K., Iezzoni, L. I., & Buerhaus, P. (2013). Using Medicare data to assess nurse practitioner–provided care. *Nursing Outlook*, 61(6), 400-407. doi:10.1016/j.outlook.2013.05.005. Cross-sectional study analyzing a random sample of 200,000 Medicare claims by internal medicine and family physicians and 800,000 claims by NPs. States with the greatest NP billing and reimbursement had the greatest number of Medicare patients. States with the highest rate of NP billing were rural. Beneficiaries assigned to NPs tended to be younger, non-white, female, dual enrolled in Medicare and Medicaid, and have a higher level of disability. Major limitation in data set being that NP visits billed as “incident to” are coded as physician visits. Level III, grade A. |
| Hansen-Turton, T., Ritter, A., Begun, H., Berkowitz, S.L., Rothman, N., & Valdez, T. (2006). Insurers' contracting policies on nurse practitioners as primary care providers: The current landscape and what needs to change. *Policy, Politics & Nursing Practice*, 7, 216-226. doi:10.1177/1527154406294339. Two-part cross-sectional mixed method study: Part 1 Surveyors interviewed staff from the top 10 Managed Care Organizations (MCOs) in each state offering HMOs about their NP credentialing and reimbursement policies. Local NMHCs were then asked to confirm or deny the information from their experience with empanelment and claims. Part 2: Two investigators conducted interviews and meetings with key decision makers in contracting and credentialing departments of the various national MCOs including Aetna, United, and several Blue plans to discover barriers related to business policy, credentialing versus contracting in MCOs, and system issues within the MCOs related to NP empanelment and reimbursement. Sample size included 206 MCOs in in 47 states and DC (a 54% response rate) for part 1, and 4 major MCOs for part 2. Only 33% of MCOs had uniform policies allowing NPs to be credentialed as PCPs. MCOs sited reasons from corporate interpretation of the law to traditions as reasons for not credentialing NPs. 52% of MCOs reimbursed NPs at the same rate as physician PCPs. Eleven declined to answer rationale behind discriminatory credentialing, 4 gave out information that was found to be incorrect. Many MCO representatives had difficulty understanding how an NP could be a PCP. Nearly 1/2 of MCOs offering Medicaid did not credential NPs. In states that required supervision only 19% of MCOs credentialed NPs, in states with FPA 78% of MCOs credentialed NPs. Part 2: National MCOs do not have standard credentialing requirements but defer to local business plans with state to state and within state variation. Local areas credential per plan "need" for listed provider types. MCOs listed barriers to NP credentialing related to IT systems including that these systems are not set up to include NPs as PCPs causing time consuming work arounds or the addition of expensive upgrades. MCOs with the longest history in an environment were most resistant to change policy and to empanel NPs. MCOs cited having physician networks and relationships to repair and protect as a reason for not empaneling NPs. Patient needs did not address biases from business-policy advocating for access to medically underserved. Limitations included selection bias and low response rate. Level III, grade B. |
| Hansen-Turton, T., Ritter, A., & Torgan, R. (2008). Insurers' Contracting Policies on Nurse Practitioners as Primary Care Providers: Two Years Later. *Policy, Politics, & Nursing Practice*, 9(4), 241-248. doi:10.1177/1527154408319450. Cross-sectional mixed method study involving survey targeting top 10 MCOs in each state and DC. Sample included 222 MCOs, a 66% response rate (significant increase from 2 years ago). 53% of MCOs credentialed NPs (up from 33%), but still almost half were refusing to credential NPs as PCPs. 56% (up from 52%) were reimbursing NPs at physician rate, 38% at lower rate. 6% reimbursed NPs at a lower rate than physicians, but made exception for physician shortage areas where they were reimbursed at the full physician rate. Reasons for not credentialing NPs included: allowing NPs to be empaneled only in areas of physician shortages, NPs did not meet company criteria for PCP (defined as a physician), state law did not mandate NP credentialing as PCPs, and stating that national accreditation prevented the credentialing of NPs as PCPs. Many MCO representatives continued to demonstrate lack of understanding of NP ability to provide comprehensive PC services. Any Willing Provider (AWP) and Any Willing Class of Provider (AWCP) laws had no positive impact on NP credentialing. A full 73% of HMOs with significant Medicaid products credentialed NPs as PCPs. Only 43% of HMOs with significant commercial products credentialed NPs, and only 33% of HMOs with significant Medicare products credentialed NPs as PCPs. This represented a 19% jump in commercial product line credentialing of NPs from 2 years prior. In states with regulations allowing independent NP prescribing: 71% of state HMOs credentialed NPs. In states requiring collaboration or supervision for prescriptive authority only 50% of HMOs credentialed NPs as PCPs. Level III, grade B. |
