Review: Systematic

JAANP

CE

Is it time for the 4th P in nurse practitioner education? Physical assessment, pharmacology, pathophysiology, and procedures: A systematic review

Marianne K. Schallmo, DNP, APRN, ANP-BC[1], Timian M. Godfrey, DNPc, APRN, FNP-BC[2], Darryn Dunbar, DNPc, CNM, NEA-BC[2], Kristen M. Brown, DNP, CRNP, CPNP-AC[2], Amanda Coyle, PhD, FNP-BC[2], & Rita F. D'Aoust, PhD, ANP-BC, CNE, FAANP, FAAN[2]

ABSTRACT

Background and purpose: Nurse practitioners (NPs) perform diagnostic and clinical procedure skills in the acute, specialty, urgent, and primary care settings. Nurse practitioners surveyed on readiness for practice report a lack of confidence and education preparation for performing selected advanced diagnostic and skills. As NPs gain independent, full practice scope, it is imperative advanced diagnostic and procedure skills used in practice are taught in nurse practitioner curriculum. The purpose of this review is to document a systematic review of the literature, answering the following question: Among primary care NPs, does current program curriculum align with current procedures and skills in theclinical setting?

Methods: PubMed, Cochrane, Scopus, CINAHL, and Embase were searched between inception and 2018 using the search terms "advanced practice nursing, clinical competence, diagnostic techniques or procedures, and primary health care." Following the preferred reporting items for systematic reviews and meta-analysis guidelines, nine articles were included in the synthesis.

Conclusion: There is scant research regarding NP educational preparation of skills and procedures. Study findings indicate that programs are not teaching all the procedures deemed important. Education should promote improved congruence between the skills and procedures taught in program curricula and those used in clinical practice.

Implications for practice: It is critical to complete an education practice survey measuring skill and procedure preparation and competency at graduation. Survey results will determine whether skill and procedure guidelines are indicated for NP education. A recommendation may include minimal skills and procedure for all nurse practitioner curricula.

Keywords: Clinical skills; clinical competence; nurse practitioner; nurse practitioner education; nurse practitioner skills; primary care.

Journal of the American Association of Nurse Practitioners 31 (2019) 705–711, © 2019 American Association of Nurse Practitioners

DOI# 10.1097/JXX.0000000000000206

Background

Nurse practitioners (NPs) autonomously perform and bill for advanced diagnostics and procedure skills (ADPS). In 2012, NPs independently billed Medicare for over 1.4 million outpatient office procedures and independent procedure billing continues to rise (Coldiron & Ratnarathorn, 2014; Zhang, Zippin, & Kaffenberger, 2018). A 2012 National Center for Health Workforce and Health Resources and Services survey of certified primary care NPs (family, adult, geriatric and pediatric) revealed over 93% ordered, performed, and interpreted advanced diagnostic tests, such as laboratory tests, x-rays, electrocardiograms (ECG), and other diagnostic studies on a regular basis and 26% performed procedures on a regular basis (Chattopadhyay, Zangaro, & White, 2015). To meet today's health care needs, NPs must possess ADPS that match the current health care environment.

As NPs gain independent, full practice scope and as patient care becomes increasingly complex, a robust knowledge and skill set regarding appropriate ADPS interpretation and implementation is necessary. For the purpose of this research, the term "ADPS" is defined as ordering and interpreting diagnostic tests and performing procedure skills reserved for advanced practice. The

[1]*School of Nursing, Purdue University Northwest, Hammond, Indiana,* [2]*School of Nursing, Johns Hopkins University, Baltimore, Maryland*

Correspondence: *Marianne Schallmo, DNP, APRN, ANP-BC, School of Nursing, Purdue University Northwest, 2200 169th St, Hammond, IN. Tel: 219.989.8059; Fax: (219)989-2848; E-mail: mschallm@pnw.edu*

Received: *14 November 2018; revised: 23 December 2018; accepted 18 January 2019*

definition is intentionally broad encompassing the vast range of skills used in advanced practice.

The increase in demand for NPs along with an endorsement for full practice created a recent and ongoing ADPS upsurge. According to the Bureau of Labor Statistics Occupational Handbook, NPs are expected to experience a 36% increase in demand between 2016 and 2026 (Bureau of Labor Statistics, 2017). Physician shortages, an aging population, and insurance expansion have contributed to the increased need for primary care NPs in the United States (Kirch & Petelle, 2017). Historically, few states allowed NPs full practice authority. However, in the last 5 years, both state and federal agencies (such as the Department of Veteran Affairs) endorse full practice. As this trend continues, it is imperative NPs are fully prepared during their initial education to meet the expanding health care expectation.

