

Physician Assistant and Nurse Practitioner Malpractice Trends

Medical Care Research and Review

1–12

© The Author(s) 2016

Reprints and permissions:

sagepub.com/journalsPermissions.nav

DOI: 10.1177/1077558716659022

mcr.sagepub.com



**Douglas M. Brock¹, Jeffrey G. Nicholson²,
and Roderick S. Hooker³**

Abstract

Trends in malpractice awards and adverse actions (e.g., revocation of provider license) following an act or omission constituting medical error or negligence were examined. The National Practitioner Data Bank was used to compare rates of malpractice reports and adverse actions for physicians, physician assistants (PAs), and nurse practitioners (NPs). During 2005 through 2014, there ranged from 11.2 to 19.0 malpractice payment reports per 1,000 physicians, 1.4 to 2.4 per 1,000 PAs, and 1.1 to 1.4 per 1,000 NPs. Physician median payments ranged from 1.3 to 2.3 times higher than PAs or NPs. Diagnosis-related malpractice allegations varied by provider type, with physicians having significantly fewer reports (31.9%) than PAs (52.8%) or NPs (40.6%) over the observation period. Trends in malpractice payment reports may reflect policy enactments to decrease liability.

Keywords

malpractice, physician assistant, liability, nurse practitioner, trends

Introduction

American physician assistant (PA) and nurse practitioner (NP) education programs were established in 1965 as a response to emerging health care needs (Cawley,

This article, submitted to *Medical Care Research and Review* on November 7, 2015, was revised and accepted for publication on June 13, 2016.

¹University of Washington, Seattle, WA, USA

²President PA Experts Network, Milwaukee, WI, USA

³Independent Health Policy Consultant, Ridgefield, WA, USA

Corresponding Author:

Douglas M. Brock, Department of Family Medicine, University of Washington, 4311 11th Avenue NE, Suite 200, Seattle, WA 98195, USA.

Email: dmbrock@uw.edu

Cawthon, & Hooker, 2012; Ford, 1982; Starr, 1982). NPs and PAs represent approximately one fifth of the American health workforce holding an active state license to provide care and prescribe medications (Hooker, Brock, & Cook, 2016; U.S. Department of Health & Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis, 2013). PAs and NPs practice in all U.S. states and federal jurisdictions in both primary care and specialty medicine, are employed in nearly every domain of medicine, and provide care for medically underserved and vulnerable populations (Benitez, Coplan, Dehn, & Hooker, 2015; Hooker, Benitez, Coplan, & Dehn, 2013). The expanded presence of PAs and NPs coincides with concerns of physician shortages (Pettersen, Liaw, Tran, & Bazemore, 2015; Sargen, Hooker, & Cooper, 2011). Increasing demand and broadening PA and NP integration into practice has raised some questions regarding the impact these providers may have on the quality of care (Coldiron & Ratnarathorn, 2014; Moses & Jones, 2011).

PA and NP scope of practice regulations and expectations of collaboration with physicians vary by state. PAs must practice under the supervision of a physician, while in many states, NPs may practice with autonomy. Despite these differences, comparison of physician, PA, and NP liability risk, and resulting malpractice and disciplinary actions, provides one indicator of the quality of care (Brock, 1998; Cawley, Rohrs, & Hooker, 1998; Ledges, Victoroff, & Ginde, 2011). Prior studies concluded that the liability risk of a PA or NP was less than that of a physician in terms of malpractice payments or number of citations. These studies drew on the early development of the National Practitioner Data Bank (NPDB). The NPDB collects and releases information related to professional competence including malpractice payments and adverse actions taken with health care providers. Since the inception of the NPDB in 1990, a great deal of data has been accumulated and, with more variables available, the information has become increasingly detailed.

Hooker, Nicholson, and Le (2009) compared PA, NP, and physician malpractice reports and disciplinary actions reported during the first 17 years (1991-2007) of the NPDB. The analysis supported earlier studies in which PAs and NPs were found to have, proportionally, fewer reported malpractice payments and adverse actions per provider than physicians (Cawley et al., 1998). Since that report, the number of PAs and NPs, their distribution across specialty practice, and legislated scope of practice have expanded markedly (Gadbois, Miller, Tyler, & Intrator, 2015). The increasing presence of PAs and NPs, holding broader responsibilities for ensuring the delivery of high-quality health care, suggests the importance of periodically revisiting of the NPDB to examine reports of clinician liability.

