Abstract—Younger women use both internal medicine and obstetrics-gynecology (OBGYN) clinics as primary sources of health care. However, the role of OBGYN clinics in cardiovascular disease prevention is largely unexplored. The objective of this study was to examine rates of hypertension recognition in women <50 years of age who presented with elevated blood pressures in family practice and internal medicine (medicine) OBGYN clinics and to compare these rates across clinic type. The study’s population consisted of 34627 nonpregnant women ages 18 to 49 years with new-onset hypertension (defined as 2 consecutive visits with elevated blood pressures and/or elevated blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg with no previous hypertension history) from 2002 to 2006. Multivariate logistic regressions predicting the clinical recognition of hypertension (a recorded diagnosis of hypertension and/or an antihypertensive prescription by any provider within 1 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 <33% of women with new-onset hypertension. Women whose second consecutive elevated blood pressure was recorded in OBGYN clinics were less likely to be recognized as having hypertension within 12 months by any provider compared with women whose second consecutive elevated blood pressure was recorded in a medicine clinic (odds ratio: 0.51 [95% CI: 0.48 to 0.54]). This study suggests that further attention be paid to identifying and treating cardiovascular disease risk factors in women <50 years of age presenting in both medicine and OBGYN clinics and that improved coordination across care settings has the potential to improve cardiovascular disease prevention in young women.

Key Words: hypertension ■ sex ■ CVD prevention ■ primary care ■ OBGYN

Cardiovascular disease (CVD) is the leading cause of death, disability, and healthcare expenditure in the United States for women and men.1 The recognition and treatment of hypertension, a key CVD risk factor, is a critical component in preventing CVD-related mortality and morbidity.2–4 Hypertension is routinely managed in the primary care settings5–7; 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.8–14 Most ambulatory visits for women ages 15 to 44 years in the United States take place in OBGYN clinics,15 and women <35 years of age are particularly likely to see their obstetrician-gynecologist as their primary care provider.15 However, there is very little information on the 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.11,16–20 Although women who use OBGYN clinics as their primary source of care may be more likely to receive preventive care services, such as tobacco use screening and vaccinations,8 other studies suggest that OBGYN clinics may provide a narrower range of primary care services than is provided in other primary care settings.21

Hypertension screening, recognition, and treatment are key components of primary care and effective strategies for CVD prevention,22 yet the rates of diagnosis and treatment of hypertension in the OBGYN setting are unknown. The objectives of this study were to examine rates of hypertension recognition and treat

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J.S. and K.B.-D. had the original idea for the study. The study was planned by J.S., K.B.-D., and J.V.S. B.S. performed the statistical analysis. J.S. drafted the article. All of the authors were involved in the interpretation of data and the revision of the article for important intellectual content. All of the authors gave final approval of the article submitted for publication. J.S. is the guarantor for the study.

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the funding organizations. The authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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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 years 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, a consortium of research organizations affiliated with the Health Maintenance Organization 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 Hypertension Registry, a multisite data source composed of >500,000 patients with hypertension, from Kaiser Permanente Northern California and Kaiser Permanente Colorado. These 2 health plans serve 3.6 million members, roughly 725,000 of whom have hypertension. Further information on the Cardiovascular Research Network Hypertension Registry definitions and data sources are available elsewhere.23,24

Because women <50 years of age are most likely to use OBGYN clinics for primary care,12,15 the study included women ages 18 to 49 years with new-onset hypertension between 2002 and 2006 whose hypertension was manifest through 2 consecutive elevated blood pressures of systolic blood pressure (SBP) ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg.2–24 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 (internal medicine or family 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 members 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 (∼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 preexisting diabetes mellitus or chronic kidney disease (<6%), lower cut points of SBP ≥130 mm Hg and diastolic blood pressure ≥80 mm Hg were used.2–24 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 (ie, were within 9 months before or 2 months after a delivery date) were also excluded. To better distinguish incident from prevalent hypertension, study subjects were required to have ≥12 months of 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 whether recognition occurred.

Clinic of Elevated Blood Pressure Presentation

The clinic where the second consecutive elevated blood pressure occurred was identified through the electronic medical records and recorded in the Cardiovascular Research Network hypertension registry. Patients were categorized based on whether this reading was recorded in a family practice or internal medicine (medicine) clinic, because the presentation of this second consecutive elevated blood pressure is the point at which guidelines suggest that hypertension recognition should occur.2,22

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.23,24 The study examined whether recognition occurred anytime within 1 year of this date. Using this definition, a successful referral to a medicine clinic for hypertension evaluation or treatment from an OBGYN clinic would be considered to be appropriate recognition of the condition.