| Hansen-Turton, T., Ware, J., Bond, L., Doria, N. & Cunningham, P. (2013). Are Managed Care Organizations in the United States Impeding the Delivery of Primary Care by Nurse Practitioners? A 2012 Update on Managed Care Organization Credentialing and Reimbursement Practices. *Population Health Management*, 16, 306-309. doi:10.1089/pop.2012.0107. Cross-sectional mixed method study using purposive sampling and thematic analysis and comparison to previous statistics from 2006, 2008. The sample included 258 of the top 10 HMOs in each state and the District of Columbia operated by 98 different MCOs. Contacted 499 HMOs, 258 agreed to participate, 52% response rate. 74% reported that they credentialed NPs as PCPs, 2 more only credentialed NPs under special circumstances such as in physician shortage areas. Only 27% reported reimbursing NPs at the same rate as physicians, 27% reported reimbursing NPs at a lower rate than physicians, and 46% reported reimbursement varied - sometimes at a lower rate and sometimes equal to physician reimbursement. Those serving significant number of Medicaid enrollees were more likely to credential NPs and reimburse at physician rates. Over 25% of HMOs still do not empanel NPs as PCPs. Level III, grade B.  |
| Maier, C. B., & Aiken, L. H. (2016). Task shifting from physicians to nurses in primary care in 39 countries: a cross-country comparative study. *The European Journal of Public Health*, 26(6), 927-934. doi:10.1093/eurpub/ckw098. Cross-sectional mixed method research study comparing survey answers from 93 purposively sampled country experts from Europe, US, Canada, Australia, and New Zealand analyzing task shifting reforms with growing NP practice. Theme analysis revealed most reforms were focused on removing regulatory barriers to scope-of-practice for NPs. Removing financial barriers to practice and reforming NP educational standards were secondary reform focuses. The report cited that the role of financing and payer reimbursement policies was less known and that lower reimbursement rates for NPs may pose a financial disincentive for hiring NP providers. Level III/IV, grade A. |
| Park, J., Athey, E., Pericak, A., Pulcini, J., & Greene, J. (2016) To what extent are state scope of practice laws related to nurse practitioners’ day-to-day practice autonomy? *Medical Care Research and Review*, 1-22. doi: 10.1177/1077558716677826. Cross-sectional study of the relationship between scope-of-practice laws and NP autonomy comparing states with full practice authority, those requiring collaboration or supervision for prescriptive authority, and those with both restricted practice and restricted prescriptive authority. A random sample of 9,021 NPs with representative samples from each state was obtained using the HRSA listings of all actively licensed NPs. Practice autonomy was measured by examining 5 factors: NP skills being fully utilized, billing independence (billing under the NPs own provider number and credentials), collaborative versus hierarchical relationships with physicians, management of the NPs own panel of patients, and admitting privileges. Overall, 85% of NPs either agreed or strongly agreed that they were fully using their NP skills, 84% described their relationship with physicians as collaborative, only about 47% reported billing using their own provider number and credentials, and only 46% reported managing their own patient panels. Lastly, only 20% reported having admitting privileges. Full practice state NPs reported the highest levels of autonomy in areas except related to admitting privileges, where no significant association with scope-of-practice law was found. Authority to practice independently without full prescriptive authority was found to be of very little benefit. Finding highlighted that scope-of-practice laws were not the only barriers restricting NP practice. Level III, grade A. |
| Poghosyan, L., Liu, J., & Norful, A. (2017) Nurse practitioners as primary care providers with their own patient panels and organizational structures: A cross-sectional study*. International Journal of Nursing Studies*, 74(2017), 1-7. http://dx.doi.org/10.1016/j.ijnurstu.2017.05.004. Cross-sectional study of 314 NPs from 163 primary care organizations in Massachusetts recruited from the state provider database. Survey results from 314 NPs revealed that only about 50% of primary care NPs carry their own patient panels and that NP roles vary from organization to organization. This study concludes that organizational structure and billing practices affect NP practice beyond state level scope-of-practice regulations, and that insurance reimbursement policies could explain some of the variability in NP role within the care delivery system. Level III/grade A. |
