Supplemental Digital Appendix 1

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I. DATA SOURCES

The National Practitioner Data Bank (NPDB) is a federal government-run repository of all malpractice claims paid on behalf of licensed healthcare practitioners in the U.S. Malpractice payments for all licensed health care practitioners must be reported within 30 days of payment under the Healthcare Quality Improvement Act of 1986. Liability payments made on behalf of a health care practitioner stemming for either a settlement or judgment of a medical malpractice claim must be reported (see 42 USC §11131).

Based on prior studies utilizing the NPBD, the “other” category includes: anesthesia related, intravenous and blood products related, obstetrics related, monitoring related, equipment or product related, other miscellaneous, and behavioral health related.

II. SPECIALTY DETERMINATION

To estimate specialty-specific trends in claim rates, resident physicians needed to be attributed to a single specialty. However, entities (insurance companies, hospitals, etc.) reporting paid malpractice claims to the National Practitioner Data Bank (NPDB) are not required to report physician specialty. As such, determination of physician specialty within the NPDB public use file is not possible. Further, NPBD expressly advises against making inferences regarding the underlying specialty of a practitioner based on other reported features of claims (e.g., allegation type).

To allow for specialty determination for this study, we submitted a special application to Health Resources and Services Administration (HRSA) to assist in matching physicians and their specialty. HRSA approved the request and performed an internal process by which the national provider identifier (which is not publicly available) was used to match each physician to their reported specialty within the Center for Medicare and Medicaid Services National Plan and Provider Enumeration System in 2016. Each physician within the CMS NPPES must designate a primary specialty designation. Using this methodology, 84% of unique resident physicians were matched to a specialty. Specialty attribution was performed solely by HRSA; researchers from Harvard University and its affiliated institutions only had access to de-identified data that was

provided from HRSA. We also note that specialty attribution was attempted for non-resident physicians, but the overall match rate was not felt to be reliable to allow for specialty-specific comparisons between residents and non-resident physicians.

III. NUMBER OF TRAINEES PER SPECIALTY

To estimate the total exposure (i.e., residents in each specialty by year), we obtained data on the number of residents in each specialty and subspecialty from publicly available data from the ACGME. ACGME reports data on trainees within accredited programs, which includes interns, residents and fellows. Specialty groupings were organized to match the specialty taxonomy utilized within NPPES. Further, we grouped all subspecialties into their relevant primary subspecialties. For example, the total number of fellows within ACGME accredited subspecialties of internal medicine (e.g., cardiology, gastroenterology, etc.) was included in the total number of internal medicine residents.

Data from ACGME on the number of trainees in GME programs per year are based on the academic year (e.g., July 2014 through June 2015). Thus, the arithmetic mean of the number of residents over two consecutive academic years was calculated to estimate the number of residents during one calendar year. For example, the number of residents in calendar year 2002 was calculated as the mean number of residents in academic years 2001-2002 and 2002-2003. The number of residents was not available for 2000-2001 and was imputed based on univariate regression predictions from 2001-2002 to 2015-2016.

IV. PATIENT COMPENSATION FUND PAYMENTS & SENSITIVITY ANALYSIS

Patient compensation funds (PCF) arose in several states as part of responses to escalating malpractice liability payments in many states. Within those states, PCFs pay for liability payments that were judgments or settlements that exceeded statutory limits. PCF payments are reported as separate entries within the NPDB.

To be consistent with previous studies, we employed similar methodology to address the issues related to PCF payments. Specifically, we communicated with authors who employed the methodology in the primary reference cited in the manuscript. PCF payments were excluded from estimates of paid claim rates to prevent double counting. To attempt to summate PCF and non-PCF payments, two reports against the same physician, with the same patient age and same injury severity were considered to be payments for the same claim, only if one of the claims was reported as being a payment from a PCF.

In our study, there were only six instances in which a PCF payment was linked to a non-PCF payment, utilizing the matching methodology employed by Studdert et al. The specialties in which PCF payments were added were: anesthesiology (2), obstetrics/gynecology (1), psychiatry/neurology (1) and unknown (1). The median inflation adjusted payment for all specialties was $198,393 if PCF payments were excluded as compared to a median payment of $199,024

Exclusion of PCF payment amounts has also been performed in some studies published using NPDB data, whereas other studies have not clearly reported how PCF payments were handled. While efforts to include PCF payments in analyses of payment amounts may be worthwhile, it is unclear as to whether their inclusion or exclusion would significantly change estimates of paid claim amounts. Therefore, we ran a simulation study to determine the sensitivity of measures of central tendency for overall and specialty specific payment amounts as a result of exclusion of PCF payments.

Among the 1,301 total paid claim entries for resident physicians in our sample, 53 (4%) were identified as PCF payments. We then randomly matched the 53 PCF payments to 53 non-PCF payments whose underlying non-PCF payment amount met or exceeded $100,000. The threshold of $100,000 was based on review of state PCF funds, with Louisiana having the lowest available threshold.[1]. Matches were completely based on random draws (without replacement), since it was not advisable to match by year or specialty.

For each matched pair (53 in total) we summed the non-PCF and PCF payment amounts, and then computed the overall and specialty-specific medians for the entire sample of paid claims. The simulation was repeated 10,000 times and distributions of the simulated medians of the 10,000 hypothetical matches were assessed.

We found that the overall median payment amount estimated by the 10,000 simulations to be $205,500 (range: $199,800 to $214,700).). We did not deem this value to be very sensitive when compared to the median payment amount for all non-PCF payments ($198,400). It is important to note that the simulation estimates are not measures of uncertainty on the underlying medians of the combined PCF and non-PCF payments and should not be interpreted as such. Instead these estimates reflect the uncertainty inherent to the random matching and are intended to demonstrate the relative lack of sensitivity of our payment median results when compared to the estimate of median payments when excluding PCF payments due to the inability to match them prospectively.

By contrast, simulated specialty-specific median payment amounts, including PCF payments, demonstrated considerable sensitivity. This was not unexpected given the smaller number of claims within each specialty. Thus, we thought it was prudent to not report specialty specific trends in payment amounts due to the uncertainty surrounding PCF payments.

V. GENERALIZED LINEAR MODEL

We explored a model-based approach to analysis as well: a Poisson GLMM is fit to model the specialty specific trends in paid claim rates, and fitted specialty-specific trajectories are plotted in Figures 1 and 2. We fit a random intercepts/slopes model, with a linear fixed effect of time:

$$log(\lambda_{ki}) = \beta_0 + \beta_1 t_i + b_{0k} + b_{1k} t_i$$

where λ_{ki} is the rate for the i^{th} time and the k^{th} specialty. t_i is equal to $i - 2001$. b_0 and b_{1k} are random intercepts and slopes respectively, which are assumed to be normally distributed with standard deviations 0 and 1. Random intercepts permits variation in baseline (2001) rate, and random slopes permit variation in the time trend across specialties. In practice, we observe very little variation in slopes, though a handful of trajectories did cross. We observed that the 1 year RR for a typical specialty is 0.94 (95% CI: 0.92, 0.97), and thus its rate in 2015 is 0.45 (95% CI: 0.31, 0.61) times its rate in 2001.

VI. REFERENCES

1. State patient compensation funds. 2015. American Medical Association Advocacy Resource Center, Chicago, IL.