ScienceDirect

Current Problems in Diagnostic Radiology

Volume 52, Issue 3, May–June 2023, Pages 149-152

# Growing Pains of Nonphysician Providers in Radiology

Robert Martin MPH

Show more

Share Cite

https://doi.org/10.1067/j.cpradiol.2023.01.001

Get rights and content

Nonphysician providers (NPPs) place in medicine continues to evolve regardless of controversy. NPPs presence in academic and private practices continues to grow in all fields. Despite their growth, there remains Contention and debate about the capability, safety, efficiency, and aptitude of NPP's abilities for proper image ordering, image interpretation, and performing radiology-related tasks. NNPs role in healthcare across the United States continues to grow in all facets of healthcare, including radiology and radiologist related procedures. The claims submitted by NPPs involving radiology have significantly increased. However, current research suggests that the current scope of practice maintains the levels of capability, safety, efficiency and aptitude of a physician. It is imperative to note that there remains no evidence comparing diagnostic accuracy/errors between NPPs and radiologists. Despite the increased radiology services rendered by NPPs, the output of NPPs is still fractional compared to radiologists but it is mostly fluoroscopy and radiography. As with medical student education, the education for NPPs has continued to grow to encompass more aspects of medicine, including radiology. Evidence-based programs for NPP radiology training offers potential to encourage proper radiology service rendering. 10,15 NPPs are skilled in their ability to provide care for specific common conditions and potential greater ability to follow protocol. All of these factors promote the opportunity to take tedious tasks

and/or cases from overworked radiologists to pursue greater generation of profit and work-life balance.

## Introduction

The utility of nonphysician providers (NPP) has long been a subject of great contention due to the implications on the healthcare systems overall cost of care, impact on practices, and scope of practice. The abilities of NPP's have long been debated in regard to their capability, safety, efficiency, and aptitude in more advanced aspects of medicine. In more recent times, there has been greater scrutiny on NPP's proper image ordering, or even, the interpretation of imaging. There has been a reduction in the number of radiology practices to meet the demand for an imaging-happy healthcare system, while the amount of NPPs in radiology practices and the general healthcare system has drastically increased.

The purpose of this review is to identify the current evidence related to NPP integration into the radiological healthcare sector from various perspectives. There is no siding for a specific opinion during this review, but rather the current climate and research related to NPPs in the field of radiology and the ability to integrate NPPs into practices. NPPs presence in academic and private practices continue to grow in all fields as nurse practitioners (NP), physician assistants (PA), and radiologist assistants (RA) continue to permeate both reading rooms and interventionist suites. Despite the increased presence of NPPs in the healthcare sector, diagnostic radiology continues to be slower to adopt these practices compared to interventional radiology.

This review article utilized PubMed, Google Scholar, and Scopus to identify sources for the material of this review. These sources were searched extensively to find peer-reviewed articles that fit the criteria for evaluating NPPs in radiology. Studies included in this review were qualitative, quantitative, and systematic reviews.

Search terms and strings utilized included, but were not limited to: “radiology non-physician provider”, “non-physician provider image ordering”, “nurse practitioner imaging”, “physician assistant imaging”, and “interventional radiology non-physicians”. Inclusion criteria included any studies investigating imaging or intervention practices of NPs, PAs, and/or RAs that were within the past 25 years. The range of dates for this review was expanded to include 25 total years due to the limited presence of adequate research.

The claims for procedures and radiology-related services billed by NPPs has continued to grow exponentially compared to the early 2000s. One study identified the increasing national level of guided vascular and nonvascular procedures performed by NPPs, finding

that NPPs perform 1%-11% of nonvascular invasive procedures with radiologists performing the remaining 97%.[1,2] From 1994-2012 a study investigated 2 large academic hospitals and their Medicare Part B billing for services including paracentesis, thoracentesis, fine-needle aspiration (FNA), superficial lymph node biopsy, abdominal biopsy, thoracic biopsy, and abdominal drainage. This study found claims from NPPs increased in categories for paracentesis (0-17,967), FNA (0-3921), superficial lymph node biopsy (0-251), thoracic biopsy (0-552), abdominal biopsy (+1818%), abdominal drainage (+1008%), and thoracentesis (+3379%). Volumes increased for radiologists and all providers with the total fraction of national services performed by NPPs increasing from 0% to 10.7% for paracentesis, 0.1%-5.7% for thoracentesis, 0%-2.1% for FNA, 0%-1.4% for superficial lymph node biopsy, 0%-1.7% for abdominal biopsy, 0%-1.0% for thoracic biopsy, and 0.1%-1.2% for abdominal drainage.[2]

