

Research Article

Underlying Rationale and Approach to Treat Hypertension in Adolescents by Physicians of Different Specialty

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Abstract

Objective: To describe the underlying clinical decision-making rationale among general pediatricians, family physicians, pediatric cardiologists and pediatric nephrologists in their approach to an adolescent with hypertension.

Methods: We conducted semi-structured phone interviews with a convenience sample of physicians from the above-mentioned 4 specialties. Each participant was asked to “think aloud” regarding their approach to a hypothetical patient - 12 year old boy with persistent hypertension for 6 months. Standardized open-ended questions about potential factors that could affect physicians’ diagnosis and treatment strategies (e.g., patient age) were used. Interviews were audio-recorded; transcribed verbatim; transcripts were independently coded by 2 investigators; emergent themes identified and inter-coder agreement achieved. Thematic analysis was performed based on grounded theory.

Results: Nineteen participants included 5 general pediatricians, 5 pediatric cardiologists, 5 pediatric nephrologists and 4 family physicians. Five themes emerged: 1) Accuracy of blood pressure measurement and hypertension diagnosis, 2) Shift in the epidemiology of pediatric hypertension from secondary to primary hypertension, 3) Patient characteristics considered in the decision to initiate workup, 4) Obesity-centered choice of diagnostic tests and lifestyle modifications, and 5) Variable threshold for initiating antihypertensive pharmacotherapy vs. referral to hypertension specialists.

Conclusions: There is variation across primary care and specialty physicians who provide care for children and adolescents with hypertension. Key areas of variability include the willingness to initiate antihypertensive medications, the use of diagnostic tests (e.g., ambulatory blood pressure monitoring), and the perceived need for specialty referral. Further study is needed to assess whether different treatment paradigms result in differential patient outcomes.

ABBREVIATIONS

ABPM: Ambulatory Blood Pressure Monitoring; BP: Blood Pressure; CBC: Complete Blood Count; DASH: Dietary Approaches to Stop Hypertension; EKG: Electrocardiogram; FP: Family Physicians; GP: General Pediatricians;

HBPM: Home Blood Pressure Monitoring; HTN: Hypertension; LVH: Left Ventricular Hypertrophy; PC: Pediatric Cardiologists; PN: Pediatric Nephrologists.

INTRODUCTION

The overall prevalence of hypertension in children and adolescents is estimated to be nearly 5% and rising [1]. Primary

hypertension among adolescents is a growing concern due to high rates of obesity among US youth [2-4]. Prior work has described differences in the use of antihypertensive medications and diagnostic tests for children and adolescents with primary

hypertension, based on the specialty of their providers (pediatric vs. adult; primary care vs. subspecialty) [5-7]. However, the rationale that underlies physicians’ clinical decision-making in the initial management of adolescents with primary hypertension has not been previously investigated.

The purpose of this preliminary qualitative study was to be hypothesis-generating and describe the underlying clinical decision-making rationale among general pediatricians, family

physicians, pediatric cardiologists and pediatric nephrologists in their initial approach to an adolescent with hypertension.

METHODS

Study Design

We conducted individual, semi-structured telephone interviews with a convenience sample of physicians from four medical specialties (general pediatrics, family medicine, pediatric cardiology, and pediatric nephrology) who manage hypertension in children and adolescents [5]. This study was approved by the Institutional Review Board of University of Michigan Medical School.

Participants and Recruitment

Using a public, online database (ReferenceUSA@[8]), we created a master list of potential participants for each specialty group. Our geographic target area of the state of Michigan and greater Chicago (IL) area provided a cross-section of rural, small city, suburban and urban settings. Our participation goal was 5 physicians per specialty group. To achieve this goal, we mailed a recruitment packet to 15 physicians per specialty (60 physicians in total), identified by systematically sampling every 3rd physician; this recruitment strategy was based on our prior experience in qualitative studies of physicians. Recruitment packets included a cover letter, study description and information sheet, and response card to indicate interest in study participation.

