Professional Services Rendered by Nurse Practitioners and Physician Assistants in Radiology Practices

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The expanding use of non-physician practitioners (NPPs) in radiology practice has been a matter of both interest and contention within the radiology community [1,2].

Prior Medicare-based studies have reported dramatic national growth in NPP performance of services traditionally rendered by radiologists, such as paracentesis and thoracentesis [3], central venous access [4], and imaging interpretation [5].

But because of the way provider types are coded in Medicare claims, it is unknown from those earlier studies whether those NPPs were employed by radiology or other specialty practices.
Background

- Santavicca et al. recently reported a 10.5% increase in the number of U.S. radiology practices employing nurse practitioners and physician assistants [6]
- Practices were more likely to employ NPPs when larger in size, located in urban areas, having a larger interventional radiologist composition, and employing younger radiologists
- However, the specific clinical roles of those NPPs in their respective practices was not examined
Methods

Radiology Practice and Radiologist-Employed NPP Identification:

- Using publicly available Centers for Medicare and Medicaid Services (CMS) Doctors and Clinicians (formerly Physician Compare) databases which include all eligible Medicare participating providers from 2017 to 2019, we extracted information for each individual provider in all group practices using reported unique organization identifiers.

- In a manner recently described [6], we defined “radiology practices” as groups in which 100% of affiliated physicians self-identified their primary specialty as diagnostic radiology, interventional radiology, or nuclear medicine (together “radiologists”).

- We then identified all self-reported nurse practitioners and physician assistants (together, NPPs) affiliated with those practices.

- As complete data for physician assistants were not reported in Physician Compare files prior to 2017 (personal communication from Medicare’s Quality Payment Program Service Center on October 26, 2021), our analysis focused on years thereafter.

We refer to nurse practitioners and physician assistants collectively as “NPPs.”
Methods

Characterization of Non-Physician Practitioners:

- For each identified NPP in the 50 states and District of Columbia, we used the CMS Doctors and Clinicians files to compute both the number of NPPs and the number of radiologists employed by their group practices.
- During the three-year period, 84/865 (9.7%) distinct NPPs were affiliated with two radiology group practices; for the purposes of this investigation, these NPPs were assigned to the group associated with the larger number of radiologists.
- CMS National Provider Identifiers were used to obtain information regarding each NPPs' Medicare billed services from the separate publicly available CMS Physician and Other Suppliers Public Use Files (POSPUF).
  - POSPFU contains provider-service level counts of all Part B fee-for-service Medicare claims billed more than 10 times annually.
- Annual POSPFU data sets from 2017-2019 were used to extract self-reported provider type, self-reported gender (reported by Medicare in a binary fashion as male or female), billing location (state, ZIP code), Rural-Urban Commuting Area (RUCA) code, and line service count.
- NPPs affiliated with radiology practices who did not submit claims to Medicare were absent in POSPFU and thus excluded from our analysis.
- Additionally linking CMS Physician Fee Schedule files to annual Medicare Part B claims data using Current Procedural Terminology (CPT) codes, we calculated the total relative clinical work effort attributed to individual reported services for each claims-submitting NPP as the product of line service count and corresponding 2021 work relative value units (wRVUs).
- NPPs were each assigned to a U.S. Census region based on their reported state.
- Each NPP’s billing location was further characterized as urban or rural using the Census tract-based RUCA classification scheme, with urban defined as RUCA codes corresponding to a metropolitan area core or metropolitan area with high commuting.
Methods

Medicare Service Classification:
- For each NPP, wRVUs were aggregated for all three service categories to compute the percentage of total clinical work effort attributable to each service category
- In a manner similar to that described by Rosenkrantz et al for radiologist subspecialty determination [8,9], each NPP’s majority wRVU focus was determined when greater than 50% of their total wRVUs were attributable to a specific service category

<table>
<thead>
<tr>
<th>Service Category</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical evaluation and management (E&amp;M)</td>
<td>• E&amp;M family CPT code between 99201-99499</td>
</tr>
<tr>
<td>Invasive imaging-guided procedures</td>
<td>• surgical family CPT code between 10000-69999</td>
</tr>
<tr>
<td></td>
<td>• Neiman Imaging Types of Service (NITOS) invasive CPT code [7]</td>
</tr>
<tr>
<td>Non-invasive diagnostic imaging</td>
<td>• NITOS non-invasive diagnostic imaging CPT code [7]</td>
</tr>
<tr>
<td>Other services (EXCLUDED)</td>
<td>• all other remaining services (e.g., peripheral intravenous access, injectables during procedures, vaccine administrations)</td>
</tr>
</tbody>
</table>
Methods

- To examine associations between service categories in which radiologist-employed NPPs focused the majority of their wRVU work effort and independent demographic, geographic, and claims factors.

- We estimated odds ratios (ORs) using a generalized estimating equations-based multinomial logistic regression model controlling for annual fixed effects with robust standard errors for whether each NPP focused a majority of their wRVU work effort in one of three service categories.