New Contributions

This work examines trends and the nature of medical errors underlying NPDB reported malpractice claims and adverse actions reported from 2005 to 2014, extending and expanding on the earlier work of Hooker et al. (2009). Using the NPDB records, we explore trends of provider malpractice and adverse actions, size of malpractice awards,

and the time lapse between an act or omission and the reporting, or judgment, regarding the event. Ten-year trends for risk ratios are provided for physician to PA, physician to NP, and PA to NP malpractice and adverse action records.

Method

The National Practitioner Data Bank

The NPDB was established under the Health Care Quality Improvement Act of 1986. As a national registry of recorded actions, it has received federally required reports of malpractice payments and certain adverse actions on health care practitioners including physicians, PAs, NPs, dentists, pharmacists, nurses, and other licensed health care practitioners in the United States since 1990. Malpractice refers to acts of negligence or incompetence on the part of a professional. Liability refers to legal responsibility, accountability, responsibility, or charge. Adverse actions taken with clinicians can involve licensure, clinical privileges, professional society membership, and exclusions from Medicare and Medicaid participation. Reports can involve health care–related criminal convictions, civil judgments, and other adjudicated actions by any civil or criminal court system.

Ten years of NPDB data (2005–2014) were selected for analysis. From 2004, malpractice payments have been recorded both as the payment that initiated the malpractice report and as the total award that was ultimately paid to the plaintiff. Only the total payment amounts are included in this analysis. As of end of year 2014, the NPDB data consisted of 414,404 events resulting in a malpractice payment or disciplinary action. Since 2005, records have 54 associated variables. The precipitating event is described by variables that include the nature of the event in aggregated form (e.g., diagnosis related) and specific (e.g., failure to diagnose), and the severity of injury (e.g., death). Patient variables include sex, age group, and type (e.g., inpatient).

The 10 years of the study period were each defined by the year that the record was reported to the NPDB. This generally reflects the year that the last malpractice payment was made or the year that an adverse action was taken. The trends examined are therefore outcomes of actions rather than trends in distribution of medical error or other act. Health professionals of interest were reclassified into three types: (a) physicians (allopathic physicians [MD/MBBS], osteopathic physicians [DOs], excluding postgraduate trainees); (b) PAs; and (c) NPs. Certified nurse midwives and certified registered nurse anesthetists were not included in the analysis. The number of practicing providers for each of the 10-year period was obtained in separate ways. The number of physicians was estimated from the American Association of Medical Colleges biennial reports for 2007, 2009, 2011, and 2013 and imputed for missing years. PA data were obtained from the Bureau of Labor Statistics and correlated with licensed PAs and certified/recertified PAs (Hooker & Muchow, 2014). The number of clinically practicing NPs across this period was taken as a 0.8 factor of all reported NPs from the American Association of Nurse Practitioners. This adjustment had been recommended to account for NPs who have little or no clinical responsibilities, working principally

Table 1. Total and Percentage of Adverse Actions (AA) and Malpractice Reports (MR) for Physicians, PAs, and NPs.

Year	Physician			PA			NP			Total		
	Total (AA + MR)	AA, %	MR, %	Total (AA + MR)	AA, %	MR, %	Total (AA + MR)	AA, %	MR, %	Total (AA + MR)	AA, %	MR, %
2005	19,011	26.9	73.1	284	61.3	38.7	207	39.6	60.4	19,502	27.6	72.4
2006	17,637	29.7	70.3	339	66.7	33.3	157	33.8	66.2	18,133	30.6	69.4
2007	16,475	31.0	69.0	334	71.9	28.1	232	49.1	50.9	17,041	32.1	67.9
2008	16,062	32.1	67.9	372	69.1	30.9	230	42.2	57.8	16,664	33.2	66.8
2009	16,034	33.8	66.2	437	70.0	30.0	224	34.4	65.6	16,695	34.8	65.2
2010	16,226	38.0	62.0	531	73.8	26.2	314	61.1	38.9	17,071	39.5	60.5
2011	17,887	46.0	54.0	771	74.6	25.4	312	53.8	46.2	18,970	47.3	52.7
2012	16,845	44.8	55.2	724	77.5	22.5	360	50.3	49.7	17,929	46.3	53.7
2013	17,123	43.9	56.1	594	72.4	27.6	384	53.1	46.9	18,101	45.2	54.8
2014	16,817	44.0	56.0	650	70.8	29.2	462	58.9	41.1	17,929	45.5	54.5
Total	170,117	37.0	63.0	5,036	71.9	28.1	2,882	50.0	50.0	178,035	38.3	61.7

Note. PA = physician assistant; NP = nurse practitioner. A total of 0.1% ($n = 92$) of all unique providers had actions under two or more different licenses (e.g., PA and physician).

in administrative roles (M. Cook, American Association of Nurse Practitioners, personal communication, September 2015).

