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## MISSED OPPORTUNITIES IN CVD PREVENTION? LOW RATES OF HYPERTENSION RECOGNITION FOR WOMEN AT MEDICINE AND OBGYN CLINICS

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### Abstract

Younger women use both internal medicine and OBGYN clinics as primary sources of health care. However, the role of OBGYNs in cardiovascular disease (CVD) prevention is largely unexplored. The objective of this study is to examine rates of hypertension recognition in women under 50 who present with elevated blood pressures in family practice and internal medicine (Medicine) and OBGYN clinics, and to compare these rates across clinic type. The study's population consisted of 34,627 non-pregnant women ages 18–49 with new-onset hypertension (defined as two consecutive visits with elevated blood pressures of SBP  $\geq$ 140mmHg or DBP  $\geq$ 90 mmHg with no prior hypertension history) from 2002–2006. Multivariate logistic regressions predicting the clinical recognition of hypertension (a recorded diagnosis of hypertension and/or an antihypertensive prescription by any provider within one year of the second elevated blood pressure) assessed the association between hypertension recognition and the clinic where the second elevated blood pressure was recorded. Analysis showed that hypertension was recognized in less than 33% of women with new-onset hypertension. Women whose second consecutive elevated blood pressure was recorded in OBGYN were less likely to be recognized as having hypertension within 12 months by any provider compared to women whose second consecutive elevated blood pressure was recorded in Medicine (OR=0.51;95% CI=(0.48, 0.54)). This study suggests that further attention be paid to identifying and treating CVD risk factors in women under 50 presenting in

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**Author Contributions:** Drs. Schmittiel and Bibbins-Domingo (KB) had the original idea for the study. The study was planned by Drs. Schmittiel, Bibbins-Domingo, and Selby. Mr. Swain performed the statistical analysis. Dr. Schmittiel drafted the article. All authors were involved in the interpretation of data and the revision of the manuscript for important intellectual content. All authors gave final approval of the manuscript submitted for publication. Dr. Schmittiel is the guarantor for the study.

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both Medicine and OBGYN, and that improved coordination across care settings has the potential to improve CVD prevention in young women.

## Keywords

Hypertension; gender; CVD prevention; primary care; OBGYN

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## Introduction

Cardiovascular disease (CVD) is the leading cause of death, disability, and health care expenditure in the United States for women and men.<sup>1</sup> The recognition and treatment of hypertension, a key CVD risk factor, is a critical component in preventing CVD-related mortality and morbidity.<sup>2-4</sup> Hypertension is routinely managed in the primary care settings;<sup>5-7</sup> however, women access primary care differently than men. Obstetrics-gynecology (OBGYN) clinics serve as a main source of primary health care for many younger women.<sup>8-14</sup> Most ambulatory visits for women ages 15-44 in the U.S. take place in OBGYN clinics,<sup>12</sup> and women under 35 are particularly likely to see their OBGYN as their primary care provider.<sup>15</sup> However, there is very little information on extent to which hypertension screening and other CVD preventive care for young women is provided through OBGYN clinics.

Evidence on the level of primary care services provided by OBGYN clinics is mixed.<sup>11, 16-20</sup> While women who use OBGYNs as their primary source of care may be more likely to receive preventive care services such as tobacco use screening and vaccinations<sup>8</sup>, other studies suggest that OBGYNs may provide a narrower range of primary care services than is provided in other primary care settings.<sup>21</sup>

Hypertension screening, recognition, and treatment are key components of primary care and effective strategies for CVD prevention,<sup>22</sup> yet the rates of diagnosis and treatment of hypertension in the OBGYN setting are unknown. The objectives of this study are to examine rates of hypertension recognition (defined as a recorded diagnosis of hypertension by any provider or a filled prescription for an antihypertensive medication) in women under the age of 50, and to compare these rates by type of clinic where high blood pressures indicating hypertension were initially recorded.

