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Addressing Diagnostic Inertia Following Incidental Adrenal Mass Discovery in Patients with Hypertension

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INTRODUCTION

Primary aldosteronism (PA) is the most common form of secondary hypertension, and its prevalence among patients referred to specialized hypertension centers is approximately 11% [1]. PA is associated with increased cardiovascular risk after adjusting for blood pressure [2], and diagnosis may allow surgical cure or medical management with mineralocorticoid receptor antagonists. Evaluation of incidental adrenal masses (IAMs) represents a key pathway to diagnosis. About 1–7% of IAMs secrete aldosterone [3], and guidelines recommend screening all patients with hypertension and an IAM for PA [4]. However, <20% of patients with IAMs receive indicated screening via plasma aldosterone/renin ratio (ARR) [5, 6]. We therefore aimed to improve PA screening among hypertensive patients with an IAM in our health system.

METHODS

We hypothesized that a multimodal yet simple quality improvement (QI) program would assist primary care providers (PCPs) in all aspects of IAM evaluation, including PA screening. Patients with possible IAMs were identified through an automated keyword search of radiology reports, with eligibility confirmed via clinician review. The intervention

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included PCP notifications and reminders via the electronic health record and email. These notifications alerted the PCP to the IAM's presence, encouraged evaluation, and linked to a web-based algorithm to facilitate work-up. The QI program coordinator sent a reminder to PCPs if no IAM evaluation occurred within 3 months. In the second year of the program, we added standardized language directly to the radiology report that recommended IAM follow-up and we created a multidisciplinary adrenal clinic.

All patients with a new IAM detected in our health system from January 1, 2018 to December 31, 2019 were considered eligible, and data for this "QI cohort" were collected prospectively. We compared this group to an institutional historical cohort who had a new IAM detected from January 1 to December 31, 2016 and received usual care. Follow-up was one year or longer for both cohorts. We report a subset analysis of PA screening among patients with hypertension and an IAM. Adult patients with an IAM detected on cross-sectional imaging, hypertension treated with medication within the past 12 months, and a PCP within our health system were included. Patients whose IAMs were previously noted were excluded. The primary outcome was PCP-initiated laboratory screening for PA. A study of the overall results of the QI initiative, including non-hypertensive patients, is being reported separately. Outcomes were assessed with Fisher's exact test, Wilcoxon rank sum test, and log binomial regression. Our regression analysis adjusted for insurance status and index imaging study location (Emergency Department, inpatient, or outpatient) on the basis of prior work [5]. Our Institutional Review Board deemed this research exempt from review.

RESULTS

Within the QI cohort, 294 of 469 patients were treated for hypertension (62.7%). Within the historical cohort, 139 of 238 patients were treated for hypertension (58.4%). In total, 114 patients in the QI cohort and 72 patients in the historical cohort met full inclusion criteria. There were no significant differences in age, sex, or race between groups (overall: median age 64.3 years, 55.4% female, and 57.0% Black/African-American). Insurance status differed between cohorts, with the QI cohort having more commercially insured patients compared to the historical cohort (21.1% vs. 6.9%). Location of index imaging study was similar; overall, 51% of imaging occurred in the outpatient setting.

More patients in the historical cohort than the QI cohort visited their PCPs at any time after IAM detection (81.9% [59/72] versus 56.1% [64/114], $p<0.001$). Among patients who visited their PCPs, 6.8% (4/59) in the historical cohort had PA screening labs ordered, compared to 48.4% (31/64) in the QI cohort ($p<0.001$). Table 1 shows the proportion of patients completing potential steps in IAM evaluation. After adjusting for insurance status and imaging setting, the relative risk for PCP-initiated PA screening in the QI compared to historical cohort was 7.4 (95%CI 2.7 – 19.8). Of patients completing screening, 8/40 had an initial ARR ≥20.

DISCUSSION

After implementation of a simple but multimodal QI project, we found that hypertensive patients with an IAM underwent more PCP-initiated screening for PA, with an absolute increase from 6.8% to 48.4%. Though this project was implemented within a single health system, its key components—PCP notification, an online clinical algorithm, and standardized radiology report recommendations—are likely transferable elsewhere.

Our study has limitations. Though the QI cohort was prospectively followed, we used a retrospective comparator cohort. The COVID-19 pandemic disrupted non-urgent care during the QI cohort follow-up period, though this would be expected to bias our results toward the null. More patients in the QI cohort did not have a PCP within our health system, leading to differential exclusion. Our cohort size was limited. Although we adjusted for insurance status and imaging setting in our multivariable regression, a larger cohort may have allowed adjustments for additional potential confounders.

In conclusion, we found that screening for PA among patients with both hypertension and an IAM increased significantly after the introduction of a simple set of interventions. While efforts remain necessary to fully optimize IAM evaluation, our results provide a road map to initiate quality improvement in an important group of patients with treatable hypertension.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Conflicts of Interest and Sources of Funding:

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Data Availability Statement:

The datasets generated and analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

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Table 1.

Patients Completing Potential Aspects of an Incidental Adrenal Mass Evaluation

Evaluation Step	Patients with a PCP* Visit			All Patients with an IAM† & Hypertension		
	Historical Cohort	QI‡ Cohort	*P* Value	Historical Cohort	QI Cohort	*P* Value
Total eligible patients with hypertension, n	59	64		72	114	
PCP visit post-IAM detection, n (%)	All	All		59 (81.9)	64 (56.1)	<0.001
PCP documented adrenal-focused history, n (%)	5 (8.5)	27 (42.2)	<0.001	5 (6.9)	27 (23.7)	0.003
Screening ARR§						
Ordered by PCP, n (%)	4 (6.8)	31 (48.4)	<0.001	4 (5.6)	31 (27.2)	<0.001
Completed (any orderer), n(%)	9 (15.3)	30 (46.9)	<0.001	10 (13.9)	30 (26.3)	0.026
Follow-up imaging ordered by PCP, n (%)	15 (24.4)	35 (54.7)	0.002	16 (22.2)	35 (30.7)	0.240
Referred to specialist, n (%)	12 (20.3)	12 (18.8)	1.000	12 (16.7)	12 (10.5)	0.264

The primary analysis of patients who had a documented PCP visit after IAM detection is shown in the left column. A secondary analysis including all eligible patients with an IAM and hypertension, who may or may not have had a PCP visit, is shown in the right column.

Abbreviations:

*PCP = primary care provider,

†IAM = incidental adrenal mass,

‡QI = quality improvement,

§ARR = plasma aldosterone/renin ratio