Statistical Analyses

χ² 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 to 29, 30 to 39, and 40 to 49 years) and increasing levels of SBP (both consecutive elevated blood pressures with SBP ≥150 mm Hg; the first SBP ≥150 mm Hg and the second SBP ≥160 mm Hg; and both SBPs ≥160 mm Hg). We also examined recognition rates by clinic type within black women because of their increased level of risk for CVD-related mortality and morbidity.23,24

Multivariate logistic regression models were then used to adjust for patient age, the mean SBP of the 2 consecutive elevated blood pressures, body mass index, smoking status, and diagnoses of the following comorbid conditions in the 12 months before 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, estimated by geocoding patient residence address to the 2000 US Census data at the block group level, was also adjusted for in the analyses. Further information on these variables can be obtained elsewhere.23

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=1882) who did not have elevated blood pressures in any of the 5 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. Fifty-six percent of women had an SBP ≥150 mm Hg in both of their recorded consecutive elevated blood pressures. Patient age varied by clinic presentation category, with more women ages 18 to 29 years presenting their second elevated blood pressures in an OBGYN clinic. Patients were similar across clinic categories in race/ethnicity, mean SBP, comorbidity burden, body mass index, 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 fourth (22%) of women presenting in an OBGYN clinic with their second elevated blood pressure had their hypertension recognized within 1 year compared with 38% of those presenting in a medicine clinic (P<0.0001). Among older women (ages 40 to 49 years), 25% of those presenting in an OBGYN clinic were recognized within a year compared with 41% in a medicine clinic (P<0.0001). Overall, women ages 18 to 29 years had the
lowest chance of having their hypertension recognized; <25% of women <30 years of age 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 2 SBPs ≥150 mm Hg and black women were much less likely to be recognized as hypertensive within 1 year by any provider if their second consecutive elevated blood pressure occurred in an OBGYN clinic as opposed to a medicine clinic. Significant differences in recognition rates between OBGYN and medicine clinics persisted in the subgroups of women with ≥1 SBP >160 mm Hg.

After adjusting for patient characteristics including age, SBP level, and race/ethnicity, women who presented their second consecutive elevated blood pressure in OBGYN clinics 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 (odds ratio: 0.51 [95% CI: 0.48 to 0.54]; 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 3 consecutive elevated blood pressures, although recognition rates were somewhat higher in both settings (30% versus 51% for medicine and OBGYN clinics, respectively). A similar pattern of results was also seen when the analyses were

Table 1. Patient Demographics and Clinical Characteristics

<table>
<thead>
<tr>
<th>Demographic/Clinical Characteristic</th>
<th>Total N (%)</th>
<th>Second Elevated Blood Pressure Detected in Medicine</th>
<th>Second Elevated Blood Pressure Detected in OBGYN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=34 627)</td>
<td>(n=23 596; 68%)</td>
<td>(n=11 031; 32%)</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>39.4 (7.9)</td>
<td>40.0 (7.6)</td>
<td>38.1 (8.3)</td>
</tr>
<tr>
<td>Ages 18 to 29 y, n (%)</td>
<td>4720 (14)</td>
<td>2742 (12)</td>
<td>1978 (18)</td>
</tr>
<tr>
<td>Ages 30 to 39 y, n (%)</td>
<td>9662 (28)</td>
<td>6284 (27)</td>
<td>3378 (31)</td>
</tr>
<tr>
<td>Ages 40 to 49 y, n (%)</td>
<td>20245 (58)</td>
<td>14570 (62)</td>
<td>5675 (51)</td>
</tr>
<tr>
<td>Mean SBP of 2 consecutive elevated blood pressures (SD)</td>
<td>145.7 (10.5)</td>
<td>145.2 (11.0)</td>
<td>146.9 (9.3)</td>
</tr>
<tr>
<td>Both consecutive elevated blood pressures with SBP ≥150 mm Hg</td>
<td>19 279 (56)</td>
<td>12 299 (52)</td>
<td>6980 (63)</td>
</tr>
<tr>
<td>Mean annual visits to medicine (SD)</td>
<td>3.6 (4.5)</td>
<td>4.1 (4.8)</td>
<td>2.6 (3.3)</td>
</tr>
<tr>
<td>Mean annual visits to OBGYN (SD)</td>
<td>1.7 (3.4)</td>
<td>1.1 (2.4)</td>
<td>2.8 (4.8)</td>
</tr>
<tr>
<td>Race/ethnicity, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>42</td>
<td>42</td>
<td>44</td>
</tr>
<tr>
<td>Black</td>
<td>11</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Latino</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Asian</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Native American</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Unknown/other</td>
<td>20</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>Mean income, $, %*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>&lt;30 000</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>30 000 to &lt;60 000</td>
<td>46</td>
<td>47</td>
<td>45</td>
</tr>
<tr>
<td>≥60 000</td>
<td>44</td>
<td>43</td>
<td>45</td>
</tr>
<tr>
<td>Education, % in block with a bachelor’s degree*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>&lt;30%</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>30% to &lt;60%</td>
<td>39</td>
<td>39</td>
<td>38</td>
</tr>
<tr>
<td>≥60%</td>
<td>53</td>
<td>52</td>
<td>54</td>
</tr>
<tr>
<td>Comorbidities, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>0.05</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>Stroke</td>
<td>0.09</td>
<td>0.12</td>
<td>0.04</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>0.05</td>
<td>0.06</td>
<td>0.03</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>0.03</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Depression</td>
<td>13</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>0.73</td>
<td>0.83</td>
<td>0.52</td>
</tr>
<tr>
<td>Current smoker</td>
<td>14</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Mean body mass index (SD)</td>
<td>31.6 (7.6)</td>
<td>32.0 (7.6)</td>
<td>30.8 (7.4)</td>
</tr>
</tbody>
</table>