Nurse practitioners surveyed on readiness for practice report a lack of confidence, and initial educational preparation performing selected ADPS (Hart & Bowen, 2016; Hart & Macnee, 2007; Jones, Kotthoff-Burrell, Kass-Wolff, & Brownrigg, 2015). The study reveals that NPs felt the least prepared in x-ray and ECG interpretation, microscopy, simple office procedures, casting, splinting, and suturing (Hart & Macnee, 2007). In other studies, NPs perceived procedural skills and knowledge as important to their practice and they reported a desire for improved ADPS educational preparation (Cole & Ramirez, 2000; Hart & Macnee, 2007; Hawkins-Walsh et al., 2011; Jones et al., 2015; Laustsen, 2013). In similar studies, NPs reported ADPS training was not obtained during their initial education program (Cole & Ramirez, 2000; Hart & Macnee, 2007; Hawkins-Walsh et al., 2011, Keough, Stevenson, Martinovich, Young, & Tanabe, 2011; Lausten, 2013). This aligns with research documenting NPs frequently acquired ADPS through on-the-job training or continuing education conferences (Cole & Ramirez, 2000; Keough et al., 2011; Keough, Tell, Andreoni, & Tanabe, 2016). It is imperative NP students receive ADPS training during their initial education program to enable them to be "practice-ready" upon graduation.

Research detailing advanced practice nursing (APN) educational programs also is scant and may not reflect the overall state of ADPS APN education. In a survey by Scheibmeir, Stevens, Fund, Carrico, and Crenshaw (2015) faculty employed at American Association of Colleges of Nurses (AACN), accredited APN programs indicated ADPS was important content to include in APN curricula. Even though faculty found ADPS to be important, a precise ADPS list and mastery level (to order, to interpret, to perform) was not consistent between programs (Hawkins-Walsh et al, 2011).

The AACN Essentials and National Organization of Nurse Practitioner Faculties (NONPF) competencies provide an educational foundation and core competencies ensuring APNs are prepared for entry to practice (AACN Essentials, 2006, 2011; NONPF Competencies, 2017). These competencies are not prescriptive and are intended to guide curriculum development.

Nurse practitioners are billing for ADPS in clinical practice. Surveyed NPs report low confidence and initial education program preparation with specific ADPS. Although faculty placed value on ADPS education, the curriculum does not reflect this perception. Finally, NPs report acquiring ADPS after graduation via on-the-job training and attending continuing education conferences. Perhaps current education is lagging behind current practice as state allowances and NP scope continues to evolve. Nonetheless, these findings suggest a gap between ADPS in practice and APN educational program preparation. The Advanced Practice Registered Nurses (APRN) Consensus Work Group on National Council of State Boards of Nursing APRN Advisory Committee (2008) requires APN core education to include the 3 Ps: Physical assessment, Pharmacology, and Pathophysiology, but ADPS is not included. To align with current APN practice, is it time to consider the fourth P (Procedures) as a mechanism for standardizing core competencies?

Purpose

The purpose of this paper is to document a systematic review of the literature, evaluating the current literature in answering the following question: Among primary care NPs, does current curriculum align with current procedures, skills, and performance in the clinical setting?

Methods

Articles were included if participants were (a) Advance Practice Nurses in primary care (family NP, adult-gerontology NP, pediatric NP, or women health NP); (b) procedural skills were acquired in a master or doctoral program; (c) procedural skills were performed in primary care, ambulatory care, or emergency department setting; (d) International studies with United States NP. Articles also needed to have full-text availability, published in English, and in a peer-reviewed journal. Articles were excluded if the (a) setting was in-patient acute care; (b) education was obtained outside the school degree, such as on-the-job training, continuing education, or a workshop; (c) the procedure was not specified; (d) NP performed the procedure outside the scope of practice; (e) International NP, because the scope of practice is different than the United States; and (f) not human studies or nonresearch. Emergency care is an umbrella term encompassing ambulatory care, urgent care, fast-track, and emergent care. Because family nurse practitioners (FNPs) provide care to individuals and families across the lifespan, they are recognized as important members providing services in emergency care (Cole & Ramirez, 2000; Hoyt et al., 2010). Traditional work sites for primary care NPs (FNP and ANP) include

both ambulatory and low acuity emergency department (Keough, et al., 2011). The exclusion criteria intent was to exclude articles when the primary care NP was practicing out of scope, such as intubation or management of unstable, complex patients.