Additional recruitment packets per specialty were mailed in approximately 3-4 month intervals as needed to achieve our participation goal. The recruitment period was 11 months from November 2010 through October 2011. Participants received an honorarium (\$40 Visa gift card) at interview completion.

Inclusion and Exclusion Criteria

Eligible participants were physicians who spent at least 50% time in clinical care. Hospitalists, administrators, residents, fellows, non-practicing physicians, and family physicians who see a limited number of children (<5% of their overall practice) were excluded based on screening questions during the recruitment process.

Telephone interview

Study participants completed semi-structured phone interviews with the Principal Investigator (EYY). Verbal consent to participate in the study was obtained from each participant at the beginning of each interview. Each participant was presented the following case scenario – “A 12 year old boy John Smith has persistent hypertension for past 6 months” – and was asked to “think aloud” regarding how he/she would approach the management of this patient. The “think aloud” approach has been used previously to assess physician decision-making [9]. Standardized open-ended questions about potential patient factors that could affect physicians’ diagnosis and treatment strategies (e.g., patient age, obesity status, family history of hypertension) were asked. The case scenario and standardized questions were written broadly to allow participants to articulate issues most pertinent to their management strategies. Participants were probed on certain topics (e.g., use of diagnostic tests, choice of therapy – lifestyle modifications and/or antihypertensive

medications, referral strategy) if these topics were not brought up by the participants.

DATA ANALYSIS

Interviews were audio-recorded and transcribed verbatim; transcripts were checked for accuracy. Two investigators (EYY and JSW) independently coded transcripts and identified emergent themes. Using an iterative consensus-based process, inter-coder agreement was achieved. Grounded theory [10] was used for thematic analysis and transcript summaries including key themes; illustrative quotes were highlighted and used for cross-case comparisons.

RESULTS

The 19 participants included 5 general pediatricians (GP), 5 pediatric cardiologists (PC), 5 pediatric nephrologists (PN) and 4 family physicians (FP). Five themes emerged: 1) Accuracy of blood pressure (BP) measurement and hypertension diagnosis in the primary care setting, 2) Shift in the epidemiology of pediatric hypertension from secondary to primary hypertension, 3) Patient characteristics considered in the decision to initiate workup, 4) Obesity-centered choice of diagnostic tests and lifestyle modifications, and 5) Variable threshold for initiating antihypertensive pharmacotherapy vs. referral to hypertension specialists. The frequency of comments pertaining to each theme is shown in the (Table 1).

Accuracy of BP measurement and hypertension diagnosis

For the majority of physicians from all 4 specialties, the initial comments after being presented the standard case scenario pertained to whether the patient truly had hypertension. Issues of BP measurement accuracy included setting, mode of measurement (manual vs. automated; cuff size), and persistence (number) of high BP readings.

Setting of BP measurement:

GP1: “I guess the first thing that I would do is look at the situations that he’s had the hypertension documented. You know, whether it was a home reading or if it was in an office and what he was in the office for at the time. Did he have other factors like physical or emotional stress that could be contributing, was he nervous, you know those kinds of things?”

GP2: “If it’s in the office and it’s only just systolic, then I oftentimes will have the family check it outside of the office, check it at school, check it at a grocery store, at the mall, wherever they can find a blood pressure reading cuff and check it to see if the systolic is just an anxiety related issue.”

PN1: “The other thing that we will do with these patients is, you know, we always take pressures at the beginning and at the end of an exam because sometimes people will relax and their pressure comes down, so some of the white coats go away when you have them sit in the office for a while.”

Mode of BP Measurement (manual vs. automatic reading, cuff size):

PC3: “If it’s the first time I’m seeing him, I’d also try to look and see what the old blood pressure readings are from the

Table 1: Themes by Physician Specialty.

