The Treating Physician and Hypertension Control: Part of the Solution or the Problem?

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Introduction

Currently defined as systolic blood pressure (BP) greater than or equal to 140 mm Hg or diastolic BP greater than or equal to 90 mm Hg, hypertension is a global public health problem.[1] It is leading cause of preventable death in the world, affecting 1 billion people worldwide.[2] Here in the United States, hypertension affects more than 70 million people, is the leading outpatient diagnosis by physicians, and is arguably the most important treatable risk factor for stroke, myocardial infarction, heart failure, peripheral vascular disease, and end-stage renal disease. [3, 4]

Despite widespread knowledge that treating hypertension can prevent many of its crippling and often deadly complications, hypertension remains poorly controlled, with only 31% of all hypertensives achieving recommended targets of less than 140/90 mm Hg.[4-6] Hypertension is largely untreated or under-treated in the majority of affected individuals in all countries, including those with the most advanced systems of medical care.[7-9] Control rates are even worse if the more stringent blood pressure targets for "high risk" individuals (i.e. those with diabetes, chronic kidney disease, peripheral vascular disease, or have a Framingham risk score greater than 10%) are considered.[10] Inadequate treatment of hypertension is a major factor contributing to some of the adverse secular trends in the last decade, including an increased incidence of stroke, heart failure, and kidney failure. [11, 12]Recent evidence suggests one major factor perpetuating poor hypertension control is *physician inertia*—an inappropriate hesitation of practicing physicians to initiate and titrate antihypertensive medication.[13-15] Physician inertia (also known as therapeutic inertia or clinical inertia) can also be defined as "the provider's failure to increase therapy when the treatment goals are unmet." [16, 17]

The objective of this discussion is to operationally define physician inertia with regard to the management of hypertension, review the magnitude of the problem, proposed reasons for physician inertia, previous interventions to reduce hypertension-related physician inertia, and future research directions.

The Complexity of Hypertension Control

Hypertension control requires continuous treatment with prescription medication, which is costly and often causes more symptoms than the disease itself. Effective hypertension management requires attentive care by a regular physician as well as sustained active involvement by an educated and motivated patient.[11] The presence of patient-level, physician-level and health system-level barriers makes controlling hypertension a complex and difficult undertaking. Myriad patient-level barriers to hypertension control have been identified, including lack of awareness, poor knowledge about the consequences of hypertension, varying health beliefs, and health literacy.[18-26] These factors likely impact hypertension control by way of the most important patient-level barrier, medication adherence.[24] Health system barriers such as cost, lack of insurance and patient-provider interactions also impede patients from getting the regular medical needed to control hypertension. While the importance of patient-level and system-level barriers to hypertension control has traditionally been the focus of much of the literature on hypertension control, recent evidence suggests physician level barriers such as knowledge gaps, misperceptions about practice patterns, and physician inertia play at least as significant a role in poor hypertension control if not more so. [13, 27]

Historical Perspective on Physician Inertia

The term physician inertia was first used in the literature in 1989 by Dr. David Nash at State University of New York to describe physicians' reluctance to initiate lipid – lowering therapy during hospitalization for patients with myocardial infarction.[28] Clinical inertia was formally defined by Phillips and colleagues in 2001 as "failure of health care providers to initiate or intensify therapy when indicated."[13] With regard to hypertension, a landmark paper by Berlowitz et al published in the New England Journal of Medicine in 1998 put a spotlight on the role physicians might play in the problem of poor hypertension control.[29] In this study of 800 hypertensive veterans at 5 Veterans' Affairs (VA) medical clinics, 39% of the study population still had BP >160/90 mm Hg 2 years

after the index visit despite more than 6 hypertension-related visits per year. During the 2 year study period, VA physicians only intensified therapy at 6.7% of hypertension-related visits. At some of the hypertension-related visits, BP was not recorded at all. This seminal paper concluded with the following statement: "Inadequate control of blood pressure can no longer be ascribed solely to lack of access to medical care and noncompliance with therapy; physicians themselves must accept some responsibility for the problem." Since this seminal paper, there have been dozens of studies that have come to a similar conclusion.