Search process

The search was conducted in January 2018. Databases searched included PubMed, Cochrane, Scopus, CINAHL, and Embase. Databases were searched from inception through January 2018. The search was intentionally broad to capture all articles. The grey literature was explored using reference lists from potentially pertinent articles and hand-searching the following journals from 2012 to 2017: Journal of Advance Nursing Practice, Journal of Nursing Education Perspectives, Nurse Educator Today, and The Journal for Nurse Practitioners.

Search terms were developed with the assistance of a medical research librarian and include the following concepts: APN, clinical competence, diagnostic techniques or procedures, and primary health care. Medical Subject Headings terms, as well as other variations, were adapted to accommodate all databases in the search.

The Preferred Reporting Items for Systematic Review and Meta-Analysis (Liberti et al., 2009) guidelines directed the search strategy and is included in **Figure 1**. The initial search yielded 4,468 articles with six identified from the grey literature. Covidence, a software platform, was used to facilitate screening and data extraction. All articles were uploaded into Covidence and duplicates were removed. Using the inclusion and exclusion criteria, two authors asynchronously reviewed the title, then abstract, and finally full-text for relevance. At every step, all disputes for inclusion were discussed among the reviewers

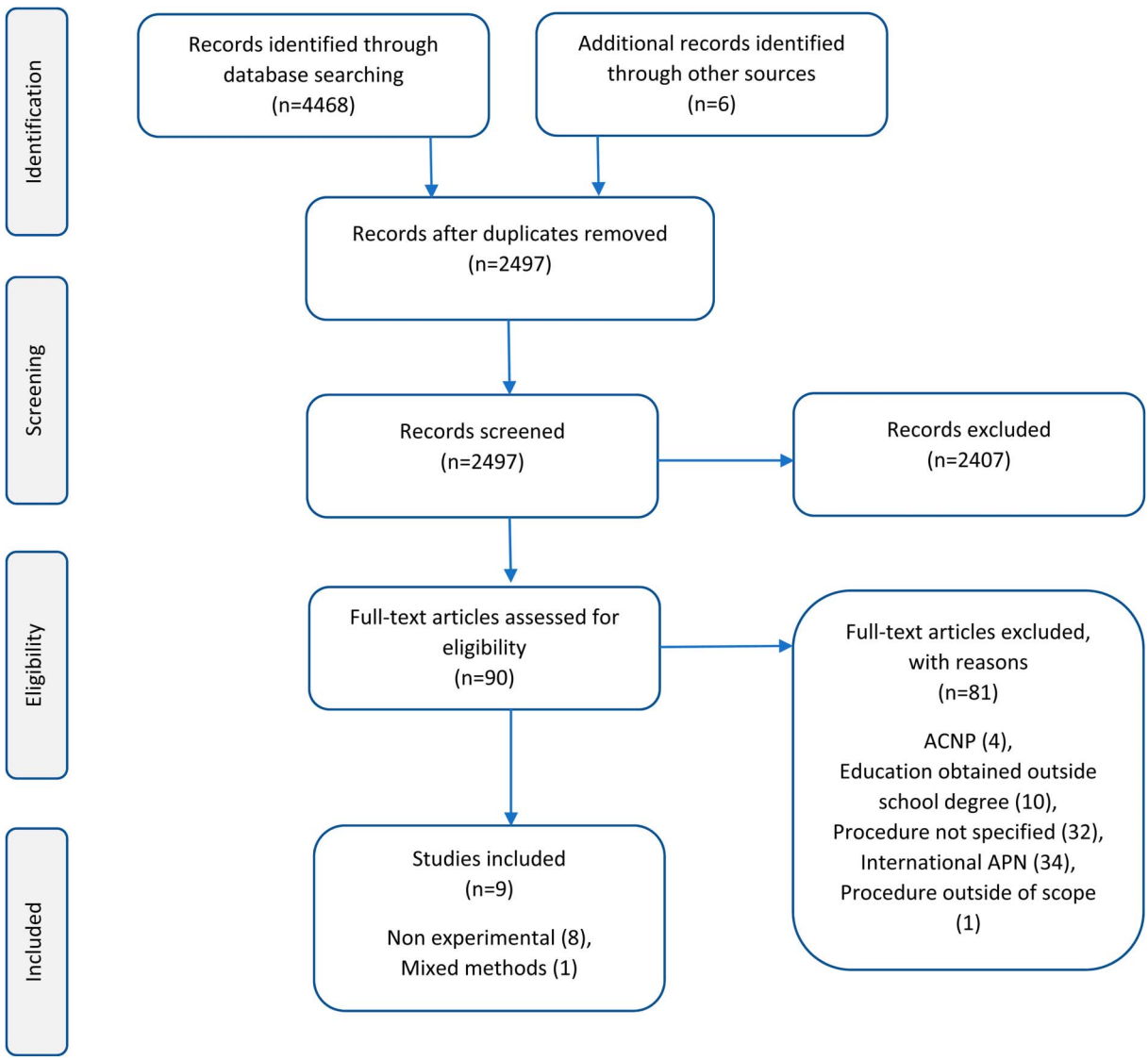

Figure 1. Preferred reporting items for systematic review and meta-analysis flow diagram for article selection.

and decided by a third reviewer. All reviewers are NPs. The reviewers consisted of a DNP Clinical Assistant Professor and a DNP student. The third reviewer is a PhD Associate Professor. During full-text review, 81 articles were excluded; four were focused on acute care NP, 10 evaluated education obtained outside of school degree, 32 did not disclose specific procedures, 34 were NPs practicing internationally, and one article involved NPs performing skills outside scope of practice. Final article inclusion was determined if it answered the research question.

Quality appraisal

The included articles underwent both strength of evidence and quality testing using The Johns Hopkins Nursing Evidence-Based Practice Research Evidence Appraisal Tool (Dang & Dearholt, 2017). Research was evaluated on three strength levels and nonresearch on five strength levels. Level I randomized controlled study, experimental study, or meta-analysis; level II quasi-experimental; level III nonexperimental, qualitative, meta-synthesis; level IV clinical practice guidelines, consensus or position statement; level V literature review, expert opinion, organizational experience, case report, community standard, or clinician experience. Evidence quality was evaluated on three levels: "A" high quality, "B" good quality, "C" low quality with major flaws. One author completed the strength and quality assessment and a second author reviewed and approved the assessment with no disagreements.