Another study that examined the impact of NPPs in diagnostic radiology involved identification of the number of imaging services interpreted by NPs specifically. This study examined the time period 1994-2015 and the diagnostic imaging services rendered by NPs. The imaging services that NPPs rendered were often fluoroscopy and plain films with mention of DEXA scans. It was found that there was an increase of 14,711% in diagnostic imaging services rendered by NPPs with radiography and fluoroscopy representing 94% of the NPP-billed imaging. Despite this large increase, the number of studies rendered by NPPs only accounted for 0.01% in 1994 and 1.27% in 2015 of all imaging services.[3] There were geographic variations of adoption of NPP-billed imaging with state-to-state variation existing alongside local care patterns and scope-of-practice laws. It was found that NP-billed imaging was least adopted in PA and Hawaii while NPP-billing was most common in South Dakota and Alaska.[3] However, there is still considerable state-to-state variation alongside local care patterns and scope-of-practice laws.

Further, another study from 2002-2012 found an increase in liver and kidney biopsies performed by NPPs by 274% and 1267%, respectively.[4] In a study that examined Medicare fee-for-service procedures performed by NPPs from 1993-2008, a 133% increase in paracentesis procedures performed by NPs and PAs was found whereas thoracentesis procedures decreased by 14%. On the other hand, radiologists' services for paracentesis and thoracentesis increased by 964% and 358%, respectively.[5]
Despite the increase in procedures performed by NPPs, there do not appear to be statistically significant differences in the efficacy nor complication rates of tasks performed by NPPs. In a study regarding NPPs performance of biopsies, it was found that 100% of the liver biopsies performed by NPs were diagnostic, compared to the 99.6% of physicians. In addition, NPPs had a minor complication rate of 1.4%, compared to 0.7% for physician's with

differences that were not found to be statistically significant.[6] Additional invasive procedures were explored by a study involving large-volume paracentesis that also found no statistical differences between NPs and physicians in the volume of ascites removed, postprocedural bleeding complications, or postprocedural infection rates.[7] In addition, the placement of subcutaneous chest port placement was found to have no statistically significant differences between NPs, IR faculty members, or trainees. Further analysis of complication rates of the aforementioned study found a complication rate for NPs of 2% compared to 1.3% for faculty, and 0.56% for IR fellows, but these differences were not statistically significant.[8]

A far less investigated group is RA performance of procedures and their complication rates. There are few studies that directly investigate the impact of RAs on practice or their difference in comparison to physicians. In a study investigating the placement of central venous access procedures by RAs there was no statistically significant difference in complication rates of RAs compared to the attending physicians or IR fellows.[9]

In regards to diagnostic image reading, at this time, there have been no studies identified by this author on the diagnostic error variation between radiologists and NPPs. Further research is needed to compare the performance of NPPs, resident radiologists, and attending radiologists.

A common concern of the integration of NPPs into the healthcare system is the increased and/or inappropriate use of healthcare resources such as the imaging ordered by NPPs for patients. There has been resistance to expanded advanced care provider coverage posted by the American Medical Association (AMA) due to cited NPP overuse of imaging and continued beliefs of inferiority of care.[12] This is a difficult topic as there are few studies comparing the performance of physicians to NPPs in regards to imaging orders and radiology involvement resulting in a controversial and sensitive discussion. One study found that there was a 33%-36% (OR 1.33 and OR 1.36 for established and new patients, respectively) increase in utilization of imaging orders via advanced care providers for Medicare patients compared to PCP physicians.[10] Of the limited additional research, there are mixed study results regarding the difference in physician and NPP diagnostic imaging order patterns. One article comparing the ordering completed by NPPs for radiography, CT, and MRI, compared to physicians, found no statistical difference in low-value imaging ordering nor the quality of care.[11] In comparison, a study from 1999 investigating the difference in resource utilization of NPs in a primary care setting, compared to physicians, was statistically significantly higher in 3 of 17 measures. The statistically significant differences were the greater number of ultrasound, CT, and MRI examinations ordered by NPs.[13]

NPPs role in healthcare across the United States continues to grow in all facets of healthcare, including radiology and radiologist-related procedures. Despite the growing imaging demand and radiologist-related procedures, the availability of radiology practices and radiologists continues to fall short of demands. Radiology practices have reduced by 36.5% whereas the NPP-employed practices increased by 10.4%. NPPs specifically employed for radiology practices have increased by 17.5%. The locations most likely to employ NPPs for radiology practices are medium-sized, urban locations, with early-career radiologists that perform a greater percentage of IR procedures.[14] It is without a doubt that NPPs presence in IR suite and reading room will continue to grow as there is greater push from the American Academy of Physician Assistants (AAPA) alongside the American Association of Nurse Practitioners (AANP) for greater NPP independence. In addition, the labor shortage of radiologists will only compound the problem as the number of required reads for outpatient, inpatient, and STAT studies continues to climb at major centers.