## Methods

### Study Population

This study was conducted within the Cardiovascular Research Network (CVRN), a consortium of research organizations affiliated with the HMO Research Network and sponsored by the National Heart Lung and Blood Institute (U19 HL91179-01). The study population consists of patients from the Cardiovascular Research Network (CVRN) Hypertension Registry, a multi-site data source comprised of over 500,000 patients with hypertension, from Kaiser Permanente Northern California and Kaiser Permanente Colorado. These two health plans serve 3.6 million members, roughly 725,000 of whom have either recognized or unrecognized hypertension. Further information on the CVRN Hypertension Registry definitions and data sources are available elsewhere.<sup>23-24</sup>

Since women under fifty are most likely to utilize OBGYN clinics for primary care<sup>12, 15</sup>, the study included women ages 18-49 with new-onset hypertension between 2002 and 2006 whose hypertension was manifest through two consecutive elevated blood pressures of systolic blood pressure (SBP)  $\geq 140$ mmHg or diastolic blood pressure (DBP)  $\geq 90$  mmHg.<sup>2</sup>

22–24 Single blood pressure readings are taken by nursing staff (eg, medical assistants) after patients have been seated for 5 minutes in the examination room in both OBGYN and Medicine clinics. Aneroid sphygmomanometers (Welch-Allyn) are the preferred measurement method in Kaiser Permanente Colorado, whereas automated measurement devices (Mindray Medical) are recommended in Kaiser Permanente Northern California. However, there is some use of the other method in each region. Staff are certified in blood pressure measurement at the time of hiring and retrained annually. Equipment is monitored by nursing staff and recalibrated as needed by bioengineering services. Blood pressure readings from settings outside of OBGYN and Medicine clinics (approximately 3%) were excluded from analyses because urgent symptoms could affect blood pressure values and because of uncertainty that the above protocol was consistently followed in other settings.

For the small percentage of women with pre-existing diabetes or chronic kidney disease (<6%), lower cutpoints of SBP  $\geq$  130 mmHg and DBP  $\geq$  80 mmHg were used.<sup>22–24</sup> To ensure that these cases were truly incident, patients with previous diagnoses of hypertension or evidence of antihypertensive medication use were excluded. Women whose elevated blood pressures were associated with pregnancy (i.e. were within 9 months prior or 2 months after a delivery date) were also excluded. To better distinguish incident from prevalent hypertension, study subjects were required to have at least 12 months continuous membership before the first elevated blood pressure. At least 12 months of continuous membership were required after the second consecutive elevated blood pressure to determine if recognition occurred.

### Clinic of Elevated Blood Pressure Presentation

The clinic where the second consecutive elevated blood pressure occurred was identified through the electronic medical record and recorded in the CVRN hypertension registry. Patients were categorized based on whether this reading was recorded in a medicine (internal medicine or family medicine) clinic vs. an OBGYN clinic, since the presentation of this second consecutive elevated blood pressure is the point at which guidelines suggest that hypertension recognition should occur.<sup>2, 22</sup>

### Hypertension Recognition

Hypertension recognition was defined as a recorded diagnosis of hypertension or a filled prescription for an antihypertensive medication issued by *any provider*, regardless of specialty or subspecialty, and occurring on or after the date of the second consecutive elevated blood pressure.<sup>23–24</sup> The study examined whether recognition occurred anytime within one year of this date. Using this definition, a successful referral to a medicine clinic for hypertension evaluation or treatment from an OBGYN would be considered to be appropriate recognition of the condition.

### Statistical Analyses

Chi-square analyses were used to assess the association between hypertension recognition within 12 months of the second consecutive elevated blood pressure and the type of clinic where the second elevated blood pressure was recorded. The relationship between clinic type and hypertension recognition was then examined within key subgroups, including patient age categories (ages 18–29, 30–39, vs. 40–49) and increasing levels of SBP (both consecutive elevated blood pressures with SBP  $\geq$ 150; the first SBP  $\geq$ 150 and the second SBP  $\geq$ 160; and both SBPs  $\geq$ 160). We also examined recognition rates by clinic type within African-American women, due to their increased level of risk for CVD-related mortality and morbidity.<sup>2, 25–26</sup>

Multivariate logistic regression models were then used to adjust for patient age, the mean SBP of the two consecutive elevated blood pressures, body mass index (BMI), smoking status, and diagnoses of the following co-morbid conditions in the 12 months prior to the first elevated blood pressure: ischemic heart disease, stroke, peripheral vascular disease, congestive heart failure, depression, diabetes mellitus, and chronic kidney disease (all obtained through membership, inpatient, and ambulatory databases.) Socioeconomic status (SES), estimated by geocoding patients' residence address to the 2000 U.S. Census data at the block group level, was also adjusted for in the analyses. Further information on these variables can be obtained elsewhere.<sup>23</sup> To ensure that results were not biased by the inclusion of the small subset of women who appeared to revert to normal blood pressure levels without treatment or recognition of hypertension, analyses were repeated after deleting the subgroup of women (n=1,882) who did not have elevated blood pressures in any of the five subsequent recorded blood pressure readings.

