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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/23531
DOI URL: http://dx.doi.org/10.21474/IJAR01/23531

RESEARCH ARTICLE

WHITE COAT SYNDROME AND THE VISUAL LANGUAGE OF CARE A COMPARATIVE REVIEW OF FLORAL SHIRTS, SOLID-COLORED SHIRTS, AND THE TRADITIONAL WHITE COAT

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Manuscript Info

Manuscript History
Received: 14 March 2026
Final Accepted: 16 April 2026
Published: May 2026

Key words:-
white coat syndrome; white-coat hypertension; white-coat effect; clinician attire; patient anxiety; ambulatory blood pressure monitoring; physician-patient relationship

Abstract

White coat syndrome, more precisely termed white-coat hypertension when elevated clinic blood pressure is accompanied by normal out-of-office blood pressure in an untreated person, is a clinically important phenomenon at the intersection of cardiovascular measurement,anxiety, learned associations and the symbolism of medical authority. The traditional white coat can increase perceived professionalism and role clarity, yet in susceptible patients it may also function as a conditioned cue for stress. This focused narrative review clarifies the terminology of white-coat syndrome, white-coat hypertension and white-coat effect; explains why ambulatory or home blood pressure monitoring is essenti al; and proposes a cautious comparative framework for three clinician visual presentations: a floral shirt, a solid-colored shirt and a white coat. The central argument is not that any attire style is universally superior, nor that attire has proven causal effects on blood pressure. Rather, attire is considered as one modifiable nonverbal signal within a larger clinical environment. Warmer attire may reduce perceived threat in low-acuity or counseling-oriented encounters, whereas white coats may support confidence and role clarity in procedural, emergency or specialist settings. A patient-centered and context-sensitive approach is recommended, together with strict blood pressure measurement discipli ne and direct empirical testing.

Introduction:-

The term "white coat syndrome" is commonly used to describe a familiar clinical scenario: a patient records higher blood pressure in a medical environment than at home or during daily life. In clinical terminology, white-coat hypertension refers more specifically to elevated office blood pressure with normal ambulatory or home blood pressure in a person who is not receiving antihypertensive treatment. A related expression, white-coat effect, describes the difference between clinic and out-of-office blood pressure and is often used for patients already treated for hypertension.This distinction matters. A single high office measurement can lead to overdiagnosis and unnecessary treatment escalation; however, dismissing the response as merely emotional can also underestimate long-term cardiovascular risk. Contemporary clinical reasoning therefore emphasizes repeated standardized

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measurement and confirmation by ambulatory blood pressure monitoring (ABPM) or home blood pressure monitoring (HBPM) when office and real-life readings disagree.

The phrase "white coat" is also symbolic. The garment may represent cleanliness, expertise and institutional authority. For many patients this symbolism increases confidence. For others, especially patients with prior negative medical experiences, fear of diagnosis or health-related anxiety, the same symbol may increase perceived threat. This creates a practical question: can the clinician's visual appearance, such as a floral shirt, a solid-colored shirt or a white coat, influence patient perceptions and perhaps contribute to physiological arousal? The present manuscript treats this question cautiously: perception effects are supported by attire research, whereas direct blood-pressure effects remain insufficiently tested.

Literature Selection and Evidence Status:-

This article is a focused narrative review combined with a hypothesis-generating conceptual model. The literature base was selected to answer two linked questions: first, how white-coat hypertension is defined, measured and clinically interpreted; second, how clinician attire affects patient perception and whether this might plausibly influence physiological arousal.

Sources were selected from peer-reviewed clinical guidelines, systematic reviews, meta-analyses and cross-sectional studies addressing white-coat hypertension, ambulatory or home blood pressure monitoring, clinician attire, patient trust, patient comfort and medical-setting anxiety. Priority was given to cardiovascular guideline papers, observational outcome syntheses, and large attire-preference studies. Conceptual or theoretical sources were used only to explain plausible mechanisms and to define future research needs. Studies were not pooled statistically in this manuscript; therefore, conclusions about attire and blood pressure are presented as hypotheses rather than evidence-based effect estimates.