All cross-clinic differences were significant at P<0.0001.

*Data are from block-level geocoded data.
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 >30,000 women under age 50 years in 2 large US integrated healthcare delivery systems, we find that care in OB/GYN clinics was associated with significantly lower levels of hypertension recognition compared with care in medicine clinics. These lower rates of hypertension recognition for women whose high SBPs presented in OB/GYN clinics were observed among older as well as younger women, in those with higher SBP elevations, and in blacks, 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 an OB/GYN clinic, mirroring the high rates of women using OB/GYN clinics for primary care observed nationally.12,15 Taken together, these results suggest that visits to the OB/GYN clinic may be important, and currently missed, opportunities for CVD prevention.

There are persistent sex disparities in CVD risk factor levels, treatment, and outcomes.27–32 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 for women’s health.31 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. OB/GYN visits are a prime, and for some women perhaps the only, opportunity for CVD screening and prevention in younger women.33,34 This study’s findings suggest that improving hypertension recognition in OB/GYN clinics may be an important strategy in reducing these disparities.35

This study found that recognition of hypertension within a year of a second consecutive elevated blood pressure reading
was low among all of the patients in this cohort of women under the age of 50 years, regardless of where the second elevated blood pressure occurred. Overall, only 32.9% of women had their hypertension recognized within a year, and <40% of women whose second elevated blood pressure occurred in a medical clinic were recognized within a year. These percentages were only slightly higher among the significant number of women with 2 presenting SBPs ≥150 mm Hg. This finding is consistent with previous literature suggesting that younger age is associated with lower levels of hypertension diagnosis and treatment. Because undiagnosed hypertension before age 40 is known risk factors for CVD mortality, further attention to elevated blood pressures in women <50 years of age by providers in both medicine and OBGYN clinics may be an important approach to primary CVD prevention.

Obstetrician-gynecologists may not be comfortable initiating diagnosis and treatment for hypertension 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 obstetrician-gynecologist 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, by increasing the likelihood that obstetrician-gynecologists will recognize and treat hypertension appropriately, or both. Although 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 preexisting 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 recognition and treatment of 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 suggest that addressing CVD risk factors in OBGYN clinics 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 are from 2 integrated delivery systems where medicine and OBGYN clinics are colocated at the same site. Because obstetrician-gynecologists can reasonably expect that their patients have other access to primary care, this may affect the rate of hypertension recognition in these OBGYN settings. Although these results may not generalize to nonintegrated delivery systems, they do suggest that 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 previous blood pressure readings, limits the generalizability of these findings to settings without such information technologies. However, healthcare providers in this country are rapidly moving toward the use of electronic medical records to improve coordination of care; our results suggest that these technologies alone are also not sufficient to assure guideline-driven care.

Although 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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Disclosures

M.H. serves as a consultant for Wellpoint, Inc.

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Missed Opportunities in Cardiovascular Disease Prevention?: Low Rates of Hypertension Recognition for Women at Medicine and Obstetrics-Gynecology Clinics
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