This study was approved by the Kaiser Permanente Northern California and Kaiser Permanente Colorado Institutional Review Boards.

## Results

A total of 34,627 women were eligible for inclusion in the study. Women were 39.4 years old on average, and 42% were white (Table 1). Thirty-two percent of women had their second consecutive elevated blood pressure recorded in an OBGYN clinic. 56% of women had an SBP  $\geq$  150 mmHg in both of their recorded consecutive elevated blood pressures. Patient age varied by clinic presentation category, with more women ages 18–29 presenting their second elevated blood pressures in an OBGYN clinic. Patients were similar across clinic categories in race/ethnicity, mean SBP, comorbidity burden, BMI, smoking status, and socioeconomic status.

Women whose second consecutive elevated blood pressure occurred in an OBGYN clinic were significantly less likely to be recognized as hypertensive within a year by any provider (Figure 1). Less than one-quarter (22%) of women presenting in OBGYN with their second elevated blood pressure had their hypertension recognized within one year, compared with 38% of those presenting in Medicine ( $p < .0001$ ). Among older women (ages 40–49), 25% of those presenting in OBGYN were recognized within a year compared with 41% in Medicine ( $p < .0001$ ). Overall, women ages 18–29 had the lowest chance of having their hypertension recognized; less than 25% of women under 30 were recognized within a year regardless of the clinic where the elevated blood pressure occurred.

Figure 2 shows the rate of hypertension recognition by clinic type for women in higher risk groups based on SBP level and race/ethnicity. Women who presented with two SBPs  $\geq$  150 mm Hg and African American women were much less likely to be recognized as hypertensive within one year by any provider if their second consecutive elevated blood pressure occurred in OBGYN as opposed to Medicine. Significant differences in recognition rates between OBGYN and Medicine clinics persisted in the subgroups of women with one or more SBP  $>$  160 mmHg.

After adjusting for patient characteristics including age, SBP level, and race/ethnicity, women who presented their second consecutive elevated blood pressure in OBGYN were substantially less likely to be recognized as having hypertension within a year than those who received their second elevated blood pressure in a Medicine clinic (OR = .51; 95% CI = (.48, .54)); (Table 2).

Sensitivity analyses demonstrated that the differences in recognition rates by clinic type were similar in analyses examining the subgroup of women who presented with three

consecutive elevated blood pressures, although recognition rates were somewhat higher in both settings (30% vs. 51% for Medicine and OBGYN clinics, respectively). A similar pattern of results was also seen when the analyses were repeated excluding the small subset of women who appeared to revert to normal blood pressure levels without treatment or recognition of hypertension (data not shown.)

## Discussion

In this study of more than 30,000 women under age 50 in two large U.S. integrated healthcare delivery systems, we find that care in OBGYN clinics was associated with significantly lower levels of hypertension recognition compared to care in Medicine clinics. These lower rates of hypertension recognition for women whose high SBPs presented in OBGYN clinics were observed among older as well as younger women, in those with higher SBP elevations, and in African Americans, all groups at higher risk of adverse outcomes as a consequence of untreated hypertension. Nearly one-third of women in this sample had their second consecutive elevated blood pressure measured in OBGYN, mirroring the high rates of women using OBGYN clinics for primary care observed nationally<sup>12, 15</sup>. Taken together, these results suggest visits to the OBGYN clinic may be important, and currently missed, opportunities for CVD prevention.

There are persistent gender disparities in CVD risk factor levels, treatment, and outcomes.<sup>27–32</sup> These disparities may stem in part from a lack of recognition by both patients and clinicians of women's risk for CVD, and of the importance of CVD prevention to women's health.<sup>31</sup> Primary care providers play a critical role in CVD prevention, and differences in how women access primary care may play a role in these disparities. OBGYN visits are a prime, and for some women perhaps the only, opportunity for CVD screening and prevention in younger women.<sup>33–34</sup> This study's findings suggest that improving hypertension recognition in OBGYN clinics may be an important strategy in reducing these disparities.<sup>35</sup>

This study found that recognition of hypertension within a year of a second consecutive elevated blood pressure reading was low among all patients in this cohort of women under the age of fifty, regardless of where the second elevated blood pressure occurred. Overall, only 32.9% of women had their hypertension recognized within a year, and less than 40% of women whose second elevated blood pressure occurred in a medicine clinic were recognized within a year. These percentages were only slightly higher among the significant number of women with two presenting SBPs  $\geq 150$ . This finding is consistent with previous literature suggesting that younger age is associated with lower levels of hypertension diagnosis<sup>36</sup> and treatment.<sup>4</sup> Since undiagnosed hypertension prior to age forty<sup>21, 25</sup> and length of time of exposure to high blood pressures<sup>37</sup> are known risk factors for CVD mortality, further attention to elevated blood pressures in women under 50 by providers in both medicine and OBGYN clinics may be an important approach to primary CVD prevention.

