Emergency Physician and Advanced Practice Provider Diagnostic Testing and Admissions Decisions in Chest Pain and Abdominal Pain

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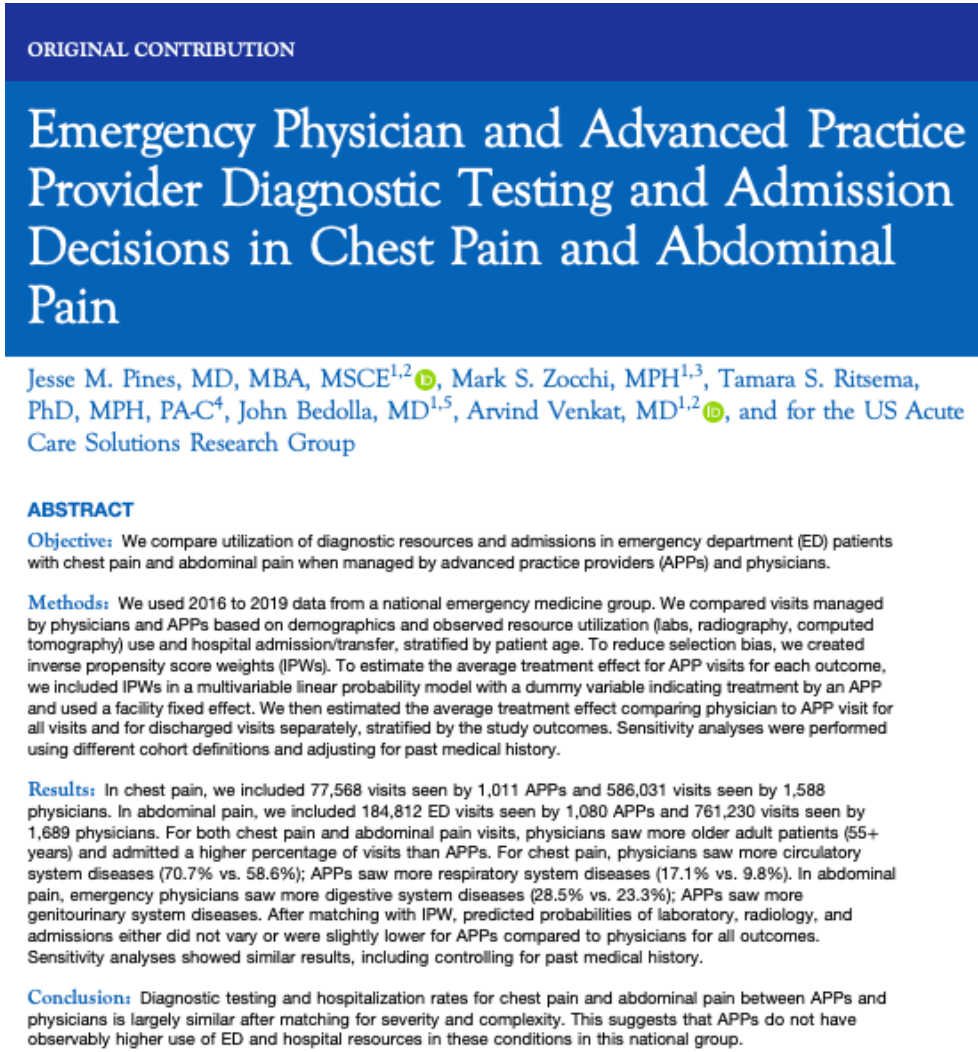

ORIGINAL CONTRIBUTION

Emergency Physician and Advanced Practice Provider Diagnostic Testing and Admission Decisions in Chest Pain and Abdominal Pain

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ABSTRACT

Objective: We compare utilization of diagnostic resources and admissions in emergency department (ED) patients with chest pain and abdominal pain when managed by advanced practice providers (APPs) and physicians.