Table 1. Evidence-status separation between established findings and hypothesis-generating claims.

Claim or component	Current evidence status	How it is used in this article
White-coat hypertension is a recognizable BP phenotype requiring office and out-of-office comparison.	Established in clinical guidelines and reviews.	Used as the clinical foundation of the article.
Untreated white-coat hypertension may carry higher long-term cardiovascular risk than normotension.	Supported by observational meta-analysis; not equivalent to sustained hypertension.	Used to justify follow-up and accurate classification.
Clinician attire influences patient perception, trust, comfort and role recognition.	Supported mainly by surveys and cross-sectional attire-preference studies.	Used to frame attire as nonverbal communication.
Clinician attire directly changes blood pressure.	Limited direct evidence; causality remains uncertain.	Presented only as a cautious hypothesis requiring trials.
Floral shirt, solid-colored shirt and white coat produce different BP responses.	Conceptual and hypothesis-generating; not proven.	Used to propose testable predictions and a trial design.

Definitions and Measurement:-

Three terms are used carefully in this revised manuscript. White coat syndrome is a broad, colloquial phrase for anxiety or elevated readings in medical environments. White-coat hypertension is a diagnostic blood-pressure phenotype: office blood pressure is elevated, while out-of-office blood pressure is normal, typically in an untreated person. White-coat effect refers to the clinic-minus-out-of-office difference and may occur in treated or untreated patients. These terms overlap in everyday language but should not be used interchangeably in clinical interpretation.

The thresholds below use commonly applied clinic and daytime/home systolic blood pressure cutoffs for conceptual classification. Local guidelines may use additional diastolic thresholds or lower diagnostic cutoffs; therefore, the matrix is a reference framework rather than a substitute for clinical judgment.

Table 2. Blood-pressure phenotype matrix integrating office and out-of-office systolic blood pressure.

Phenotype	Office SBP	Out-of-office SBP	Clinical trajectory and risk profile
Normotension	Normal (<140 mmHg)	Normal (<135 mmHg)	Baseline profile; no hypertension intervention indicated solely by BP phenotype.
White-coat hypertension	Elevated (>=140 mmHg)	Normal (<135 mmHg)	Requires ABPM/HBPM confirmation; may carry elevated long-term CV risk if untreated and persistent.
Sustained hypertension	Elevated (>=140 mmHg)	Elevated (>=135 mmHg)	Persistent risk across settings; lifestyle intervention and pharmacotherapy may be indicated according to risk.
Masked hypertension	Normal (<140 mmHg)	Elevated (>=135 mmHg)	High real-world risk; frequently missed during routine office screening without ABPM/HBPM.