To adjust for inflation, the net present value of all awards was calculated to January 2014. Adjusted inflation values were calculated using the consumer price index (CPI), an index representing changes in the prices of all goods and services purchased by urban households. Data distributions for malpractice total payments were highly skewed and means were disproportionately influenced by extreme outlying measurements. To reduce the impact of these outliers, the median was selected for reporting central tendency of data.

Results

Spanning 10 years from January 1, 2005 through December 31, 2014, the NPDB recorded 178,035 medical malpractice or adverse actions (Table 1). This represents 104,482 unique providers: 99,070 (94.8%) physicians, 3,064 (2.9%) PAs, and 2,256 (2.2%) NPs. There were 92 practitioners with filed reports who had practiced under more than one of three professional licenses (e.g., PAs who became physicians). Inspection of these 92 individuals failed to reveal interpretable differences from providers who had only a single professional license. They were retained for the current study; their individual records being reported for their discipline at the time of the act or omission.

In the aggregate, nearly two thirds (61.7%) of the reports were malpractice reports, while 38.3% were adverse action reports. The ratio of adverse actions to malpractice payments differed across professions. Physicians had significantly more total malpractice reports than adverse actions (63.0% vs. 37.0%, $p < .001$), but this relationship was

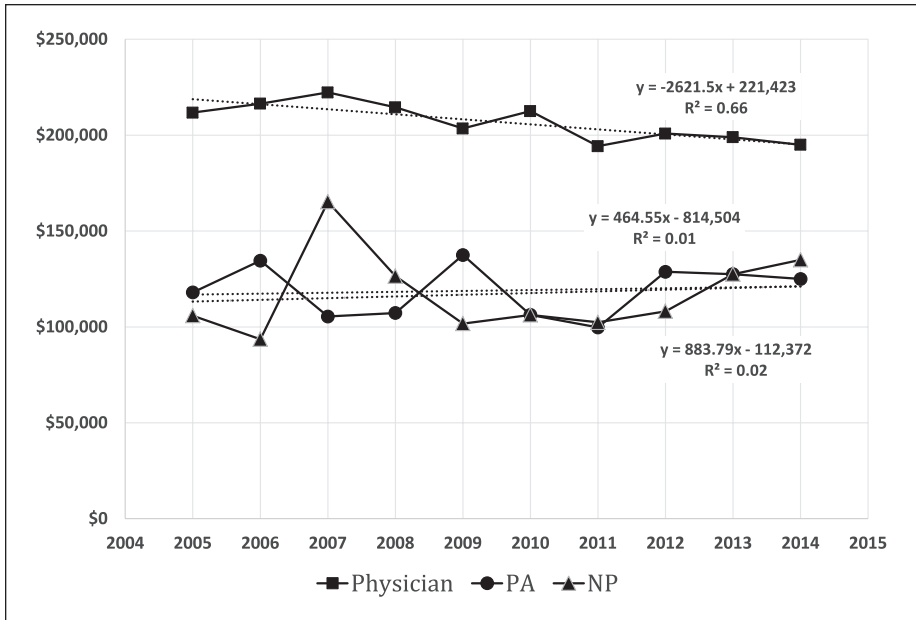


Figure 1. Median total malpractice payment by year for physicians, PAs, and NPs. Note. PA = physician assistant; NP = nurse practitioner.

reversed for PAs who had significantly fewer total malpractice reports than adverse actions (28.1% vs. 71.9%, $p < .001$). NPs were equally distributed between adverse actions and malpractice reports (50.0% vs. 50.0%). Further inspection of Table 1 demonstrates significant increasing percentages (each $p < .001$) of adverse actions relative to malpractice reports for each provider discipline across the 10-year period.

There is considerable variability in the elapsed time between an act or omission and the time that a malpractice payment is reported to the NPDB. The report date is considered the best representation of the date of the judgment. Similar data are not made available for an adverse action associated with an error. While there is minor variability by year, aggregated judgments for PAs ($m = 3.95$ years) and NPs ($m = 4.32$ years) show significantly fewer elapsed years than do physician reports ($m = 4.81$; each $p < .001$) across the 10-year observation period.