Data extraction

Using a summary tool (Table, Supplemental digital content 1, http://links.lww.com/JAANP/A22), one reviewer completed the data extraction. A second reviewer verified the extracted data for accuracy. Information extracted from the articles included: citation, research question, study design, measures, sample, demographics, analysis, results, key findings, and limitations.

Results

The nine articles chosen for the systematic review were graded on evidence level and quality as outlined in the Johns Hopkins Nursing Evidence-Based Practice Evidence Level and Quality Guide. All sources of evidence were identified as evidence level III (n = 9) and study quality varying from "B" (n = 8) to "C" (n = 1). Each of the chosen articles were nonexperimental studies with reasonably consistent results and recommendations. The reviewers graded one article to have incongruence between the data and conclusions of the study.

Eight of the articles selected used a descriptive survey design (Allen, Fennie, & Jalkut, 2008; Cole & Ramirez, 2003; Hawkins-Walsh et al., 2011; Hoyt et al., 2010; Keough et al., 2016; Laustsen, 2013; Logsdon & Gleason, 2015; Marchand, Van Dinter, Mundt, Dingel, & Klein, 2003), and one article used claims data to evaluate procedures performed by APNs (Coldiron & Ratnarathorn, 2014). Six of the studies used descriptive statistics as the sole method for analysis (Coldiron & Ratnarathorn, 2014; Cole & Ramirez, 2003; Hawkins-Walsh et al., 2011; Hoyt et al., 2010; Laustsen, 2013; Marchand et al., 2003). In addition to descriptive statistics, three articles used nonparametric and parametric testing, including the Mann–Whitney *U* test (Allen et al., 2008; Logsdon & Gleason, 2015), Chi-square test (Allen et al., 2008; Logsdon & Gleason, 2015), Fisher's exact test (Allen et al., 2008), one-way analysis of variance, and post hoc Tukey's procedure (Keough et al., 2016). Due to the abundance of descriptive data and limited availability of statistical analysis, a meta-analysis of the selected articles could not be performed.

All nine studies were conducted in the United States. Aside from the article using claims data (Coldiron & Ratnarathorn, 2014), the survey sample populations differed among each of the studies. Study samples included newly graduated APNs (n = 164), actively practicing APNs (n = 1,649), and program directors of graduate nursing programs (n = 189). Each study had a component of evaluation for ADPS frequency and/or ADPS education of the APN.