OBGYNs may not be comfortable initiating diagnosis and treatment for hypertension,<sup>38–39</sup> or prefer to focus on gynecologic care and refer issues of CVD prevention to a general internist or family physician. This may particularly be true in the setting of this study, where women are encouraged to have both a designated OBGYN for gynecologic care and a medicine provider for more general primary care. That women who present their second consecutive elevated blood pressures in OBGYN clinics had a significantly lower odds of hypertension recognition within a year by *any provider* indicates that care could be improved by either enhancing the frequency of referrals to general internists and family physicians, or by increasing the likelihood that OBGYNs will recognize and treat hypertension appropriately, or both. While individual physicians play a key role in CVD risk

identification and prevention, ideally integrated health care systems should be able to detect incident hypertension regardless of the type of clinic in which it presents. Neither health care system in the study had system-level outreach programs targeted at the patients or their providers to address elevated blood pressures in young female patients without pre-existing CVD risk factors. System-level interventions such as point-of-care clinical decision support to identify hypertension and guide initial treatment, automated referrals, and active outreach to patients may improve recognizing and treating hypertension in women across all care sites. This study found that clinic type had a significant impact on hypertension recognition even within a large integrated delivery system with electronic medical records where referrals and outreach across clinics are more feasible than in many settings. This study's findings of low levels of hypertension recognition and referral through OBGYN clinics suggests that addressing CVD risk factors in OBGYN may be a major opportunity to improve the cardiovascular health of women.

This study has a number of limitations that should be noted. This study defines hypertension recognition as the recording of a hypertension diagnosis or a dispensing of a hypertension medication. Lifestyle therapy, especially for younger adults, is an important approach to addressing incident hypertension, and it is possible that providers are treating incident hypertension with diet and lifestyle advice that we are unable to measure in the clinical data systems available to this study. Therefore providers treating incident hypertension with diet and lifestyle advice for a year without recording a diagnosis of hypertension would be incorrectly classified.

The data from this study is from two integrated delivery systems where medicine and OBGYN clinics are co-located at the same site. As OBGYNs can reasonably expect that their patients have other access to primary care, this may affect the rate of hypertension recognition in these OBGYN settings. While these results may not generalize to non-integrated delivery systems, they do suggest integration and close proximity alone may not be sufficient to provide appropriate preventive care. Similarly, the presence of electronic medical records in our study sites, which should facilitate access to prior blood pressure readings, limits the generalizability of these findings to settings without such information technologies. However, health care providers in this country are rapidly moving towards the use of EMRs to improve coordination of care;<sup>40</sup> our results suggest that these technologies alone are also not sufficient to assure guideline-driven care.

While hypertension screening in primary care is a key component of CVD prevention, lipid testing and other CVD-related screenings are also traditionally provided through primary care. Further research should examine whether the type of clinic where women receive primary care plays a role in the receipt of these types of services as well.

## Perspectives

Many young women with incident hypertension present in OBGYN clinics, and these women are substantially less likely to be diagnosed or treated for hypertension. These findings suggest that further attention to identifying and treating CVD risk factors be paid to young women presenting in OBGYN clinics, and that coordination of care across clinics may lead to improved care of this important CVD risk factor.

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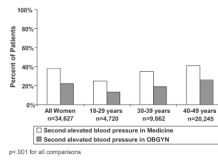
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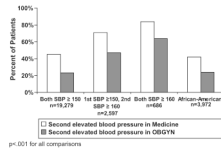
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**Figure 1.**  
Hypertension Recognized within 12 Months of Second Consecutive Elevated Blood Pressure, by Patient Age



**Figure 2.** Hypertension Recognized within 12 Months of Second Consecutive Elevated Blood Pressure, by Systolic Blood Pressure Level