The median malpractice payments by year for the study period for all three providers, adjusted to 2014 dollars, are displayed in Figure 1. Physician median malpractice total payments were significantly greater than those of PAs and NPs for each year of data (each $p < .001$). When the slopes of the CPI adjusted median malpractice payments were calculated, the adjusted median physician malpractice award demonstrated a significant decrease ($R^2 = .66$, $p < .001$) across the 10-year period. PA and NP payments fluctuated by year, but the CPI adjusted trend for malpractice awards were not significant ($p = ns$ for both PAs and NPs).

Table 2. Malpractice Counts and Rates.

Year	Number of providers			Malpractice counts			Per 1,000 providers		
	Physician	PA	NP	Physician	PA	NP	Physician	PA	NP
2005	737,473	63,350	88,532	13,992	110	125	19.0	1.7	1.4
2006	747,581	62,960	92,266	12,475	113	104	16.7	1.8	1.1
2007	760,695	67,160	96,000	11,459	94	118	15.1	1.4	1.2
2008	773,809	71,950	100,000	11,001	115	133	14.2	1.6	1.3
2009	786,659	76,900	104,000	10,715	131	147	13.6	1.7	1.4
2010	799,509	81,420	112,000	10,158	139	122	12.7	1.7	1.1
2011	808,680	83,540	118,400	9,743	196	144	12.0	2.4	1.2
2012	817,850	83,640	125,600	9,362	163	179	11.4	2.0	1.4
2013	832,466	88,110	136,800	9,656	164	180	11.6	1.9	1.3
2014	844,340	91,670	153,600	9,477	190	190	11.2	2.1	1.2

Note. PA = physician assistant; NP = nurse practitioner.

Table 3. Adverse Actions Counts and Rates.

Year	Number of providers			Adverse action counts			Per 1,000 providers		
	Physician	PA	NP	Physician	PA	NP	Physician	PA	NP
2005	737,473	63,350	88,532	5,109	174	82	6.9	2.8	0.9
2006	747,581	62,960	92,266	5,239	226	53	7.0	3.6	0.6
2007	760,695	67,160	96,000	5,101	240	114	6.7	3.6	1.2
2008	773,809	71,950	100,000	5,153	257	97	6.7	3.6	1.0
2009	786,659	76,900	104,000	5,426	306	77	6.9	4.0	0.7
2010	799,509	81,420	112,000	6,161	392	192	7.7	4.8	1.7
2011	808,680	83,540	118,400	8,226	575	168	10.2	6.9	1.4
2012	817,850	83,640	125,600	7,553	561	181	9.2	6.7	1.4
2013	832,466	88,110	136,800	7,523	430	204	9.0	4.9	1.5
2014	844,340	91,670	153,600	7,399	460	272	8.8	5.0	1.8

Note. PA = physician assistant; NP = nurse practitioner.

Tables 2 and 3 illustrate, respectively, the number of malpractice and adverse action reports by provider type, estimated number of providers for each year of data, and rate per 1,000 of each action by each provider type. Across the 10-year period, the highest rate of malpractice reports for physicians was in 2005 (19.0 per 1,000) and the lowest in 2014 (11.2 per 1,000). For PAs, the highest rate of malpractice was 2.4 per 1,000 in 2011 and the lowest was 1.4 per 1,000 in 2007. For NPs, the highest rate of malpractice reports was 1.4 per 1,000 in 2005, 2009, and 2012 and the lowest was 1.1 per 1,000 in 2006 and 2010. Linear regression revealed that, across the past 10 years, there has been a significant decrease in the rate of malpractice reports ($R^2 = .89, p < .001$) for physicians. There was a significant upward trend for PAs ($R^2 = .35, p < .001$). The rate of malpractice reports for NPs did not change significantly ($p = ns$).