Synthesis of results

Throughout the nine selected articles for this systematic review, two common themes were identified with the following corresponding characteristics:

Employment:

- Frequency
  - Self-reported ADPS frequency in practice (Allen et al., 2008; Laustsen, 2013).
  - Actual ADPS frequency: billing claims Frequency of Billing procedures (Coldiron & Ratnarathorn, 2014).
- Perception (self-reported) for importance of ADPS skill on the job (Hoyt et al., 2010; Laustsen, 2013).
- Perception (self-reported) need for additional ADPS training post-graduation (Keough et al., 2016).

Education:

- Perception of importance to teach during initial education
  - Faculty (Cole & Ramirez, 2003; Hawkins-Walsh et al., 2011; Logsdon & Gleason, 2015).
  - Professional organization at state level (Hoyt et al., 2010).
- Procedure taught in NP program (Cole & Ramirez, 2003; Hawkins-Walsh et al., 2011; Laustsen, 2013; Logsdon & Gleason, 2015; Marchand et al., 2003).

Employment

Frequency of advanced diagnostics and procedure skills in practice. Two articles surveyed APNs to self-report the frequency of ADPS used in clinical practice. Advanced diagnostics and procedure skills that was self-reported to be frequently performed by >25% of APNs included x-ray interpretation, cerumen impaction removal, care for animal and insect bites, ECG interpretation, skin tag removal, nebulizer administration, peak flow meter, suturing, venipuncture, capillary blood collection, Wood's lamp examination, punch biopsy, skin biopsy, corneal abrasion, removal of foreign body from ear, venipuncture, and abscess incision and drainage (Allen et al., 2008; Laustsen, 2013).

One article used claims data from the 2012 Medicare Physician/Supplier Procedure Summary Master File to assess the actual frequency of independently billed procedures by APNs (Coldiron & Ratnarathorn, 2014). Results revealed that 1,431,929 procedures were performed in an outpatient office setting and were independently billed to Medicare by APNs (Coldiron & Ratnarathorn, 2014). More than half of the paid claims performed were dermatologic procedures that included destruction of premalignant lesions and single biopsy of skin lesion (Coldiron & Ratnarathorn, 2014).

Perception of importance of advanced diagnostics and procedure skills in practice. Two articles evaluated the APN perception of the importance in knowing certain ADPS in clinical practice (Hoyt et al., 2010; Laustsen, 2013). Advanced diagnostics and procedure skills rated as being "important" by more than 80% of study participants included: x-ray interpretation, foreign body removal from eye, foreign body removal from ear or nose, venipuncture, incision and drainage, suturing, ECG interpretation, lumbar puncture, nail bed debridement/removal/trephination/closure, skin lesion shaving/destruction/biopsy, arthrocentesis aspiration/injection, anesthesia injections into tendon/trigger point, paravertebral/sacroiliac/knee, digital nerve block, impacted cerumen removal, extremity splinting or application of immobile devices, fluorescein eye examination, burn debridement, ultraviolet eye examination, eye dilation, tonometry, slit-lamp examination, needle thoracostomy, gastrostomy tube replacement, childbirth, fecal impaction removal, closed fracture/dislocation reduction, cast removal, compartment pressure measurement, epistaxis management, animal or insect bite wound management, pap smear, nebulizer treatment, peak flow testing, and microscopy wet mount (Hoyt et al., 2010; Laustsen, 2013).

Perceptional need for further advanced diagnostics and procedure skills training. One article identified which ADPS APNs believed required additional training after their initial educational training (Keough et al., 2016). Results revealed the ADPS that needed further training were: x-ray interpretation (57%), suturing (47%), ECG interpretation (59%), laboratory interpretation (55%), and computer tomography scan interpretation (32%).

Education

Perception of advanced diagnostics and procedure skills importance in initial education. One article surveyed FNP program directors to report the importance of ADPS in APN education (Cole & Ramirez, 2003). Twenty-seven ADPS were rated as being "important" by but were not included in the curriculum of 50% or more of the FNP programs (Cole & Ramirez, 2003). One-half or more of FNP program directors designated the following six ADPS as being "very important" to teach in an FNP program: single-layer wound closure, fluorescein staining of the eyes, 12-lead ECG interpretation, splinting of extremities, visual acuity testing, and Pap smear collection (Cole & Ramirez, 2003).