| Poghosyan, L., Nannini, A., Smaldone, A., Clarke, S., O'Rourke, N. C., Rosato, B. G., & Berkowitz, B. (2013). Revisiting Scope of Practice Facilitators and Barriers for Primary Care Nurse Practitioners: A Qualitative Investigation. *Policy, Politics & Nursing Practice*, 14(1), 10p. doi:10.1177/1527154413480889. Qualitative study using a purposive sample of 23 NPs from Massachusetts in primary care exploring scope-of-practice and practice barriers in primary care. Themes related to barriers to NP practice included: the regulatory environment, comprehension of the NP role, and work environmental obstacles. NPs were taking on similar responsibilities to physicians but regulatory and reimbursement/billing practices limited their practice. NPs reported providing full primary care services but billing often being done as incident-to for higher reimbursement and hiding their impact on patient care. Collaboration and supervision of NP care as required by regulation was inconsistent or non-extent without added value serving as a technicality leading to challenges in timely care provision and the filing of forms. NPs reported lower reimbursement rates increased incident-to billing and prevented them from being empaneled as primary care providers in some instances. NPs in community health centers reported flat fee reimbursements and less reimbursement discrepancies as compared with physicians. Level III, grade B. |
| Pohl, J., Tanner, C., Pilon, B., & Benkert, R. (2011). Comparison of Nurse Managed Health Centers with Federally Qualified Health Centers as Safety Net Providers. *Policy, Politics & Nursing Practice*, 12(2), 10p. doi:10.1177/1527154411417882. Retrospective analysis of 4 years of annual Nurse Managed Health Center (NMHC) data from the National NMHC Survey and 2008 FQHC data in the Uniform Data System. Sample included 42 NMHCs and 1080 FQHCs. NMHC and FQHC saw similar populations yet funding and reimbursement differences were significant. NMHC rely more on grants and private sector donations, FQHC have access to considerable federal support based on serving the underserved. NMHC are challenged by state, federal and third party insurer regulations that disadvantage nurse practitioners as PCPs. Level III, grade B. |
| Sears, J. M., & Hogg-Johnson, S. (2009). Enhancing the policy impact of evaluation research: a case study of nurse practitioner role expansion in a state workers' compensation system. *Nursing Outlook*, 57(2), 99-106. doi:10.1016/j.outlook.2008.05.001. Case study report with pilot study of Washington state’s NP fight to be empaneled as providers for selection and reimbursement under the state workers’ compensation program. A three-year pilot program authorizing NPs to function as attending providers is evaluated documenting improved access to care and provider availability without negative impacts on quality, claims disputes, costs, or disability outcomes. The report concludes that ongoing stakeholder communication, stakeholder analysis, and facilitating stakeholder input into policy is essential. Level V, grade B. |
| Spetz, J., Fraher, E., Li, Y., & Bates, T. (2015). How many nurse practitioners provide primary care? It depends on how you count them. *Medical Care Research and Review*, 72(3), 359-375. doi:10.1177/1077558715579868. Retrospective data analysis from California and North Carolina licensure data and from the 2012 US National Survey of Nurse Practitioners is compared for estimates of NPs working in primary care. Sample included data from 3,972 active NPs in NC, 14,636 NPs in CA, and a random sample of 1.384 of the 22,000 NPs in the US National Survey of Nurse Practitioners. Results showed that based on education 83.5-90.7% of NPs practiced in primary care. Based on certification 74.5-79.9% of NPs practiced in primary care. Based on employment setting 58.4-67.9% of NPs practiced in primary care. The CA survey contained reimbursement data showing that only 24% of NPs reported being recognized as primary care providers (PCPs) by insurance. While 34% of those specializing in geriatrics, 20% of those specializing in home health or school nursing were recognized as PCPs. Of those employed by HMOs, 64% were recognized as PCPs. While only 43.7% employed in long term care facilities, 32.4% of NPs in community health centers, and 31.3% in home health were recognized as PCPs. Of those in private medical practices, only 24% were recognized as PCPs and empaneled by third party payers. Level III, grade A. |
| Yee, T., Boukus, E. L. L. Y. N., Cross, D., & Samuel, D. (2013). Primary care workforce shortages: Nurse practitioner scope-of-practice laws and payment policies. National Institute for Health Care Reform. Research Brief, 13, 1-7. Qualitative study including telephone interviews of 30 NPs from six states. Conclusions include that scope-of-practice laws did not seem to restrict the services NPs provided to patients as much as they had a substantial indirect effect on practice opportunities and may influence payer policies. Payer policies affected whether NPs could directly bill or be reimbursed and whether NPs were included/empaneled in provider networks. More restrictive scope-of-practice regulations were associated with more barriers related to public and private billing and reimbursement, ordering of some tests, and the ability to establish independent practices. Level III, grade B. |