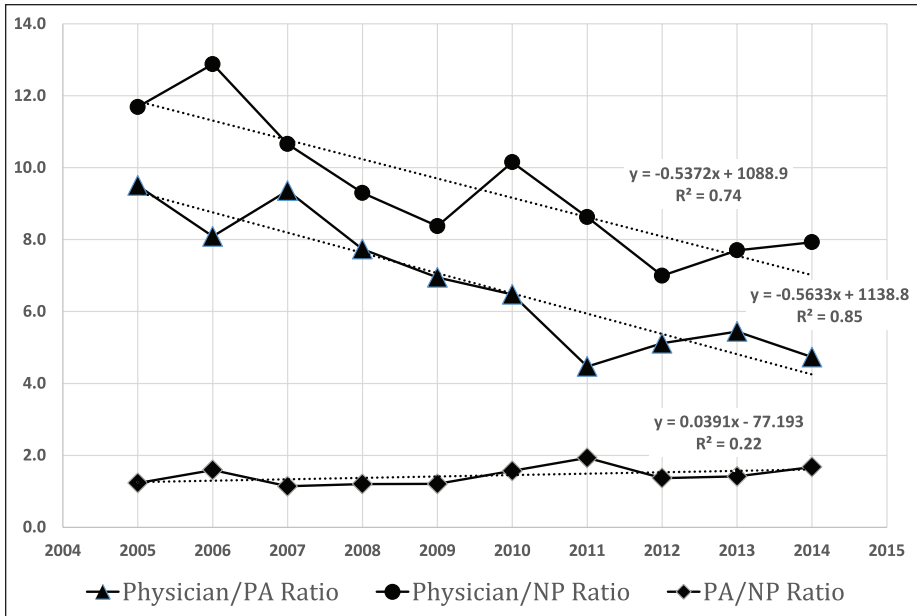


Figure 2. Risk ratio for physician to PA, physician to NP, and PA to NP malpractice reports. Note. PA = physician assistant; NP = nurse practitioner.

Figure 2 graphically displays provider population adjusted ratios of physician to PA, physician to NP, and PA to NP malpractice risk ratios. Risk ratios reflect the ratio of the probability that one group (e.g., physicians) will experience an event (e.g., malpractice award) relative to a second group (e.g., PAs). The risk ratio between physicians and PAs declined significantly across the 10-year period ($R^2 = .85, p < .001$). There was also a significant downward trend in the risk ratio of malpractice reports for physicians in comparison to NPs ($R^2 = .74, p < .001$). The risk ratios of PAs to NPs show an upward trend ($R^2 = .22, p < .05$) in malpractice records across the 10-year period.

Table 3 includes provider population adjusted adverse action counts and rates for physicians, PAs, and NPs. The highest rate of adverse actions for physicians was in 2011 (10.2 per 1,000) and the lowest in 2007 and 2008 (6.7 per 1,000). For PAs, the highest rate of adverse actions was 6.9 per 1,000 in 2011 and the lowest was 2.8 per 1,000 in 2005. For NPs, the highest rate of adverse events was 1.8 per 1,000 in 2014 and the lowest was 0.6 per 1,000 in 2006. Linear regressions revealed that physicians, PAs, and NPs each had a significant increase in the rate of adverse actions across the 10-year period ($R^2 = .62, p < .001$; $R^2 = .56, p < .001$; $R^2 = .62, p < .001$, respectively for physicians, PAs, and NPs).

Figure 3 graphically displays provider population adjusted ratios of physician to PA, physician to NP, and PA to NP adverse action risk ratios. Inspection of Figure 3 reveals significant downward trends in the risk ratio of adverse action records of