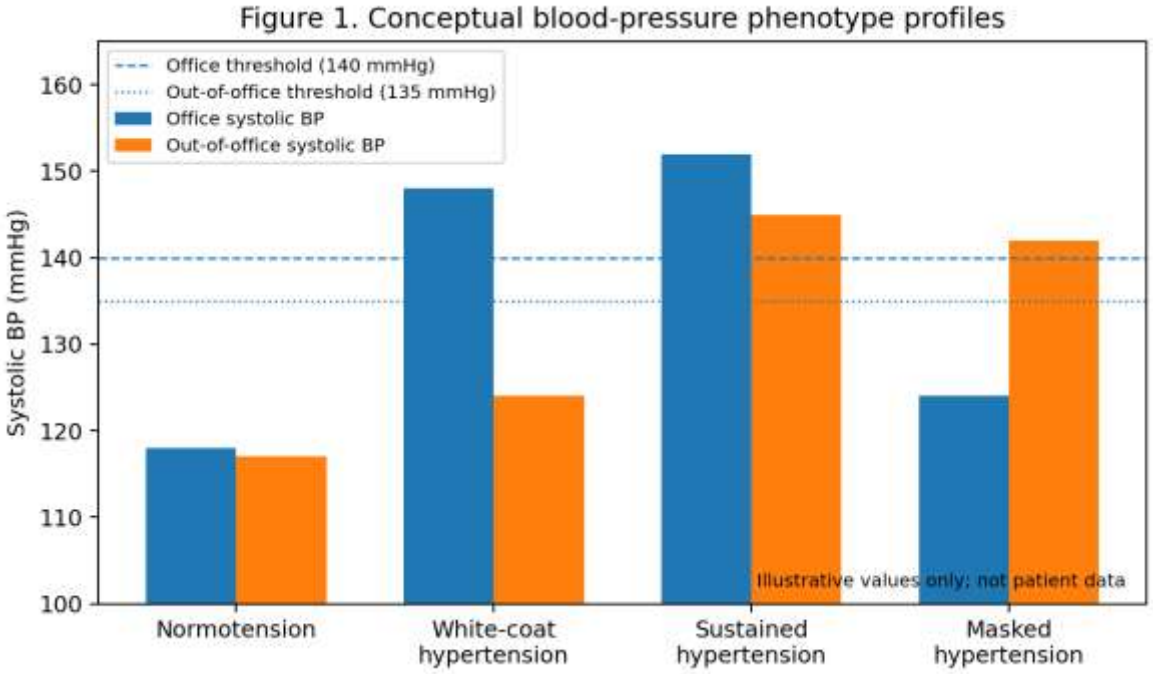

Figure 1. Conceptual office and out-of-office systolic BP profiles. Values are illustrative and based on commonly used thresholds; they are not patient-level data.

Why the White Coat May Raise Blood Pressure in Susceptible Patients:-

White-coat hypertension is best understood as a biopsychosocial measurement response rather than as simple nervousness. The clinical setting may increase sympathetic nervous system activity, leading to higher heart rate, increased myocardial contractility, increased vascular tone and transient elevation of systolic blood pressure. This can occur even when the patient does not consciously report panic.

A plausible neurobiological pathway begins with visual appraisal. Institutional symbols such as a white coat, examination room, sphygmomanometer, computer screen or stethoscope may be interpreted as signs of diagnosis, judgment, pain or loss of control. In susceptible patients, these cues may increase salience and threat processing in limbic circuits, including the amygdala. Downstream activation of hypothalamic and brainstem autonomic pathways can increase sympathetic outflow and adrenal catecholamine release, especially norepinephrine and epinephrine. The immediate result may include tachycardia, peripheral vasoconstriction and a short-term rise in blood pressure. A slower hypothalamic-pituitary-adrenal response, including cortisol release, may also contribute to persistent arousal during longer visits.

The reaction can also be learned. Needles, previous diagnoses, fear of bad news, fear of judgment and the formal hierarchy of the clinic can become associated with physiological arousal. The clinician's clothing is only one cue among many; it should therefore be considered alongside communication style, waiting time, room design, measurement technique and prior patient experiences.Anxiety is not the only explanation. Older age, metabolic risk, kidney disease, arterial stiffness and early hypertension can coexist with white-coat hypertension. A high office reading should therefore be verified, contextualized and followed over time rather than dismissed as a cosmetic response to clothing.

Clinician Attire as Nonverbal Communication:-

Clothing is a clinical message before the first sentence is spoken. A white coat can signal expertise, hygiene, authority and institutional legitimacy. A floral shirt may communicate warmth, creativity and reduced threat. A solid-colored shirt may communicate neutrality and professionalism without the symbolic intensity of a coat.

Research on physician attire indicates that patients often associate white coats or formal attire with professionalism and trust, although preferences vary by specialty, culture, age and clinical context. The same garment can therefore have opposite meanings: confidence for one patient and stress for another. This manuscript avoids claiming that attire alone changes blood pressure. Instead, attire is treated as one visual signal that may influence perception and could plausibly contribute to physiological arousal in selected patients.

Table 3. Conceptual comparative framework: floral shirt, solid-colored shirt and white coat. This table is hypothesis-generating, not evidence of measured BP effects.