**Table 1**

## Patient Demographics and Clinical Characteristics

Demographic / Clinical Characteristic	TOTAL N(%) n=34,627	Second Elevated Blood Pressure Detected In Medicine n=23,596 (68%)	Second Elevated Blood Pressure Detected in OBGYN n=11,031 (32%)
Mean Age (SD)	39.4 (7.9)	40.0 (7.6)	38.1 (8.3)
Ages 18–29 (%)	4720 (14%)	2742 (12%)	1978 (18%)
Ages 30–39 (%)	9662 (28%)	6284 (27%)	3378 (31%)
Ages 40–49 (%)	20245 (58%)	14570 (62%)	5675 (51%)
Mean Systolic Blood Pressure (SBP) of Two Consecutive Elevated Blood Pressures (SD)	145.7 (10.5)	145.2 (11.0)	146.9 (9.3)
Both Consecutive Elevated Blood Pressures w/ SBP >= 150	19,279 (56%)	12,299 (52%)	6,980 (63%)
Mean Annual visits to Medicine (SD)	3.6 (4.5)	4.1 (4.8)	2.6 (3.3)
Mean Annual visits to Obgyn (SD)	1.7 (3.4)	1.1 (2.4)	2.8 (4.8)
Race/Ethnicity			
White	42%	42%	44%
African American	11%	11%	13%
Latino	15%	15%	15%
Asian	11%	11%	11%
Native American	1%	1%	1%
Unknown/Other	20%	21%	16%
Mean Income*			
Missing	3%	3%	3%
<30K	7%	7%	7%
30–<60K	46%	47%	45%
60+K	44%	43%	45%
Education: % in Block with a BA*			
Missing	3%	3%	3%
< 30%	5%	5%	5%
30–<60%	39%	39%	38%
60+%	53%	52%	54%
Comorbidities			
Ischemic Heart Disease	0.05%	0.06%	0.02%
Stroke	0.09%	0.12%	0.04%
Peripheral Vascular Disease	0.05%	0.06%	0.03%
Congestive Heart Failure	0.03%	0.04%	0.00%
Depression	13%	14%	10%
Diabetes	5%	5%	3%
Chronic Kidney Disease	0.73%	0.83%	0.52%
Current Smoker	14%	15%	12%
Mean BMI (SD)	31.6 (7.6)	32.0 (7.6)	30.8 (7.4)

Note: All cross-OB/GYN variable differences significant at  $p < .0001$ ;

\*  
from block-level geocoded data



**Table 2**

## Odds Ratios for Predicting Hypertension Recognition

Predictor Variable	Hypertension Recognition within 12 Months of the Second Consecutive Elevated Blood Pressure:Odds Ratio (95% CI)
Second Elevated Blood Pressure Occurs in an OBGYN Clinic	0.51 (0.48, 0.54)
Annual visits to Medicine	1.10 (1.10, 1.11)
Annual visits to Obgyn	0.97 (0.96, 0.98)
Race (White as referent)	
African-American	1.36 (1.26, 1.47)
Native-American	1.21 (0.95, 1.55)
Asian-American	1.66 (1.53, 1.80)
Hispanic/Latino	1.13 (1.05, 1.22)
Unknown/Other	1.26 (1.18, 1.35)
Mean SBP of Two Consecutive Elevated Blood Pressures	1.05 (1.05, 1.06)
Age (40–49 years as referent)	
18–29 years	0.51 (0.47, 0.55)
30–39 years	0.82 (0.77, 0.86)
Income (> \$30K as referent)	
< \$30,000	1.01 (0.91, 1.13)
Income Data Missing	1.53 (1.00, 2.34)
Education (> 60% as referent)	
< 30%	1.11 (0.99, 1.25)
30–60%	1.05 (1.00, 1.11)
Education Data Missing	0.83 (0.55, 1.25)
Comorbidities	
Stroke	1.05 (0.48, 2.31)
Ischemic Heart Disease	5.96 (1.71, 20.8)
Congestive Heart Failure	5.06 (0.58, 44.2)
Chronic Kidney Disease	0.59 (0.42, 0.83)
Depression	0.91 (0.85, 0.98)
Diabetes	1.40 (1.24, 1.59)
Peripheral Vascular Disease	1.63 (0.54, 4.98)
BMI (20–25 as referent)	
< 20	0.87 (0.75, 1.00)
26–35	1.04 (0.94, 1.15)
35–40	1.07 (0.95, 1.21)
> 40	1.05 (0.93, 1.19)
BMI Data Missing	0.86 (0.79, 0.95)
Current Smoker	0.90 (0.84, 0.96)