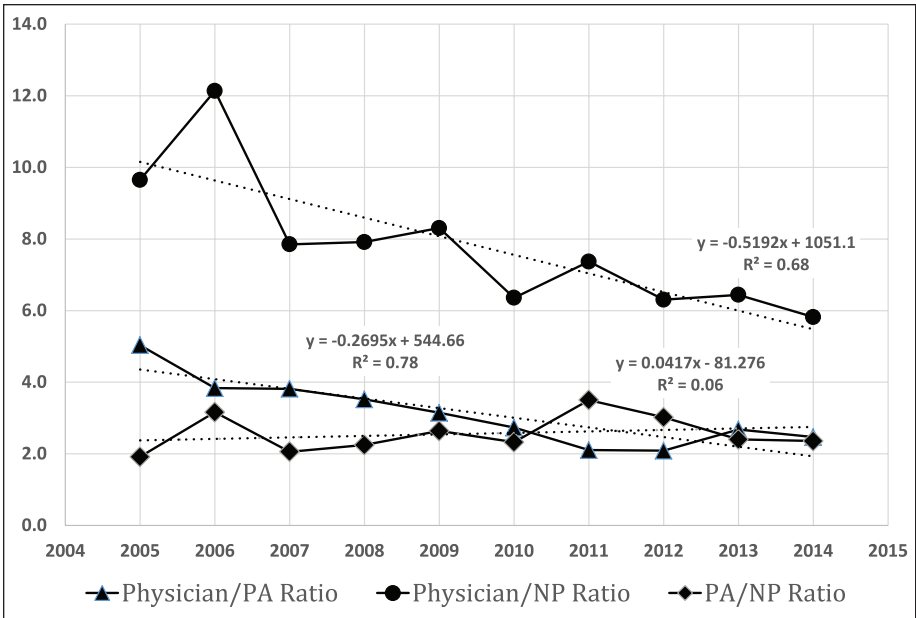


Figure 3. Risk ratio for physician to PA, physician to NP, and PA to NP adverse actions. Note. PA = physician assistant; NP = nurse practitioner.

physicians to PAs and NPs ($R^2 = .78, p < .001$; $R^2 = .68, p < .001$, respectively). The risk ratios of PAs to NPs show a nonsignificant upward trend ($R^2 = .06, p = ns$) in adverse actions records across the 10-year period.

The NPDB classifies medical errors underlying malpractice claims into 1 of 11 broad categories. Table 4 provides the number of malpractice claims and percentage of claims for each of these broad malpractice allegation groupings. The three most common groupings when aggregating provider groups were diagnosis related (32.2%), surgery related (26.0%), and treatment related (19.8%). Examining these three allegation groupings reveals that PAs and NPs were significantly more likely to have diagnosis-related and treatment-related malpractice allegations than were physicians (each $p < .001$). The top four specific allegations in malpractice actions against all three provider groups was the same, though in different order: failure to diagnose, delay in diagnosis, improper management, and improper performance. Approximately two thirds (63.6%) of all claims reflected serious injury across the 10-year period: 32.4% resulting in death, 15.3% in significant permanent injury, 10.9% in major permanent injury, and 5.1% resulting in quadriplegia, brain damage, or lifelong care.

Discussion

Per capita, PAs and NPs were less likely to have made malpractice payments or have been subject to an adverse action than were physicians. It is also apparent that the

Table 4. Malpractice Allegation Groups for Physicians, PAs, and NPs.

Malpractice allegation	Physician		PA		NP		Total	
Diagnosis related	34,155	31.9%	747	52.8%	586	40.60%	35,693	32.2%
Surgery related	28,592	26.7%	56	4.0%	26	1.80%	28,827	26.0%
Treatment related	20,953	19.5%	377	26.6%	465	32.20%	21,977	19.8%
Obstetrics related	8,085	7.5%	10	0.7%	53	3.70%	8,257	7.4%
Medication related	5,553	5.2%	132	9.3%	184	12.80%	5,922	5.3%
Monitoring related	3,293	3.1%	36	2.5%	69	4.80%	3,434	3.1%
Anesthesia related	2,889	2.7%	6	0.4%	16	1.10%	2,947	2.7%
Other miscellaneous	2,463	2.3%	39	2.8%	21	1.50%	2,550	2.3%
Equipment/product related	637	0.6%	7	0.5%	4	0.30%	650	0.6%
Behavioral health related	404	0.4%	3	0.2%	16	1.10%	429	0.4%
Intravenous and blood products related	203	0.2%	2	0.1%	2	0.10%	209	0.2%

Note. PA = physician assistant; NP = nurse practitioner.

reasons for malpractice actions differ between the three provider groups for critical categories including diagnosis, treatment, and surgery. Approximately three quarters of medical malpractice awards for PAs and NPs, but only about one half for physicians, reflected diagnosis- or treatment-related events. This result may be partially explained by the presence of surgeons and anesthesiologists in the physician group, yet it may speak to where PAs and NPs might be most at risk for error. It is also important to note that liability incidence is potentially explained by differences in the number of patients seen and breadth of patient acuity.

Under the doctrine of respondent superior, a plaintiff may hold the physician, as a supervisor, accountable for the actions of his or her employees (Davis, Radix, Cawley, Hooker, & Walker, 2015). From a policy standpoint, the NPDB cannot conclusively indicate that integration of PAs and NPs into health care increases or decreases liability. However, at the aggregate level, these two types of clinical providers are significantly less likely to be subject to a malpractice action than physicians.