Methods: We used 2016 to 2019 data from a national emergency medicine group. We compared visits managed by physicians and APPs based on demographics and observed resource utilization (labs, radiography, computed tomography) use and hospital admission/transfer, stratified by patient age. To reduce selection bias, we created inverse propensity score weights (IPWs). To estimate the average treatment effect for APP visits for each outcome, we included IPWs in a multivariable linear probability model with a dummy variable indicating treatment by an APP and used a facility fixed effect. We then estimated the average treatment effect comparing physician to APP visit for all visits and for discharged visits separately, stratified by the study outcomes. Sensitivity analyses were performed using different cohort definitions and adjusting for past medical history.

Results: In chest pain, we included 77,568 visits seen by 1,011 APPs and 586,031 visits seen by 1,588 physicians. In abdominal pain, we included 184,812 ED visits seen by 1,080 APPs and 761,230 visits seen by 1,689 physicians. For both chest pain and abdominal pain visits, physicians saw more older adult patients (55+ years) and admitted a higher percentage of visits than APPs. For chest pain, physicians saw more circulatory system diseases (70.7% vs. 58.6%); APPs saw more respiratory system diseases (17.1% vs. 9.8%). In abdominal pain, emergency physicians saw more digestive system diseases (28.5% vs. 23.3%); APPs saw more genitourinary system diseases. After matching with IPW, predicted probabilities of laboratory, radiology, and admissions either did not vary or were slightly lower for APPs compared to physicians for all outcomes. Sensitivity analyses showed similar results, including controlling for past medical history.

Conclusion: Diagnostic testing and hospitalization rates for chest pain and abdominal pain between APPs and physicians is largely similar after matching for severity and complexity. This suggests that APPs do not have observably higher use of ED and hospital resources in these conditions in this national group.

Background

- Health services research into the contribution of PAs and PA practice patterns has been limited by the invisibility of PAs in large billing datasets.
- A few published papers with dubious methods have asserted that PAs and NPs compensate for their shorter training by ordering more lab and radiology testing to come to a diagnosis
- If PAs /NPs overuse diagnostic resources, the cost savings from hiring them (relative to doctors) would be lost.

Solution

- Look for a non-insurance-based data source. Big data held by large practices and health systems potentially make these analyses possible for the first time
- Partnered with US Acute Care Solutions (USACS) – a very large Emergency Medicine practice with >200 EDs in 19 states.
- USACS has an active research team that does both practice-based evaluation and large scale health services research
- *PAEA was gracious enough to fund this work through the Faculty Generated Research Grant program – thanks!*

Methods (1)

- Marry billing data (not insurance reimbursement data) with the clinical database to get an accurate visit record. USACS does this on a regular basis already.
- For our projects, we created large, de-identified sub-database with 13 million ED visits over a 4 year period from the existing USACS dataset.
- IRB exempt because our data was drawn from existing, de-identified data held at USACS.

Methods (2)

- From this dataset we looked at patients with chest pain (N=946,132) or abdominal pain (N=663,599)
- Chest pain outcome measures:
  - Labs ordered on CP patients
  - ECG
  - Imaging (CT, CXR, US, other)
  - Admissions, stratified by age group
- Abdominal pain outcome measures:
  - Labs ordered on Abd Pain patients
  - ECG
  - Imaging (CT, US, x-rays of abd or chest, other)
  - Admissions, stratified by age group and sex

Methods (3)

- Initial descriptive stats used to compare patient and clinician characteristics
- Inferential statistics were used to control for potential effect modifiers including patient age, number of years in practice for each clinician.
- Separate analyses were run for admitted and discharged patients as a potential marker for disease severity
- Less than 1% of patients had missing data, so patients with missing data were excluded.
- Bonferroni corrections applied for multiple comparisons