	General Pediatricians (n=5)	Family Physicians (n=4)	Pediatric Cardiology (n=5)	Pediatric Nephrology (n=5)
Accuracy of blood pressure measurement				
Setting	3 (60%)	-	3 (60%)	4 (80%)
Mode of measurement	3 (60%)	2 (50%)	2 (40%)	2 (40%)
Persistence of hypertension	3 (60%)	1 (25%)	4 (80%)	2 (40%)
Patient characteristics prompting workup				
Weight status	2 (40%)	1 (25%)	5 (100%)	4 (80%)
Age	1 (20%)	1 (25%)	4 (80%)	1 (20%)
Symptoms	2 (40%)	-	2 (40%)	2 (40%)
Diagnostic tests for HTN workup				
Urine/Blood (CBC/Metabolic panel)	4 (80%)	3 (75%)	4 (80%)	4 (80%)
Lipid panel	3 (75%)	-	2 (40%)	3 (60%)
Renal ultrasound	4 (80%)	3 (75%)	5 (100%)	3 (60%)
Echocardiogram	1 (20%)	3 (75%)	5 (100%)	3 (60%)
Electrocardiogram (EKG)	1 (20%)	1 (25%)	1 (20%)	-
ABPM	-	-	2 (40%)	3 (60%)
HBPM	1 (20%)	1 (25%)	4 (80%)	2 (40%)
Threshold for initiating antihypertensive drugs				
Older age	-	3 (75%)	3 (60%)	1 (20%)
Severity of HTN	-	-	1 (20%)	3 (60%)
Symptoms	-	2 (50%)	1 (20%)	2 (40%)
End-organ damage (LVH)	-	1 (25%)	4 (80%)	3 (60%)
No threshold (treat all)	-	-	1 (20%)	2 (40%)

CBC = Complete Blood Count; ABPM = Ambulatory Blood Pressure Monitoring; HBPM = Home Blood Pressure Monitoring; LVH = Left Ventricular Hypertrophy

primary care physician. And most of the time those are probably going to be automatic blood pressure cuff, which I have very little, unfortunately, I don't have a lot of faith in, depending upon how high it is, you know, if he was over the 95th percentile, if it was just sort of a pre-hypertension, or borderline Stage I hypertension, probably not do a whole lot except see him back again to repeat the blood pressure."

Persistence (number) of High BP readings:

GP2: "I would look at the persistence of it...how many times it's been checked and what scenarios it's been checked in...Has it ever occurred before? What do we have in the past? We start checking blood pressures at age 3 in our office, so we should have, if this is a patient we've been seeing for years, should have some data on whether this is a persistent fact or not."

PC2: "I'd like to have some, more than a few, outpatient blood pressure managements, or measurements, I should say to look at the trend." One family physician commented about the complicated nature of guidelines in making hypertension diagnosis in adolescents based on BP percentiles.

FP3: "Well, first I would establish the diagnosis using the NIH guidelines which are somewhat complicated to use actually because they are based on the gender and the percentile of height and weight and then you have to look up on that big table whether they have hypertension or not. So I assume for the purpose of this that we've already gone through the waiting period with

the re-checks and we've determined that he does indeed have hypertension."

Shift in the epidemiology of pediatric hypertension

Several pediatric cardiologists (3/5) and nephrologists (3/5) talked about the shifting epidemiology of pediatric hypertension from secondary to primary hypertension and related this change to the increase in childhood obesity.

PC3: "As a cardiologist...when I was doing my training, cardiology didn't handle hypertension....at least where I trained, that if you had somebody with hypertension they went to nephrology. I think things have changed a lot with the increase in obesity, that we're seeing a lot more adolescents with essential hypertension. So it has changed hypertension significantly. I think that the work-up and the etiology for hypertension changed significantly in the last twenty years."

PN1: "We're seeing so many kids that are obese, that I would say diet and exercise are so important, because most of these youngsters, really, that's why we're seeing this outbreak of HTN."

Patient characteristics considered for initiating hypertension workup

Patient's weight status, age, and symptoms were the main characteristics considered in the physicians' decision to initiate workup for hypertension. Physicians stated that they would more

likely initiate work up for the patient if he was thin, younger, and had symptoms.