Outcome variable

- Majority wRVU focus
  - **Baseline**: Clinical E&M
  - Invasive procedures
  - Non-invasive imaging

Covariate measures

- Continuous
  - Individual NPP service count
  - Number of practice radiologists
  - Number of practice NPPs
  - Years of each NPP's experience

- Categorical
  - Provider type
  - Gender
  - Census region
  - Urban vs. rural location
Results

- All Non-Physician Practitioners
- Nurse Practitioners
- Physician Assistants

Counts of Non-Physician Providers

- Majority wRVU Focus
- Clinical E&M
- Invasive Procedures
- Non-Invasive Imaging

Years: 2017, 2018, 2019
**Results**

**Invasive procedures**
- **Majority wRVU focus**
  - +17.5% from 326 (62.3% of all NPPs) to 382 (63%)
  - From 132 radiology practices in 2017 and 116 in 2019
- **Performed any service**
  - +18.3% from 387 (74%) to 458 (75.3%)
  - From 149 radiology practices in 2017 and 181 in 2019

**Clinical E&M**
- **Majority wRVU focus**
  - +9.7% from 185 (35.4% of all NPPs) to 203 (33.4%)
  - From 113 radiology practices in 2017 and 116 in 2019
- **Performed any service**
  - +7.6% from 329 (62.9%) to 354 (58.2%)
  - From 155 radiology practices in 2017 and 170 in 2019

**Non-invasive imaging**
- **Majority wRVU focus**
  - +83.3% from 12 (2.3% of all NPPs) to 22 (3.6%)
  - From 7 radiology practices in 2017 and 14 in 2019
- **Performed any service**
  - +31.8% from 85 (16.3%) to 112 (18.4%)
  - From 41 radiology practices in 2017 and 66 in 2019
Results

Likelihood of Invasive Imaging-Guided Procedural Focus (vs. Clinical E&M)
- Number of group radiologists (OR=1.01 per additional radiologist, 95%, P=.010)
- Medicare service count (OR=1.13 per 100 services, P<.001).
- Physician assistants (OR=4.67 vs. NPs, P<.001).
- Urban locations (OR=5.71 vs. rural, P<.001)
- South (OR=2.20 vs. West, P=.001)

Likelihood of Non-Invasive Diagnostic Imaging Focus (vs. Clinical E&M)
- Number of group radiologists (OR=1.02 per additional radiologist, 95%, P<.001)
- Medicare service count (OR=1.25 per 100 services, P<.001)
- Male gender (OR=2.95 vs. female, P=.025)
- Physician assistants (OR=4.74 vs. NPs, P=.011)
- Midwest (OR=7.74, P=.011) or Northeast (OR=10.92, P=.008) (both vs. West)
Discussion

- The need for interventional radiology practices to expand and support their clinical services has been highlighted in previous reports describing increases in E&M services rendered by interventional radiologists [10,11].
- Expansion of E&M services has been associated with increases in both the volume and complexity of interventional radiology procedures [12].
- NPPs have been described as part of a team-based approach, within appropriate regulatory confines, to grow an interventional radiology practice’s clinical presence [13,14].
- We believe that the observed growth of E&M services rendered by radiologist-employed NPPs, particularly in light of increased employment of NPPs by radiology practices with larger interventional presences [6], reflects ongoing adoption of such team-based interventional radiology care.
Discussion

- The number of imaging interpretation services rendered by radiologist-employed NPPs grew considerably during our short observation window.
- Makeeva et al previously reported even more dramatic relative growth (+14,711%) in the volume of imaging services rendered by NPPs nationwide between 2004 and 2015, but they were unable to map those NPPs to their specialty groups (e.g., radiology vs. non-radiology practices) [5]
  - With other Medicare datasets since 2017 fully including nurse practitioners and physician assistants, such linking is now possible.
- In contrast to NPPs more broadly providing a variety of radiography and fluoroscopy services, we found that 86.7% of all imaging interpretation services billed by radiologist-employed NPPs fell into two narrow groups (DEXA and swallowing studies) which seem qualitatively different than most traditional diagnostic imaging performed by most radiologists.
  - Both are examinations with potentially low radiologist interest, and ones already being assumed by other specialties (i.e., DEXA by endocrinologists and swallowing studies by speech pathologists).
  - As such, radiologist-employed NPPs are performing services that the specialty may otherwise be at risk of dispossession entirely to non-radiologists, thus keeping these examinations within the specialty.
Take Home Points

- As the number of radiologist-employed NPPs increased 16.3% between 2017 and 2019, their associated national Medicare wRVUs increased 17.3% overall.
- National radiologist-employed NPP wRVUs increased 40.0% for E&M, 5.6% for invasive procedures, and 74.0% for imaging interpretation.
- A majority of radiologist-employed NPPs perform invasive procedures and E&M (75.3% and 58.2% in 2019, respectively).
- Of all three service categories, radiologist-employed NPP relative growth has been largest (+31.8%) in imaging interpretation (18.4% of all radiology NPPs in 2019).
References


Thank you for your time! Please contact Stefan Santavicca with any questions.