Results

Table 1
Characteristics of ED Visits With Chest Pain and Abdominal Pain

	Abdominal Pain				Chest Pain			
	APPs		Physicians		APPs		Physicians	
N (%)	184,812	(19.5)	761,320	(80.5)	77,568	(11.7)	586,031	(88.3)
Total clinicians	1,080	(39.0)	1,689	(61.0)	1,011	(38.9)	1,588	(61.1)
Total facilities	97				83			
Clinician characteristics								
Clinician age, mean (±SD)	37.7	(±8.8)	42.5	(±9.4)	38	(±8.8)	42.1	(±9.4)
Years since first hire, mean (±SD)	3.6	(±3.5)	5.2	(±5.0)	3.5	(±3.5)	5.1	(±4.9)
Female clinicians, %	60.8		30.1		56.9		30.8	
Patient demographics								
Female, %	69.5		65.4		58.6		53.9	
Age, mean (±SD)	36.1	(±18.4)	42.4	(±20.3)	43.2	(±19.5)	52.3	(±18.6)
Age (years), %								
<10	5.2		3.0		2.0		0.4	
10–17	6.6		4.9		4.8		1.6	
18–54	70.8		64.0		64.0		51.8	
55+	17.4		28.1		29.2		46.2	
Payer types								
Commercial	32.1		32.0		33.3		31.0	
Medicaid	35.2		29.0		28.9		20.8	
Medicare	12.9		21.1		20.7		32.8	
Self-pay	17.8		15.8		14.9		13.4	
Other	2.0		2.0		2.2		1.9	
Clinical characteristics								
ESI level								
2	2.9		7.6		30.1		47.4	
3	90.4		90.1		59.5		51.1	
4	6.7		2.3		10.4		1.5	
Admitted/transferred	10.6		23.7		24.6		40.3	

Study sample includes visits from general EDs, 2016 to 2019.
APP = advanced practice provider; ESI = Emergency Severity Index.

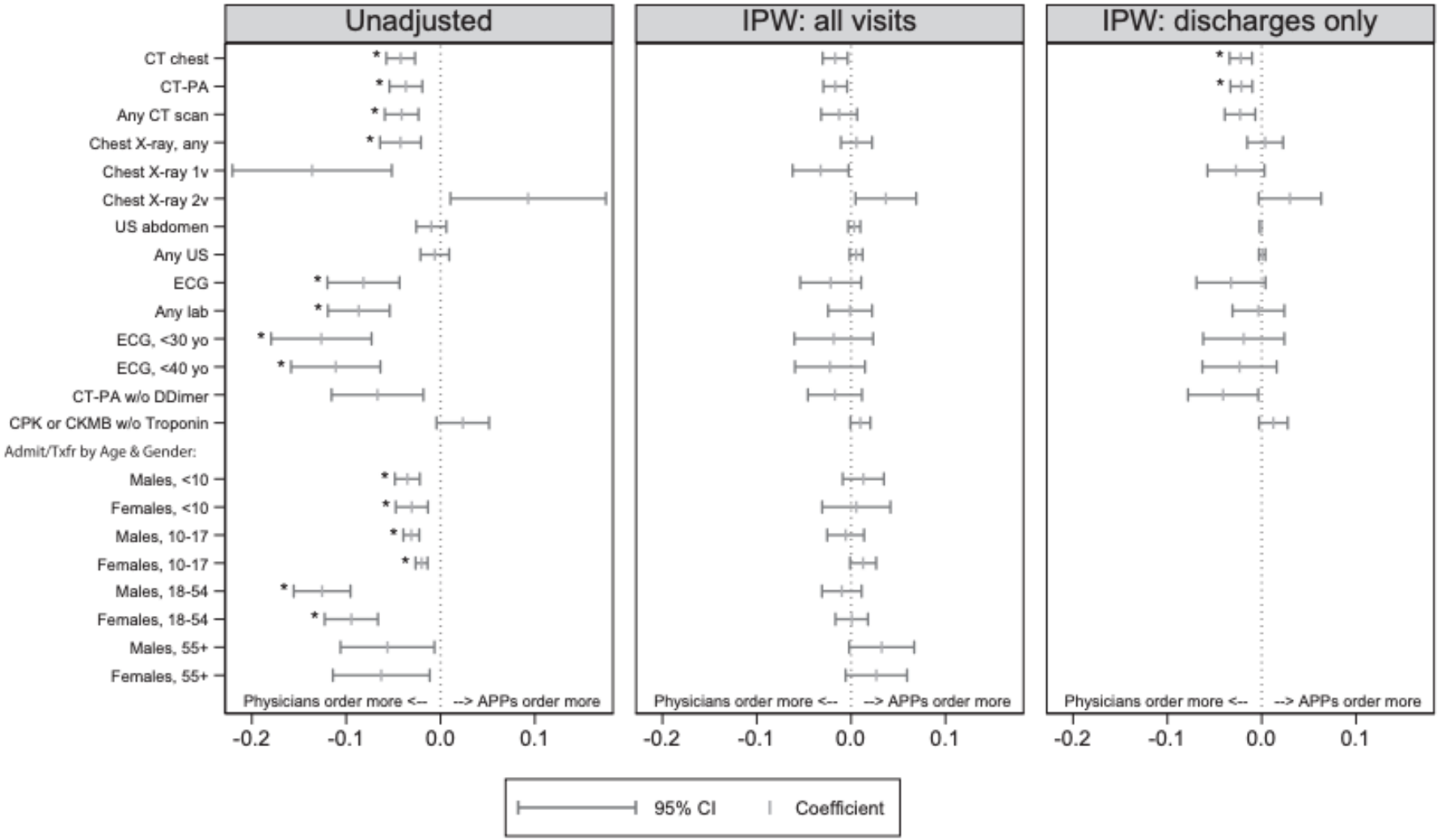
Results (2)