Two articles surveyed APNs to self-report the importance of the inclusion of ADPS in their initial education (Hawkins-Walsh et al., 2011; Logsdon & Gleason, 2015). Graduates from primary care APN programs expressed that on-the-job training was fundamental in current clinical practice and better prepared them for practice than their education programs (Hawkins-Walsh et al., 2011). Out of 905 APNs surveyed in Florida, only 10.5% of respondents felt well-prepared in ordering diagnostic imaging and only 6% felt well-prepared in ordering contrast (Logsdon & Gleason, 2015). Of the participating APNs, 94% stated they would like continued education in diagnostic imaging (Logsdon & Gleason, 2015).

One study conducted by the Emergency Nurses Association performed a Delphi study that developed a list of 60 entry-level competencies for APNs practicing in emergency care (Hoyt et al., 2010). Of the 52 participants, a majority (69%) had completed an FNP program. These findings revealed that many primary care APNs are practicing in emergency care and the competencies should be used to guide educational curricula for APNs in preparing graduates to become competent providers (Hoyt et al., 2010).

Advanced diagnostics and procedure skills taught in advanced practice nursing graduate program. Four studies evaluated which ADPS were taught in primary care APN programs (Cole & Ramirez, 2003; Hawkins-Walsh et al., 2011; Laustsen, 2013; Marchand et al., 2003). Of the FNP programs surveyed, 80.7% reported their curriculum did not have a specific procedures course (Cole & Ramirez, 2003). Advanced diagnostics and procedure skills taught in FNP curriculum were: obtaining Pap smears, testing visual acuity, audiometry, tympanometry, splinting of extremities, 12-lead ECG interpretations, interpreting arterial blood gases, local infiltration of anesthetics, single-layer wound closure, fluorescein staining of the eyes, x-ray interpretation, incision and drainage of

abscesses, foreign body removal from ear or nose, skin lesion shaving/destruction/biopsy, skin tag removal, cerumen impaction removal, burn debridement, ultraviolet eye examination, bites, nebulizer treatment, peak flow testing, epistaxis management, microscopy wet mount, and eye irrigation (Cole & Ramirez, 2003; Hawkins-Walsh et al., 2011; Laustsen, 2013; Marchand et al., 2003).

Discussion

The systematic review aim was to evaluate the current literature linking the alignment of NP curriculum with current clinical setting procedures and skills. After a rigorous search, nine articles met the inclusion/exclusion criteria. Although eight studies used self-reported questionnaires, which may contain bias, one study reported Medicare billing data, revealing procedures NPs are currently performing in practice. All articles were strength-rated level III and eight were quality-rated B with one C. The results of this review establish both the frequency and scope of ADPS currently performed by primary care NPs. Furthermore, it clearly documents the overall lack of NP initial educational preparedness for ADPS in practice.

Purposeful NP curriculum development is crucial to prepare NP to work to their full scope of practice. Curriculum development is based on many interacting factors, including community, health, and societal needs (Iwasiw, Andrusyszyn, & Goldenberg, 2020). It is important for education programs to keep pace with the evolving and advancing scope of practice for NPs. The APRN Consensus Model is endorsed by all major APRN organizations and aligns with both NONPF competencies (2017) and AACN essentials (2006; 2011). The APRN Consensus Model (2008) prescribes NP curriculum to include the 3 Ps—physical assessment, physiology/pathophysiology, and pharmacology, but does not include specific ADPS.

To prepare graduates for both current and future nursing practice, it is imperative NPs learn ADPS in their initial education program. A dedicated stand-alone ADPS course is necessary ensuring that upon graduation, NPs are prepared to their full scope. Research revealed NPs report low confidence in ADPS (Hawkins-Walsh et al., 2011; Logsdon & Gleason, 2015) and one study found NPs did not follow clinical guidelines when ordering diagnostic imaging (Logsdon & Gleason, 2015).

This review found no consensus regarding which ADPS should be included in NP education or the level of ADPS mastery. Many studies were self-report skill frequency and skill importance based on opinion and not actual performed procedures. The Coldiron study (2014) reported billed procedures performed by NPs, but this study was limited to Medicare recipients.

Nurse practitioners report learning ADPS at a variety of venues, such as conferences, workshops, and on-the-job training. These skills would be best taught in formal education setting allowing the student the opportunity to practice and demonstrate skill mastery using defined competencies.