A second intent of the study was to compare the findings of the report that looked at the first 17 years of data in the NPDB with the more recent and detailed 10-year data in this study. PA and NP malpractice events per provider were found to be increasing, but PAs and NPs continued to be significantly less likely to make a malpractice payment than physicians. The Hooker et al. (2009) study reported that PAs were 12 times less likely to make a malpractice payment than physicians averaged from 1991 to 2007. Across the more recent 10-year period, this difference continues but the gap between physicians and PAs, and physicians and NPs is decreasing (Hooker et al., 2009).

Adverse actions and malpractice awards may constitute rough incidence estimates of PA and NP medical error rates. Suggesting these estimates adequately describe patient safety is, however, not warranted and no such claims are made because some adverse actions and malpractice awards may reflect spurious complaints. On the other

hand, medical errors and near misses are often not reported and not all substantive allegations will result in an award (Kels & Grant-Kels, 2012).

Limitations

Use of the NPDB for research examining discipline or specialty specific outcomes is challenging. The NPDB does not identify provider specialty with sufficient precision to make unqualified statements about individual provider types (Reich & Schatzberg, 2015). NPDB reports constitute only those actions where a payment has been made, including those actions where a judgment was made in the favor of the provider or when a claimant settled a claim. The NPDB cautions that malpractice awards may not necessarily negatively reflect on the provider's conduct. Chandra, Nundy, and Seabury (2005) estimated that approximately 20% of claims are dropped without a judgment or payment.

The nature and number of physician, PA, and NP malpractice actions may not accurately reflect important considerations such as patient to provider encounter ratio or the extent to which events reflect the actions of an individual or constitute a team error. Without a richer examination of the malpractice and adverse action reports, several potential issues emerge regarding physician versus PA and NP differences. Are physicians experiencing higher acuity patients, and could thus be hypothesized to be at greater risk for malpractice allegations? Are the larger median physician awards a reflection of a patients' perception that higher awards can be obtained from suits against physicians? Do supervising physicians (or physician groups) serve to "shield" PAs and NPs from direct legal actions? Similarly, are physicians' liability for their supervised PAs and NPs, whose actions result in malpractice, inflating physician estimates.

Future Directions

The trends reported in this study may reflect changing distributions of specialty types over time, as well as the increasing scope of practice and broader integration of PAs and NPs into health care delivery. Future work may benefit from national stratified surveys of clinicians across specialty and the investigation of state records and other data sources that can supplement the NPDB public data. Collaboration with the NPDB to report specialty data while maintaining the confidentiality of providers would also be of value.

We are not alone in noting that malpractice claims are declining (Quinn, Kats, Kleinman, Bates, & Simon, 2012). These trends may reflect changes in health care policy and state and federal legislative modifications to malpractice law (Avraham, 2007). Enactment of apology laws and improved management of medical error through disclosure are perhaps being reflected in the NPDB data collection (Ho & Liu, 2011). Each of these legal changes is intended to reduce the likelihood that an error or omission escalates to a malpractice suit and ultimately a report or adverse action.

Earlier investigators concluded from NPDB data that liability risk in terms of number of malpractice payments was less for PAs than for physicians (Brock, 1998; Cawley et al., 1998; Ledges et al., 2011). The work reported in this study aligns with those previous conclusions, but caution is warranted. Legal actions may target physician supervisors, physicians may see more high-risk patients, and increased reporting efforts may have proved more successful with physicians than with PAs and NPs. Each potentially inflates physician counts relative to PAs and NPs. Such conjecture offers fertile directions for future work. Liability rates based on number and acuity of patient encounters would provide a more accurate means for understanding malpractice across provider groups.

Conclusions

The NPDB is a valuable resource for examining liability issues, but its use for supporting widespread policy change requires caution. Despite its limitations, it remains an important and unique data source for the study of broader trends in actions taken following error or negligence. We undertook a provider liability study to compare rates of malpractice reports and adverse actions for physicians, PAs, and NPs. The latest 10 years of observation is consistent with reports that PAs and NPs have lower reports of liability relative to their physician colleagues. This conclusion also aligns with studies reporting on earlier years of the NPDB.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

- Avraham, R. (2007). An empirical study of the impact of tort reforms on medical malpractice settlement payments. *Journal of Legal Studies*, 36(Suppl. 2), S183-S229.
- Benitez, J., Coplan, B., Dehn, R. W., & Hooker, R. S. (2015). Payment source and provider type in the US healthcare system. *Journal of the American Academy of Physician Assistants*, 28(3), 46-53.
- Brock, R. (1998). The malpractice experience: How PAs fare. *Journal of the American Academy of Physician Assistants*, 11(6), 93-94.
- Cawley, J. F., Cawthon, E., & Hooker, R. S. (2012). Origins of the physician assistant movement in the United States. *Journal of the American Academy of Physician Assistants*, 25(12), 36-42.
- Cawley, J. F., Rohrs, R. C., & Hooker, R. S. (1998). Physician assistants and malpractice risk: Findings from the National Practitioner Data Bank. *Journal of Medical Licensure and Discipline*, 85, 242-247.