Weight Status:

PC3: "First we would get sort of an idea as to body habitus, what his height is, what degree of hypertension he has, what percentile he's running. If they're fairly thin at 12 years of age, I'd be doing just the basic metabolic profile"

PC4: "So, a 12-year-old obese kid, I would think more in terms of adult risk factors. A thin 12-year-old with no family history, then you'd be more inclined to work up.

Patient Age:

PC3: "If [he] was younger, then I'd automatically send them over to see the nephrologist, because of a higher risk of nephrotic, renal abnormalities rather than essential hypertension. If they were 14, then it's much more likely that we're dealing with essential hypertension and less with renal abnormalities."

PC2: "[I]t depends on some of the other psychosocial factors or measurement factors, but I think as you're getting older, you're probably dealing with essential hypertension as opposed to a structural component, and then some of those, you know, the yield of some of those tests is less."

FP4: "I would view hypertension in any child, especially under age 18, as abnormal, so I would definitely want to look for secondary causes of hypertension."

Patient Symptoms:

GP2: "Obviously, if he's got symptoms, then it's something different, I'd be more aggressive. If he was having symptoms of headaches or dizziness or things like that, I would probably check urine here in the office, just because that's easy for us to do. And I would actually probably call our pediatric nephrologist—they're pretty available—and talk with him over the phone, and sometimes they'll have me send these kids to the emergency room for the work-up if they're symptomatic hypertensive."

Obesity-centered choice of diagnostic tests and lifestyle changes

The majority of physicians from all 4 specialties stated that they would order basic urine and blood tests (e.g., CBC, metabolic panel) as well as obtain a lipid panel in the initial workup of this patient. Renal ultrasound and echocardiogram were used by all physician groups and EKG was used infrequently across all groups. Pediatric nephrologists talked about using ambulatory blood pressure monitoring (ABPM) more than pediatric cardiologists who discussed the use of home blood pressure monitoring (HBPM) more. Neither group of primary care providers described using either of these methods.

PN3: "We rely very strongly on ambulatory blood pressure monitoring. We found that a lot of kids have [white] coat hypertension. We have three machines at our disposal, and unless the family seems to be not very trustworthy we would ship them a cuff which he would wear obviously for 24 hours."

PC5: "I don't have a good source for ambulatory, 24 hour ambulatory blood pressure monitoring. We don't have it in our

hospital; and there's no reimbursement for it...So that would be an ideal approach for me. I just don't have that at my disposal. I would also, generally also have some home monitoring... I'll have them bring in at a visit in my office just to make sure they are correlating with the levels that we're getting" Most physicians across specialties stated that they would start lifestyle changes with initial focus on weight management by counseling patients and families on weight loss, increasing exercise and modifying diet. Only one physician (FP) spoke specifically about low salt and Dietary Approaches to Stop Hypertension (DASH) diet. One physician in each specialty would refer the patient to a nutritionist/dietitian.

PC5: "Generally I would give 3 months and see where they're tracking in terms of compliance with exercise, compliance with watching diet and weight loss."

GP4: "I probably would, you know, we'd talk a long time, he and I, about diet and proper nutrition, and go over what he eats and drinks and I might make a referral to our dietician for him to be seen by her. Exercise is huge, obviously, so I'd try to find out if he's a pretty stationary kid or is he getting up and moving. And then we'll try to explain to him that obviously his hypertension could very well be linked to his obesity, so let's maybe set some goals for him to come back in like one month and see if he's made some diet changes, see if we have any weight loss, any change."

FP2: "I would probably, you know, do some pretty significant counseling as far as nutrition, get him set up with a nutritionist, see if we could lose about 10% of his weight and see if that improved his blood pressure numbers."

Variable threshold for initiating antihypertensive pharmacotherapy vs. referral to hypertension specialists

All general pediatricians stated that they would not prescribe antihypertensive medications themselves for the adolescent in the case scenario, often noting that they are not comfortable in that role. In contrast, family physicians and subspecialists stated that they would initiate antihypertensive drugs in the adolescent in the case scenario if he was older, had more of adult habitus, high severity of hypertension, or evidence of end-organ damage (e.g., left ventricular hypertrophy (LVH)). Few subspecialists stated that they would treat every hypertensive patient with antihypertensive medications.