Strengths and limitations

This is the first systematic review analyzing the alignment of primary care NP procedure curriculum and practice. Nine articles met the inclusion criteria and each gave a different view answering the research question. This systematic review was purposefully broad to capture all relevant articles. Nonetheless, it is possible not all articles were represented.

Another limitation was the lack of common language or procedure definition in the study. Many authors used different terms to describe a similar procedure. For example, one author used the broad term suturing, another defined suturing as simple or multiple layers, and another as intermediate repair or extensive repair. The reader was unsure of the exact procedure the author was referring. This made it difficult to compare procedures across several articles.

Most research in this review was retrospective perception, which could present recall bias. Nurse practitioners may over or under recall the frequency of performing procedures in their day-to-day practice.

One article reported Medicare billing records that document how many procedures NP performed. Unfortunately, Medicare billing only records procedures billed to Medicare recipients and does not represent the entire patient population cared by NPs. The research also excludes procedures not billed or not covered by Medicare, such as aesthetic procedures and "incident to" billing. Procedures more common in non-Medicare population, such as Pap smears, would also be underrepresented.

Conclusion

This review found a gap in the literature in that there is scant research regarding the educational preparation of ADPS among APNs. Study findings indicate that primary care APN programs are not teaching all the procedures that program directors found as being important to teach (Cole & Ramirez, 2003; Hawkins-Walsh et al., 2011) and provide implications for the APN educator regarding the need for reviewing the scope of ADPS training in APN programs (Laustsen, 2013). The education of the APN should promote improved congruence between the ADPS taught in program curricula and those used in clinical practice (Laustsen, 2013).

A survey of education practice exploring the scope and depth of NP ADPS preparation and competency at graduation is critical to determine educational practice and whether additional guidelines relative to a "fourth P" is indicated for APRN education. To further document the gap between ADPS education and clinical practice, it may

be beneficial to explore employers' ADPS expectation for entry-level NP graduates. Based on the survey findings, a recommendation may be to offer a structured approach for minimal ADPS for all NP curricula. It is important to differentiate cognitive competency (knowledge) from clinical application competency in order to ensure that primary care NP graduates are prepared to meet today's practice realities.

Authors' contributions: *M.K. Schallmo, T.M. Godfrey, and D. Dunbar participated in data acquisition, data analysis and interpretation, drafting, revising and approving final manuscript. A. Coyle participated in concept and design, data acquisition, data analysis and interpretation, drafting and approving final manuscript, and a supervisory role. K.M. Brown and R.F. D'Aoust participated in concept and design, data acquisition, data analysis and interpretation, drafting, revising, and approving final manuscript, and a supervisory role.*

Competing interests: *The authors report no conflicts of interest.*

References

Allen, P. J., Fennie, K. P., & Jalkut, M. K. (2008). Employment characteristics and role functions of recent PNP graduates. *Pediatric Nursing*, 34, 151–159.

American Association of Colleges of Nursing (AACN). (2006). *The Essentials of Doctoral Education for Advanced Nursing Practice*. Retrieved from https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf. October 26, 2018.

American Association of Colleges of Nursing (AACN). (2011). *The Essentials of Master's Education for Advanced Practice Nursing*. Retrieved from https://www.aacnnursing.org/Portals/42/Publications/MastersEssentials11.pdf. October 26, 2018.

APRN Consensus Work Group and National Council of State Boards of Nursing APRN Advisory Committee. (2008). *The Consensus Model for APRN Regulation: Licensure, Accreditation, Certification, Education*. Retrieved from https://www.ncsbn.org/Consensus_Model_for_APRN_Regulation_July_2008.pdf. October 26, 2018.

Bureau of Labor Statistics, U.S. Department of Labor, (2017) *Occupational Outlook Handbook, Nurse Anesthetists, Nurse Midwives, and Nurse Practitioners*. Retrieved from https://www.bls.gov/ooh/healthcare/nurse-anesthetists-nurse-midwives-and-nurse-practitioners.htm#tab-6. October 26, 2018.

Chattopadhyay, A., Zangaro, G. A., & White, K. M. (2015). Practice patterns and characteristics of nurse practitioners in the United States: Results from the 2012 national sample survey of nurse practitioners. *The Journal for Nurse Practitioners*, 11, 170–177.

Coldiron, B., & Ratnarathorn, M. (2014). Scope of physician procedures independently billed by mid-level providers in the office setting. *JAMA Dermatology*, 150, 1153–1159.