- Chandra, A., Nundy, S., & Seabury, S. A. (2005). The growth of physician medical malpractice payments: Evidence from the National Practitioner Data Bank. *Health Affairs*. Retrieved from <http://content.healthaffairs.org/content/early/2005/05/31/hlthaff.w5.240>
- Coldiron, B., & Ratnarathorn, M. (2014). Scope of physician procedures independently billed by mid-level providers in the office setting. *Journal of the American Medical Association: Dermatology*, *150*, 1153-1159.
- Davis, A., Radix, S., Cawley, J. F., Hooker, R. S., & Walker, C. (2015). Access and innovation in a time of rapid change: Physician assistant scope of practice. *Annals of Health Law*, *24*, 286-336.
- Ford, L. C. (1982). Nurse practitioners: History of a new idea and predictions for the future. In L. H. Aiken (Ed.), *Nursing in the 1980s: Crises, opportunities, challenges* (pp. 231-247). Philadelphia, PA: Lippincott.
- Gadbois, E. A., Miller, E. A., Tyler, D., & Intrator, O. (2015). Trends in state regulation of nurse practitioners and physician assistants, 2001 to 2010. *Medical Care Research and Review*, *72*, 200-219.
- Ho, B., & Liu, E. (2011). Does sorry work? The impact of apology laws on medical malpractice. *Journal of Risk and Uncertainty*, *43*, 141-167.
- Hooker, R. S., Benitez, J. A., Coplan, B. H., & Dehn, R. W. (2013). Ambulatory and chronic disease care by physician assistants and nurse practitioners. *Journal of Ambulatory Care Management*, *36*, 293-301.
- Hooker, R. S., Brock, D. M., & Cook, M. L. (2016). Characteristics of nurse practitioners and physician assistants in the United States. *Journal of the American Association of Nurse Practitioners*, *28*, 39-46.
- Hooker, R. S., & Muchow, A. N. (2014). Supply of physician assistants: 2013-2026. *Journal of the American Academy of Physician Assistants*, *27*(3), 39-45.
- Hooker, R. S., Nicholson, J. G., & Le, T. (2009). Does the employment of physician assistants and nurse practitioners increase liability? *Journal of Medical Licensure and Discipline*, *95*(2), 6-16.
- Kels, B. D., & Grant-Kels, J. M. (2012). The spectrum of medical errors: When patients sue. *International Journal of General Medicine*, *5*, 613-619.
- Ledges, M., Victoroff, M., & Ginde, A. A. (2011). PAs and malpractice. *Medical Economics*, *88*(19), 34-42.
- Moses, R. E., & Jones, D. S. (2011). Physician assistants in health care fraud: Vicarious liability. *Journal of Healthcare Compliance*, *13*(2), 51-57.
- Petterson, S. M., Liaw, W. R., Tran, C., & Bazemore, A. W. (2015). Estimating the residency expansion required to avoid projected primary care physician shortages by 2035. *Annals of Family Medicine*, *13*, 107-114.
- Quinn, M. A., Kats, A. M., Kleinman, K., Bates, D. W., & Simon, S. R. (2012). The relationship between electronic health records and malpractice claims. *Archives of Internal Medicine*, *172*, 1187-1189.
- Reich, J., & Schatzberg, A. (2015). Empirical comparisons of malpractice claims of different specialties. *Journal of Public Health Aspects*, *2*, 1-7.
- Sargen, M., Hooker, R. S., & Cooper, R. A. (2011). Gaps in the supply of physicians, advance practice nurses, and physician assistants. *Journal of the American College of Surgeons*, *212*, 991-999.
- Starr, P. (1982). *The social transformation of American medicine*. New York, NY: Basic Books.
- U.S. Department of Health & Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. (2013). *The U.S. health workforce chart-book*. Rockville, MD: Author.