Table 2
Past Medical History in Visits With a Complaint of Chest Pain and Abdominal Pain

	Abdominal Pain				Chest Pain			
	APPs		Physicians		APPs		Physicians	
N (%)	107,309	(21.3)	396,099	(78.7)	42157	(12.8)	287658	(87.2)
Total clinicians	667	(41.0)	958	(59.0)	583	(40.2)	868	(59.8)
Total facilities	50				44			
Past medical history, %								
Hypertension		18.6		30.1		28.9		45.5
Diabetes		10.8		16.2		14.2		22.1
Cancer		3.6		7.0		3.6		6.0
COPD		2.2		4.4		3.9		6.8
Congestive heart failure		1.2		2.8		4.0		7.8
Asthma		11.5		12.3		11.9		11.1
Renal failure		4.8		8.3		4.5		8.1
Total past medical history, %								
None		64.7		51.2		55.1		40.0
1		23.2		27.8		27.3		30.2
2+		12.1		21.0		17.6		29.7

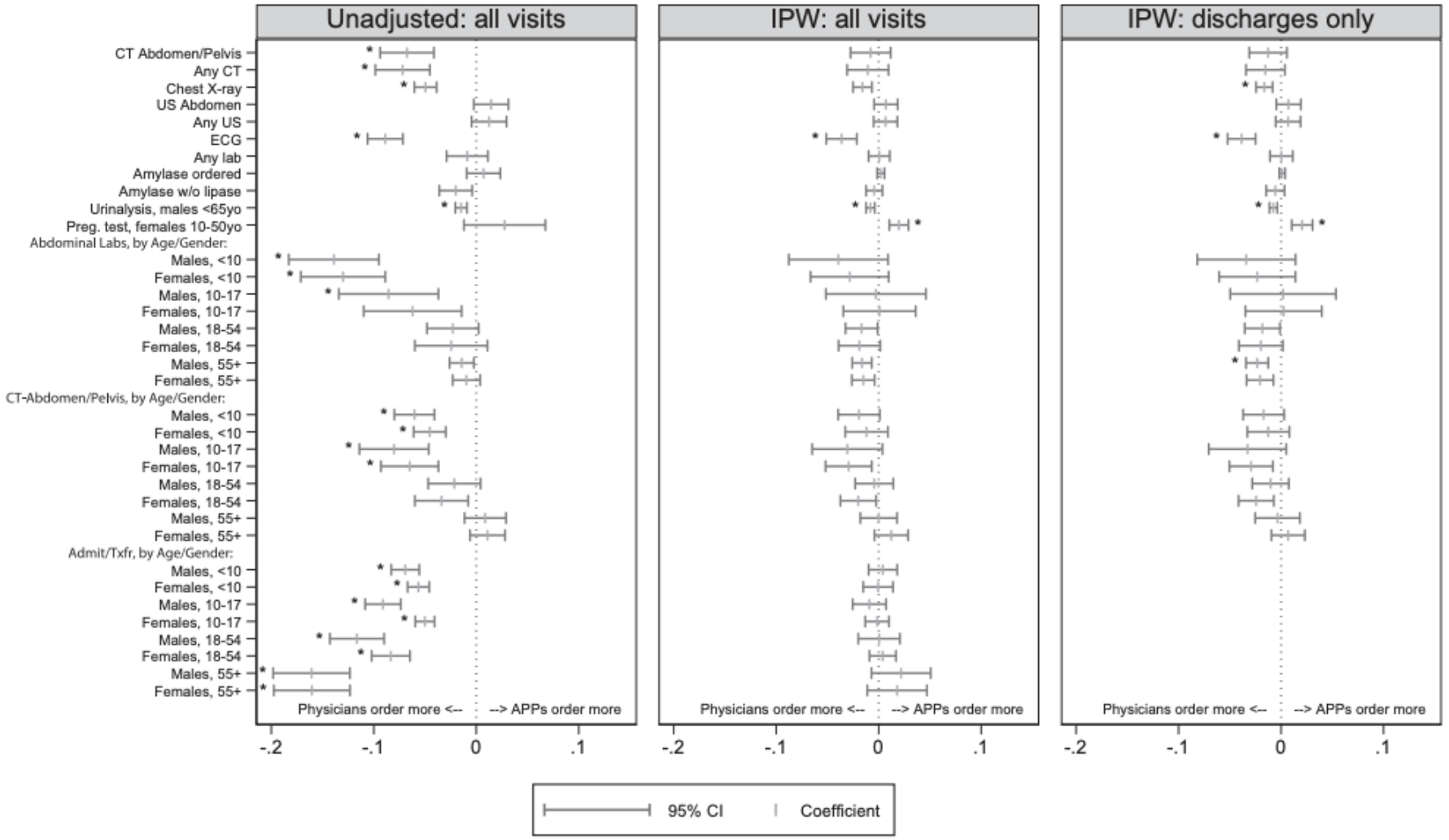
Study sample includes general EDs that submitted data on patient medical histories, 2016 to 2019.
APP = advanced practice provider; COPD = chronic obstructive pulmonary disease.

Results (3) –chest pain only



* = significant after adjustment for multiple comparisons (p<.0014).

Results (4) –abd pain only



* = significant after adjustment for multiple comparisons (p<.0008).

Main Results

- PAs and NPs see more lower acuity CP and Abd pain patients than MDs. However, in this study, 30% of CP patients seen by an APP were at ESI level 2, and 3% of abd pain patients were at ESI level 2. This is compared to 48% of CP patients and 7% of Abd pain patients at ESI 2 seen by MDs.
- Unadjusted analyses showed APPs using fewer resources, however most of these findings disappeared when we controlled for acuity.
- In general, PA/NP practice did not differ from MD practice when all the controllers were put into the model. When they differed, results sometimes favored PA/NP and sometimes favored doctors.

Discussion

- Previous studies have asserted that PAs and NPs do use greater numbers of diagnostic resources than doctors to come to clinical decisions. However, these studies have either been based on misleading billing data or potentially inaccurate self-report data for the comparison.
- This study uses a large, national level dataset incorporating a wide variety of ED types which, for the first time, captures the direct contribution of PA/NPs to patient care. In this study, we did not find many differences between the PA/NPs. Some of the small differences detected favored PA/NP –provided care, while others favored physician-provided care.

Limitations

- We cannot tell if the patients were seen in a fast track or main ED from the data
- PAs and NPs who work for USACS undergo a 2 year training program after hire. All providers at USACS regularly receive further clinical training and decision support resources designed to standardize care. Not all emergency medicine providers in the US receive these resources, which may limit the generalizability of this study to non-USACS EDs.
- None of the APPs at USACS work without a physician onsite, so this data does not support independent practice by APPs.

Further Research

- Further research should be conducted in settings other than the ED. Hopefully, a benefit of the big-data movement will allow us to use non-billing data to better conduct health services research involving PAs
- Would be great to look at:
  - Primary Care
  - General Hospital Medicine

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