GP2: "I do not [start meds]... if it's [hypertension is] moderate or severe, I'm going to refer them, because I don't feel that, I don't feel that I have the appropriate training."

FP2: "if I had done all of the workup and the renal ultrasound was normal with the Doppler and the blood work was all normal and it was a patient that was more of an adolescent, older, 16, had more of the physiology of an adult, I would probably consider trying to treat them initially myself."

PN5: "If they have really high blood pressure, I wouldn't wait for them to try to lose weight before starting medication."

PN4: "If they have LVH, it's a no-brainer. If they have LVH, we're going to treat. Because there's nothing to negotiate....if they have end-organ damage, it's a very easy decision."

PN4: "...I would treat just about everybody who's hypertensive with BP medication if I'm convinced they're hypertensive, so in terms of choosing to treat or not treat, if they're consistently above the 95th percentile, I'm going to treat them"

PC3: "So in a 12 year old, you're talking about someone that's obese and it's looking like essential hypertension, then yeah, I would go ahead and treat them because I'm looking at all of the risk factors for coronary artery disease. I sort of, cause then it gets to essentially the same reason why you treat essential hypertension in an adult."

Variable threshold for referral to and choice of hypertension specialist: All general pediatricians had a very low threshold for referring the adolescent in the case scenario to a hypertension specialist citing discomfort initiating antihypertensive drugs and lack of appropriate training. Three general pediatricians stated that they would refer to pediatric cardiology; two would refer to pediatric nephrology. In contrast, family physicians had higher threshold of referral to a hypertension specialist and/or were comfortable initiating antihypertensive therapy themselves and referring at the same time. Family physicians' referral choice of hypertension specialists were split evenly between pediatric cardiologists (n=2) and pediatric nephrologists (n=2). Family physicians stated that they would refer patients who were symptomatic, thin without family history of hypertension, younger, had LVH on echocardiogram, or if the parents requested a referral.

FP1: "Any symptoms, then I would definitely start treatment right away and refer to pediatric nephrology."

FP2: "If he wasn't overweight and he had no family history, I would probably get a renal ultrasound and then send him to a pediatric cardiologist"

FP3: "They [older adolescents] basically, then have adult body size, and when you look up the drug dosing, it's pretty much the same as adults. So I feel like I know those doses, I know those drugs, I know how to handle it. **With younger kids**, it's just been too hard. I mean if you have two eight year olds who are on antihypertensives you just don't know the drug doses well enough to be safe about taking responsibility for that. So those kids I've insisted that they see someone else.... **LVH on echo** would scare me, and it would make me not want to manage the case as a family doctor...would definitely ask for help from a pediatric HTN specialist....**If the parent wanted to involve a pediatric hypertension specialist** and was willing to drive ... then I'd be willing to make that referral at this point and let them choose the medication.... most parents are concerned enough about that diagnosis that they are willing to go ..." One pediatric cardiologist expressed concern about the hands-off approach of general pediatricians who refer patients for management of essential hypertension.

PC3: "I will tell you that the general pediatricians are becoming more and more narrow-focused. They don't want to necessarily manage, co-manage something like this. They want you to take over it. So as a subspecialist, we're dealing with kids that probably could easily be managed by a primary care...internists would not think of sending a person with hypertension to a cardiologist. They would be evaluating and managing it themselves... as they

see more kids with obesity, it's going to become more evident that we have to start pushing these kids back to their primary care physicians. But I've actually have some reluctance on the primary care physicians' parts in taking these kids back and them being the primary manager of the medications. Because they're medications that they're not accustomed to."