Attire condition	Likely psychological signal	Possible benefit	Possible limitation	Expected BP/anxiety effect
Floral shirt	Warm, approachable, less institutional.	May reduce threat and encourage conversation, especially in pediatrics, mental health, primary care or anxious patients.	May be perceived as less formal or less authoritative by some adults or in high-acuity settings.	Conceptual only: potentially lower anxiety and smaller white-coat response; evidence is indirect.
Solid-colored shirt	Neutral, tidy and professional but less symbolic than a coat.	Balanced presentation; may preserve professionalism while reducing visual overstimulation.	May lack the clear role signal some patients expect from clinicians.	Conceptual only: predicted intermediate response between floral shirt and white coat.
White coat	Medical authority, expertise, cleanliness and hierarchy.	May increase trust, confidence and role recognition in many settings.	May trigger conditioned anxiety and clinic-related BP elevation in susceptible patients.	Conceptual for attire-to-BP causality: potentially higher response in vulnerable patients; direct evidence is limited.

Conceptual Attire-Response Model and Qualitative Proxies:-

Figure 2 is a conceptual model, not a measured dataset. To make the 0-10 scores interpretable before empirical testing, the proposed scores should be operationalized using patient-reported and behavioral indicators. These proxies would allow the model to be translated into a measurable research protocol.

Table 4. Proposed proxies for the conceptual 0-10 attire-response scores.

Model variable	Suggested 0-10 qualitative or behavioral proxy	Measurement example for a future trial
Expected anxiety	Patient-rated immediate anxiety, visible restlessness, request to delay BP measurement, avoidance of eye contact.	Single-item anxiety visual analog scale before and after clinician entry.
SBP-elevation score	Conceptual translation of clinic SBP rise relative to home or baseline reading.	Mean office SBP minus pre-visit HBPM/ABPM baseline, scaled after data collection.
Perceived professionalism	Patient perception of competence, role clarity, hygiene and seriousness.	Post-encounter Likert ratings of professional confidence.
Perceived approachability	Patient willingness to ask questions, disclose concerns and return for care.	Post-encounter approachability and communication ratings.