One current issue is that there is currently no radiology-specific standardized training program for NPPs. This issue can be addressed with a rigorous radiology training program with direct guidance before implementation into the practice. The presence of a well-defined training regimen, alongside a strict scope of practice clarified by supervising radiologists, can make great efficacy and turnaround with the implementation of NPPs into radiology practices.[15] Additional adaptation of formal RA training/educational programs, such as current RA graduate school curriculums, can potentially be utilized to provide a well established organizational and educational structure for other NPPs. Further supporting this can be the implementation of NPP reporting structure to facilitate communication between NPPs and radiologists. The structure can vary depending on the number of NPPs employed. For example, a practice with one or two NPPs can report directly to a supervising radiologist/physician whereas a large multi-specialty center may require different reporting structure (ie, report to division director or lead NPP who works with division directors in all areas the NPP functions). Further integration may involve the utilization of time-driven activity-based costing (TDABC) which involves matching of performed tasks with clinical skills to optimize resources. This TDABC matching can ensure that NPPs are receiving appropriate studies for their scope of practice while radiologists can focus on other higher RVU imaging. The current evidence suggests that with appropriate scope of practice, NPPs can improve the efficiency and value of care while being as safe as the care provided by a physician.[16,17] However, there is no current evidence comparing the diagnostic errors and/or capabilities between radiologists and NPPs.

Another financial aspect to consider is that while RAs can perform minimally invasive procedures, they cannot bill for them due to not being considered qualified Medicare

healthcare providers.[1]RAs are formally trained on image-guided procedures including patient evaluation prior to, and following, procedures alongside the identification and treatment of complications.[1] Though focalizing around procedures, RA training does include image interpretation, allowing the ability to make initial impressions and dictate observations for radiologist's final approval, similarto a radiology resident workflow. Though RAs have varying levels of radiologist supervision, they require constant collaboration with the radiologist. On the other hand, NPs and PAs can bill for a 85% reimbursement in the Medicare Physician Fee Schedule (MPFS) for procedures performed (paracentesis, thoracentesis, percutaneous biopsy, and central venous access).[1,16] The presence of the physician in-room with personal supervision can result in full 100% reimbursement so long as the radiologist sufficiently participates in performance of the procedure alongside the preparation of their own report; it is recommended that the radiologist be scrubbed in and hands-on throughout the procedure. Mere presence, without direct participation, of the radiologist requires that the practice bills using the correct radiologic supervision and interpretation ("S&I") or CPT codes with a modifier to indicate a reduced service identifying that the radiologists did not sufficiently render the services themselves (S&I 70000 and 20000 or CPT 30000 with a "-52" modifier). Further, when physicians submit claims for reimbursement to federal programs via the Form CMS-1500, those physicians certify that they personally furnished the services. Additional definitions identified by Form CMS-1500 state: “Rendering Provider does not include individuals performing services in support roles, such as lab technicians or radiology technicians.” (Thomas Greeson, J.D., MBA., email communication, February 7, 2023)

It is imperative to consider the geographic variation in NPP billing requirements mandated by local payers. The local scope of practice, determined by the supervising physician, can permit NPPs to perform minimally invasive procedures and bill Medicare via their own NPI for diagnostic image rendering.1, 2, 3, 4 Despite the increase in diagnostic imaging rendered by NPPs, the process of reimbursement remains relatively unclear; MPFS does not clearly state the reimbursement of NPP-rendered imaging. This is in stark contrast to the clear 85% reimbursement for a sole NPP providing IR or inpatient-related care. Coding and billing for diagnostic services performed by NPPs are complex and vary state-to-state with local payer-related concerns. To compound the confusion, Medicare claims do not identify whether NPPs are employed by radiology or other specialty physician groups. This results in uncertainty about the exact role of these employees in radiology practices compared to other specialty groups when conducting research on Medicare claims data.