DISCUSSION

In this preliminary hypothesis-generating qualitative study of physicians' clinical rationale and approach to a young adolescent with hypertension, many described their concerns about the accuracy of blood pressure measurement and hypertension diagnosis. Accurate blood pressure measurement is the first step to correctly diagnosing hypertension yet is highly dependent on the use of appropriately-sized arm cuffs (bladder must cover at least 80% of the upper arm circumference[11]) and known to be variable depending on the type of device used (manual auscultation vs. traditional oscillometry) [11]. Given the issues with measurement accuracy, general pediatricians who are relatively unfamiliar with the management of hypertension in adolescents may be also reluctant to act upon high blood pressure readings themselves. General pediatricians in our study acknowledged their overall discomfort in the management of hypertension in the young adolescent in the case scenario compared to family physicians. This reflects the fact that the diagnosis, workup and treatment of hypertension in children and adolescents still remain largely in the pediatric subspecialty domain whereas the treatment of hypertension in adults largely occurs in the primary care setting. Many pediatric cardiologists and nephrologists in our study noted the shift in the epidemiology of pediatric hypertension from secondary to primary hypertension associated with increases in childhood obesity consistent with prior studies [12-17]. Moreover, studies have previously shown that nearly two-thirds of pediatric hypertension patients 6-16 years old had primary hypertension [13]. Given this epidemiologic shift associated with childhood obesity, it is not surprising then that the physicians' choice of diagnostic tests often included the lipid panel and they focused lifestyle changes on obesity treatment rather than hypertension-specific diet changes such as low salt or DASH diet. Importantly, the effectiveness of lifestyle changes on improving blood pressure control has yet to be determined among overweight or obese adolescents with hypertension. Our study also identified stark differences between general pediatricians and family physicians in their threshold to initiate antihypertensive pharmacotherapy and referral to hypertension specialists. Most notable was the high level of discomfort by all general pediatricians interviewed in initiating antihypertensive medications and perceived lack of training to prescribe antihypertensive medications themselves, which is consistent with a previous study [18]. In contrast, family physicians generally felt more comfortable initiating antihypertensive medications, particularly if the patient was older or more closely resembled an adult in body habitus. Many described parallel experiences in treating adult patients with primary hypertension and familiarity with the adult dosing regimen. Previous studies have described that family physicians were leading prescribers of antihypertensive medications for adolescents with primary hypertension [5]. Given that the majority of adolescents with hypertension have primary

hypertension,[12-17] the “refer all” approach used by general pediatricians to pediatric cardiologists or pediatric nephrologists represent an unsustainable workforce burden on subspecialists; this was noted by one pediatric cardiologist in our study. Thus, medical education programs should strongly consider providing focused training in the treatment and management of adolescents with hypertension for general pediatrics trainees and practitioners.

LIMITATIONS

This qualitative study of a small convenience sample of physicians practicing in the State of Michigan and Chicago-area (n=19) was intended to generate hypotheses about the rationale for physician decision-making. Results from this study should not be interpreted as generalizable findings. Future studies should test the hypotheses generated from this preliminary qualitative work in a nationally-representative sample of physicians providing care for children and adolescents with hypertension.

CONCLUSION

There is variation across primary care and specialty physicians who provide care for children and adolescents with hypertension. Key areas of variability include the willingness to initiate antihypertensive medications, the use of diagnostic tests (e.g., renal ultrasound, echocardiogram, ABPM), and the perceived need for specialty referral. Further study is needed to assess whether different treatment paradigms result in differential patient outcomes.

DISCLOSURE

All authors are responsible for the reported research. We have participated in the concept and design, analysis and interpretation of data, and drafting or revising of the manuscript; and we have approved the manuscript as submitted. Dr. Esther Yoon wrote the first draft of the manuscript and no honorarium, grant, or other form of payment was given to anyone to produce the manuscript. There was no involvement of study sponsors/funding source in 1) study design; 2) the collection, analysis, and interpretation of data; 3) the writing of the report; and 4) the decision to submit the paper for publication.

We disclose that there is no affiliation, financial agreement, or other involvement of any author with any company whose product figures prominently in the submitted manuscript so that the editors can discuss with the affected authors whether to print this information and in what manner. All authors have no conflict of interest, real or perceived.

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the data and the accuracy of the data analysis.

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