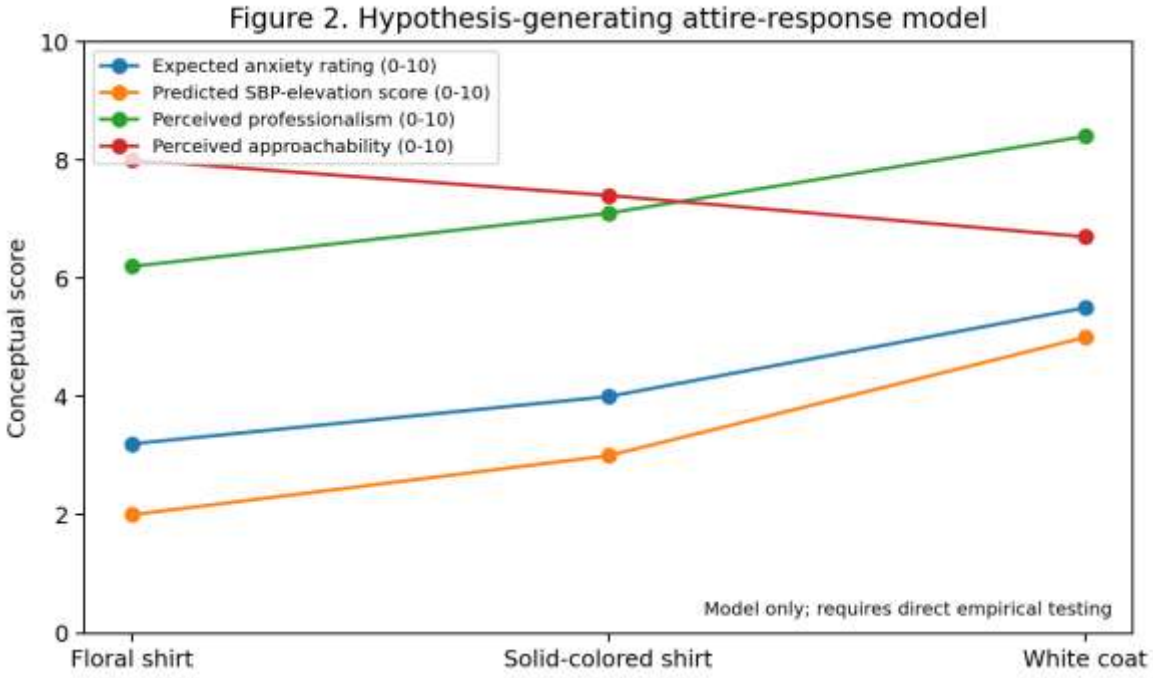

Figure 2. Hypothesis-generating model only. The graph illustrates a possible pattern of perceptions and predicted SBP response; it is not evidence from a clinical dataset.

Clinical Risk: White-Coat Hypertension Is Not Always Benign:-

Historically, white-coat hypertension was sometimes considered harmless. More recent evidence is more cautious. A meta-analysis of 27 observational studies found that untreated white-coat hypertension was associated with increased cardiovascular events, all-cause mortality and cardiovascular mortality compared with normotension. Treated white-coat effect did not show the same increased risk in that analysis, emphasizing the need to distinguish untreated white-coat hypertension from treated clinic-elevated readings.

The practical implication is that a high clinic reading should not lead automatically to treatment escalation, but it also should not be ignored. The defensible response is accurate classification: repeated standardized office measurement, ABPM or HBPM, risk-factor assessment and follow-up.

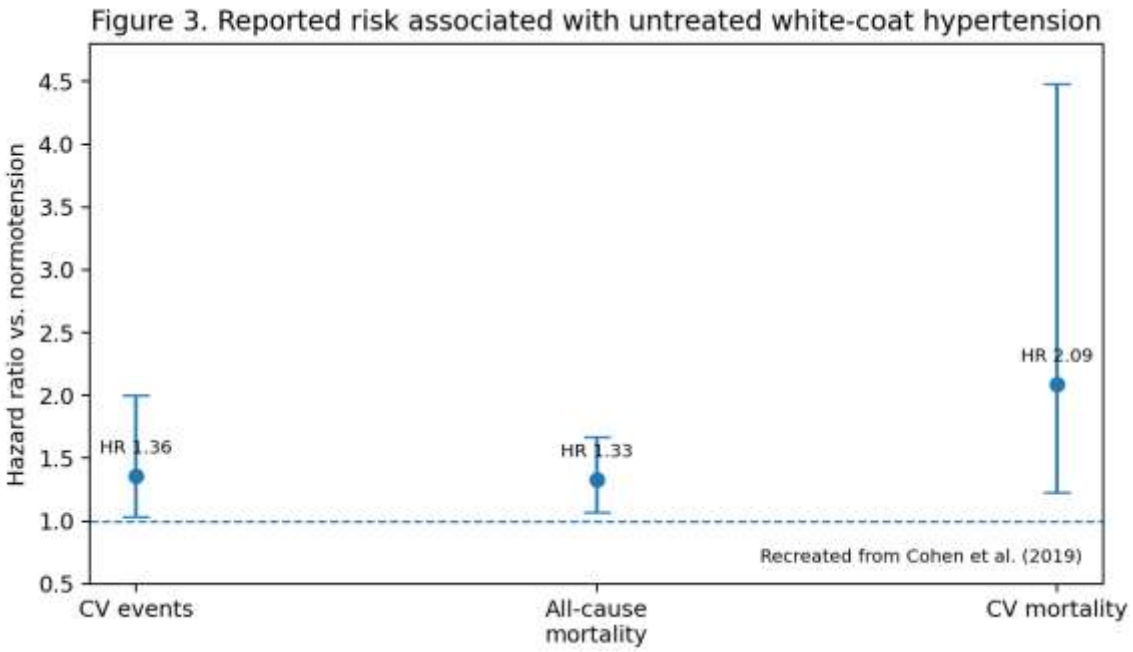

Figure 3. Hazard ratios reported for untreated white-coat hypertension versus normotension in Cohen et al. (2019). Unlike Figures 1 and 2, this figure summarizes published meta-analytic risk estimates rather than an attire hypothesis.