Outside of finances, NPPs have also been demonstrated to improve other aspects of safety and efficiency. In a study that utilized nurses, it was found that the nurses could aid the

imaging process by screening patients for the appropriateness of imaging, patient scheduling, preimaging information, and gathering relevant clinical information.[18,19] In addition to supplemental services, NPPs can also coordinate multidisciplinary teams, service lines, education for students, and clinics.[1]

NPPs can further be utilized for nonprocedural and nondiagnostic benefits including the performance of inpatient consultations, preprocedural patient evaluation, imaging appropriateness screening, procedure/imaging consent, and postprocedural inpatient care. The NPPs ability to bill for services that are tedious, or under-billed, by physicians can add an additional revenue of funds that were not previously utilized. NPPs can be utilized as educators for students as they may have more time to educate and have a greater opportunity to do so without the stress of time obligations.[17] In comparison, a systematic review created a standardized evaluation of cost-effectiveness for NPs inclusion in practice, but still found mixed results in care and cost; this may have been due to other studies having a lack of protocol and/or standardization.[20]

Further research will have to be done to see if there is a marginal or drastic difference between NPPs and radiologists. However, there remains concerned about NPPs ordering excess imaging compared to their primary care physician counterparts. This concern is fair, but the study completed reflects on just Medicare patients and is becoming dated. As with medical student education, the education for NPPs has continued to grow to encompass more aspects of medicine, including radiology. Evidence-based programs for NPP radiology training offer potential to encourage proper radiology image ordering and interpretation.[10,15]

To support the integration of NPPs into radiology practices, there are various tools from the American College of Radiology (ACR) such as appropriateness criteria, R-SCAN, incidental finding white papers, and other resources that aid advanced providers in image ordering, diagnostic imaging recommendation, and diagnostic image rendering.[21] NPPs are skilled in their ability to provide care for specific common conditions and potentially greater ability to follow protocol. This can take tedious tasks and/or cases from overworked radiologists/physicians to pursue greater profit and work-life balance.

## Section snippets

## Conclusion

NPPs role in healthcare across the United States continues to grow in all facets of healthcare, including radiology and radiologist-related procedures. The claims submitted by NPPs involving radiology have significantly increased while the current scope of practice of NPPs maintains the levels of capability, safety, efficiency, and aptitude of a physician. However, it is imperative to note there remains no evidence comparing diagnostic accuracy/errors between NPPs and radiologists. Further, …

Recommended articles

## References (21)

CM Hawkins *et al.*
The impact of nonphysician providers on diagnostic and interventional radiology practices: Regulatory, billing, and compliance perspectives
J Am Coll Radiol (2015)

R Duszak *et al.*
Expanding roles of nurse practitioners and physician assistants as providers of nonvascular invasive radiology procedures
J Am Coll Radiol (2015)

W Angel *et al.*
Percutaneous hepatic and renal biopsy procedures: An 18-year analysis of changing utilization, specialty roles, and sites of service
J Vasc Interv Radiol (2015)

R Duszak *et al.*
National fluid shifts: Fifteen-year trends in paracentesis and thoracentesis procedures
J Am Coll Radiol (2010)

FB Murphy *et al.*

Comparison of image-guided nonfocal hepatic biopsies performed by physicians and nurse midlevel providers
J Am Coll Radiol (2014)

N Gilani *et al.*
The safety and feasibility of large volume paracentesis performed by an experienced nurse practitioner
Ann Hepatol (2009)

AM Silas *et al.*
Complication rates and outcomes of 536 implanted subcutaneous chest ports: Do rates differ based on the primary operator's level of training?
Acad Radiol (2010)

JR Benham *et al.*
Complication rate of venous access procedures performed by a radiology practitioner assistant compared with interventional radiology physicians and supervised trainees
J Vasc Interv Radiol (2007)

S Santavicca *et al.*
Radiology practices employing nurse practitioners and physician assistants: Characteristics and trends from 2017 through 2019
J Am Coll Radiol (2022)

CC Blackmore *et al.*
Physician assistants in academic radiology: The Harborview experience
J Am Coll Radiol (2004)
There are more references available in the full text version of this article.

## Cited by (2)

Seven Challenges in Radiology Practice: From Declining Reimbursement to Inadequate Labor Force: Summary of the 2023 ACR Intersociety Meeting
2025, Journal of the American College of Radiology

Show abstract

NAM National Plan for Health Workforce Well-being: Applications for Radiology

2024, Academic Radiology

> *Citation Excerpt :*
>
> …Options to meet the demand for radiology services include expansion of the utilization and the scope of practice for physician assistants and other advanced practice providers. However, some contested this based on the much shorter training period (106). There is also a need to expand training positions in technologists and nursing schools to meet the demand for nurses and technologists.…

Show abstract

The author declares no conflict of interest.

View full text