Cole, F. L., & Ramirez, E. (2000). Activities and procedures performed by nurse practitioners in emergency care settings. *Journal of Emergency Nursing: JEN*, 26, 455–463.

Cole, F. L., & Ramirez, E. (2003). Procedures taught in family nurse practitioner programs in the United States. *Journal of the American Academy of Nurse Practitioners*, 15, 40–44.

Dang, D. & Dearholt, S. L. (2017). *Johns Hopkins nursing evidence-based practice: Model and guidelines* (3nd ed.), Indianapolis: Sigma Theta Tau International Honor Society of Nursing.

Hart, A. M., & Bowen, A. (2016). New nurse practitioners' perceptions of preparedness for and transition into practice. *The Journal for Nurse Practitioners*, 12, 545–552.

Hart, A. M., & Macnee, C. L. (2007). How well are nurse practitioners prepared for practice: Results of a 2004 questionnaire study. *Journal of the American Academy of Nurse Practitioners*, 19, 35–42.

Hawkins-Walsh, E., Berg, M., Docherty, S., Lindeke, L., Gaylord, N., & Osborn, K. (2011). A national survey of the primary and acute care pediatric nurse practitioner educational preparation. *Journal of Pediatric Health Care*, 25, 5–15.

Hoyt, K. S., Coyne, E. A., Ramirez, E., Peard, A. S., Gisness, C., & Gacki-Smith, J. (2010). Nurse practitioner Delphi study: Competencies for practice in emergency care. *Journal of Emergency Nursing: JEN*, 36, 439–449.

Iwasiw, C. L., Andrusyszyn, M., & Goldenberg, D. (2020). *Curriculum development in nursing education* (4th ed.). Burlington, MA: Jones & Bartlett Learning.

Jones, J., Kotthoff-Burrell, E., Kass-Wolff, J., & Brownrigg, V. (2015). Nurse practitioner graduates "Speak out" about the adequacy of their educational preparation to care for older adults: A qualitative study. *Journal of the American Association of Nurse Practitioners,* 27, 698–706.

Keough, V. A., Stevenson, A., Martinovich, Z., Young, R., & Tanabe, P. (2011). Nurse practitioner certification and practice settings: Implications for education and practice. *Journal of Nursing Scholarship,* 43, 195–202.

Keough, V. A., Tell, D., Andreoni, C., & Tanabe, P. (2016). Unique educational needs of emergency nurse practitioners. *Advanced Emergency Nursing Journal*, 38, 300–307.

Kirch, D. G. & Petelle, K. (2017). Addressing the physician shortage: The peril of ignoring demography. *Journal of the American Medical Association*, 317, 1947–1948.

Laustsen, G. (2013). What do nurse practitioners do? Analysis of a skills survey of nurse practitioners. *Journal of the American Association of Nurse Practitioners*, 25, 32–41.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gotzsche, P. C., Ioannidis, J. P. … Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analysis of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Medicine*, 6, e1000100.

Logsdon, R., & Gleason, R. (2015). Advanced nurse practitioner educational needs for safe and efficient radiological imaging. *Advanced Emergency Nursing Journal*, 37, 233–241.

Marchand, L., Van Dinter, M., Mundt, M., Dingel, W., & Klein, G. (2003). Current cervical cancer screening practices of Dane County, Wisconsin primary care clinicians. *Wisconsin Medical Journal,* 102, 35–40.

National Organization of Nurse Practitioner Faculties. (2017). *Nurse practitioner core competencies*. Retrieved from https://cdn.ymaws.com/www.nonpf.org/resource/r-esmgr/competencies/2017_NPCoreComps_with_Curric.pdf. October 26, 2018.

Scheibmeir, M., Stevens, C., Fund, M. B., Carrico, K., & Crenshaw, J. (2015). Advanced diagnostic content in nurse practitioner and physician assistant programs. *The Journal for Nurse Practitioners*, 11, 633–639.

Zhang, M., Zippin, J., & Kaffenberger, B. (2018). Trends and scope of dermatology procedures billed by advanced practice professionals from 2012 to 2015. *JAMA Dermatology*, 154, 1040–1044.

CE Instructions: The test for this CE activity can be taken online at www.NursingCenter.com/JAANP. Find the test under the article title. Registration Deadline: December 1, 2020.
Payment: The registration fee for this test is $12.95. AANP members are eligible for a 50% discount. For questions, contact Lippincott Professional Development: 1-800-787-8985.