Proposed Direct Study: Testing the Attire Hypothesis:-

Because direct evidence comparing floral shirts, solid-colored shirts and white coats on blood pressure is limited, a randomized crossover study is the most appropriate next step. Each participant would attend three standardized brief visits, with the same clinician or carefully matched clinicians wearing a different attire condition each time. Attire order would be randomized to reduce order effects.

The revised protocol should specifically address the causality gap. In addition to standard office measurements after seated rest, participants could wear an ambulatory or automated cuff programmed to obtain repeated readings during the first 30 minutes after clinician entry or immediately after the encounter. This early ABPM-style window would help distinguish an immediate visual-trigger response from generalized office anxiety that persists throughout the visit.

Table 5. Proposed crossover design to test whether clinician attire affects blood pressure, anxiety and perception.

Study element	Recommended design
Population	Adults with previously elevated office BP or self-reported medical-setting anxiety; optional pediatric or adolescent subgroup only with separate ethics approval.
Conditions	A: floral shirt; B: solid-colored shirt; C: traditional white coat over professional attire.
Randomization	Randomized attire order across three visits; same room, same time of day and same scripted greeting where possible.
Office BP protocol	Validated automated device; correct cuff size; five minutes seated rest; no talking; two or three readings averaged.

Early post-encounter ABPM window	Automated readings during the first 30 minutes after clinician entry or immediately after the encounter to isolate immediate visual triggers.
Primary outcome	Difference in mean office systolic BP between attire conditions.
Secondary outcomes	Diastolic BP, heart rate, anxiety score, trust score, approachability score, patient preference and willingness to return.
Bias controls	Blinded data analyst; standardized room; standardized instructions; scripted clinician greeting; identical measurement protocol; exclude acute pain, fever or acute illness.
Analysis	Within-participant comparison using mixed-effects models or repeated-measures analysis, with attire order and visit number included as covariates.

Practical Recommendations and Measurement Discipline:-

Measurement discipline should precede fashion decisions. Correct technique is more important than attire when classifying hypertension. Clothing may be relevant to patient experience, but incorrect cuff sizing, rushed measurement or conversation during measurement can create larger and more misleading blood-pressure errors than attire.

Table 6. Structured blood-pressure measurement discipline checklist before evaluating a potential white-coat response.

Step	Measurement control	Reason
1	Use a validated automated BP device and an appropriately sized cuff on a bare arm.	Reduces device and cuff-size error.
2	Seat the patient with back supported, feet flat, legs uncrossed and arm supported at heart level.	Reduces posture-related BP elevation.
3	Allow at least five minutes of quiet rest before measurement.	Reduces activity- and arrival-related arousal.
4	Avoid talking, phone use or clinical questioning during the reading.	Prevents communication-triggered sympathetic activation.
5	Obtain two or three readings and average them according to protocol.	Improves reliability over a single reading.
6	Document pain, anxiety, caffeine, nicotine, exercise, acute illness and timing of medication.	Identifies confounders before interpreting a white-coat response.
7	Use ABPM or HBPM when office and real-life readings disagree.	Prevents misclassification of white-coat, sustained or masked hypertension.
8	Consider attire flexibility only after the measurement protocol is standardized.	Keeps environmental modification secondary to accurate clinical measurement.

Tailor attire to context: white coats may be useful in specialist, procedural or acute settings; warmer clothing may be useful for anxious patients or counseling-oriented encounters.

Ask the patient: a short question such as "Do medical visits usually make your blood pressure rise?" can identify patients who need a calmer measurement protocol.

Separate role clarity from threat: name badges, clear introductions and respectful communication can preserve professionalism even without a white coat.

Do not overinterpret attire: a change in clothing should not replace ABPM/HBPM, repeated measurement or cardiovascular risk assessment.

Appendix: Evidence Summary Table

Table A1. Evidence summary and cross-reference to the revised manuscript sections.

Source	Design / scope	Most relevant point for this article	Main section supported
Whelton et al. 2017/2018 ACC/AHA guideline	Clinical practice guideline	Supports confirmation of hypertension phenotypes using out-of-office BP measurement.	Sections 3, 9
Cohen et al. 2019	Systematic review and meta-analysis; 27 studies	Untreated WCH was associated with higher cardiovascular events and mortality versus normotension.	Section 7; Figure 3
Petrilli et al. 2015	Systematic review of physician attire	Physician attire influences patient perceptions, including trust and confidence, with context-dependent effects.	Sections 5, 10
Petrilli et al. 2018	Cross-sectional study; 10 US academic medical centers	Formal attire with a white coat was often preferred in several contexts, but preferences varied by setting.	Sections 5, 10
Houchens et al. 2022	International cross-sectional studies; 9171 patients	Attire preferences varied by country and setting; no single dress style applies universally.	Sections 5, 9, 10
Mancia et al. 2021	Clinical/pathophysiological review	White-coat hypertension includes physiological and clinical dimensions and should not be dismissed.	Sections 4, 7
Nuredini et al. 2020	Clinical review	Summarizes current classification and management concerns in white-coat hypertension.	Sections 3, 7, 9
Cobos et al. 2015	Behavioral and relationship-focused review	Links white-coat hypertension with patient-practitioner relationship and communication factors.	Sections 4, 5, 9
Kim et al. 2025	Systematic review of physician attire	Supports the view that attire affects patient perception; direct physiological endpoints remain limited.	Sections 2, 5

Discussion:-

The white coat is a paradox: it can reassure and alarm at the same time. It reassures by communicating competence, tradition and medical legitimacy. It may alarm because it can activate previous fear, diagnostic uncertainty and institutional hierarchy. A floral shirt may humanize the clinician and reduce perceived threat, but it may also reduce perceived authority in patients who expect formal medical dress. A solid-colored shirt may provide a compromise between warmth and professionalism. The strongest conclusion supported by current literature is that attire influences perception. The weaker and still unproven possibility is that attire independently changes blood pressure. This distinction is central. A patient may feel more comfortable with less formal attire, but whether this comfort reliably translates into lower systolic blood pressure requires direct testing under controlled measurement conditions.

For clinical practice, the most defensible position is flexibility rather than universal standardization. Dress policy should consider setting, specialty, infection-control policy, cultural norms, patient age, prior trauma, patient preference and the purpose of the visit. For research, the unanswered question is physiological causality: does attire

itself alter blood pressure, or does it merely shape subjective perceptions while measurement technique and general office anxiety drive the BP response? The proposed crossover study could address this gap with relatively low cost and high practical relevance.

Conclusion:-

White coat syndrome is not simply a joke about nervous patients. It is a meaningful measurement problem and, in the form of untreated white-coat hypertension, a potential marker of cardiovascular risk. The clinician's clothing is one part of the broader sensory environment that can influence trust, comfort, role clarity and possibly physiological arousal.

The revised evidence-based position is cautious: high office blood pressure should be confirmed with out-of-office monitoring; clinician attire influences patient perception; and direct comparisons of floral shirts, solid-colored shirts and white coats on blood pressure remain under-studied. Until stronger evidence exists, clinicians should preserve professionalism, reduce avoidable threat, respect patient context and measure blood pressure under standardized conditions.

Ethics and Data Availability:-

This manuscript is a narrative review and conceptual proposal. It does not report original patient-level data and therefore does not require patient consent. Any future crossover trial involving direct patient measurement should obtain institutional ethics approval and informed consent.

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