Physician Inertia: Operational Definition

In defining what constitutes clinical inertia in managing hypertension, there are two major considerations. First, the treatment goals must be selected.[30] Currently, the treatment threshold and goal for most patients with hypertension is BP less than 140/90 mm Hg in the office; for high-risk patients, the goal is less than 130/80 mmHg.[1] However, only 10 years ago, with publication of the Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC 6) in 1997, the threshold for drug treatment for non-diabetics and patients without target organ damage was *160/100* mm Hg.[31] Second, "appropriate action" must be defined and must be measurable. In much of the literature, appropriate action has been defined as initiating or titrating medications whenever treatment goals are unmet. In other studies, appropriate action has been determined by consensus guidelines (i.e. JNC Guidelines), which often consider nonpharmocologic actions to be appropriate. Most studies of clinical inertia do not include nonpharmacologic therapies as appropriate actions in part because they are much more difficult to measure than medication changes. [11, 13, 30] Most of the present discussion will focus on physician inertia with regard to antihypertensive prescribing behavior, since antihypertensive medications have been the mainstay of hypertension management since the 1950s.[11] Important therapeutic principles for effective use of antihypertensive therapy, and evidence for what is currently considered to be appropriate management of hypertension are summarized below.

Expanded Definition of High Risk Hypertensives with More Stringent BP Goals: JNC 7 guidelines recommend a usual BP of 140/90 mm Hg as the threshold for initiating antihypertensive medication in most patients and a lower threshold of 130/80mmHg for high-risk patients, including those with diabetes or chronic kidney disease.[1] In the newest hypertension guidelines from the American Heart Association based on new evidence that has come to light after publication of JNC 7 in 2003, the definition of "high risk" patients has been expanded to those with any of the following four conditions: 1) diabetes mellitus,, 2) chronic kidney disease (estimated GFR < 60 m/min/1.73 m^2 or estimated urinary albumin excretion > 300 mg/24 hours), 3) established coronary artery disease (CAD), 4) peripheral artery disease, aortic aneurysm, or carotid bruit , 5) high risk for CAD (i.e. a Framingham Risk Score of ≥10%), or 6) heart failure (≥120/80).[32]

B4.2 Importance of Combination Drug Therapy: An impressive body of evidence from recent clinical trials emphasizes the overriding importance of lowering BP with combinations of drugs rather than belaboring the choice of the single best agent to begin therapy. Physicians and other medical providers need to understand that high-dose monotherapy is ineffective in most hypertensive patients and often causes unwanted dose-dependent side-effects.[33] In most patients, the cause of the hypertension is multifactorial and effective treatment targets multiple pathogenetic mechanisms.[5, 33] Multiple treatment trials have shown that low-dose combination therapy, often with 3 or more drugs of different drug classes typically is the only way to achieve recommended BP goals while minimizing unwanted side-effects.[29, 34, 35] Low-dose drug combinations exert synergistic effects on BP, minimize side-effects, and reduce pill burden as well as cost.[11]

B4.3 More Rapid BP Reduction Needed to Avoid Cardiovascular Events. An unexpected outcome of the recent VALUE trial was the greater cardiovascular protection in high-risk hypertensive patients randomized to dihydropyridine CCB (amlodipine)-based treatment than to ARB (valsartan)-based treatment.[36] This result was largely explained by a more rapid reduction of BP in the first three months of the trial.[11] Similarly a more rapid reduction of BP in the first few months of the ASCOT-BPLA trial was a major factor in the

better cardiovascular outcomes in the patients randomized to the dihydropyridine + ACE inhibitor regimen as compared with the beta-blocker + thiazide diuretic regimen. Thus, for many high-risk hypertensive patients, failure to control BP within the first few months after hypertension is diagnosed may be a cause of preventable cardiovascular complications, especially in Black men.[11]

Magnitude of the Problem

From an epidemiological perspective, the prevalence of physician inertia is difficult to ascertain for two reasons: 1) there are no population-based epidemiologic studies focusing on physician inertia, and 2) available studies on physician inertia do not all use the same definition for hypertension control or for what constitutes physician inertia. With this limitation in mind, available studies estimate the prevalence of physician inertia between 29-87%.[16, 29, 37-41] Several of the important studies that have given us some estimation of how common the problem are summarized below:

Study	Study Population	Practice Setting	mean no. visits/yr	Major Finding
Berlowitz et al 1998	800 hypertensive patients	VA	5.5	Medications increased in only 11% of visits
Borzecki et al 2003	981 hyertensive patients	VA	4.4	Medications increased in only 22% of visits
Hicks et al 2005	757 poorly controlled hypertensives	Academic health system	2.6-3.0	Medications increased at 79% of visits
Hicks et al 2006	778 diabetic hypertensive	Rural and frontier primary care practices	not reported	Action taken to lower BP in 35% of uncontrolled visits
Oliveria et al 2002	231 poorly controlled hypertensives	Large Healthcare network	3.5	Medication increased in 39% of uncontrolled visits
Okonofua et al 2006	7253 poorly controlled hypertensives	Mostly VA and group practices	not reported	Medication increased in 13% of uncontrolled visits
Rondondi et al 2006	137,177 poorly controlled hypertensives	Large Staff Model HMO	not reported	"Appropriate care" given to 71% of patients with poorly controlled Systolic BP

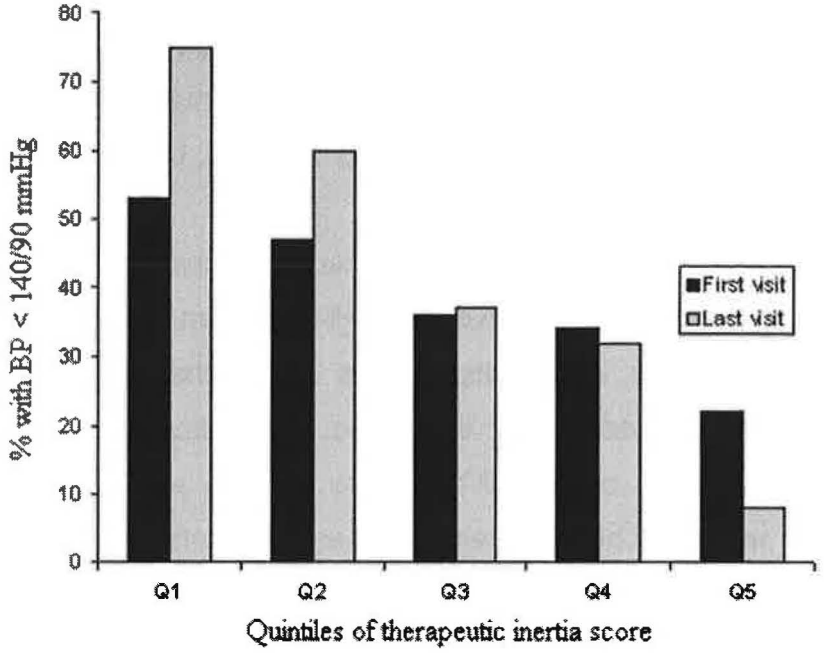
Table 1: Summary of studies defining the magnitude of physician inertia

Borzecki et al,[40] in a follow up to the seminal VA study by Berlowitz, examined 981 hypertensive veterans from 10 VA sites over the course of one calendar year. This sample differed from the previous VA sample in that more women and nonwhites were included. Despite a mean of more than 4 hypertension-related visits during the study period, 57% had a BP >140/90 mmHg at the study's end. Yet, medication was increased at only 22% of the hypertension-related visits. This is twice the number of medication increases compared to the Berlowitz study, a vast improvement, but still inadequate.

In a study of blood pressure management in an academic health system, Hicks et al examined 850 poorly controlled hypertensives (BP ≥140/90 mm Hg) during a one year study period.[42] 79% of patients with multiple visits during the year with at least 2 uncontrolled visits had their medications intensified. Intensification was significantly associated with subsequent BP control. While there was no significant difference in intensification between white and black patients, Hispanic patients were significantly less likely to have their medications intensified. A subsequent study by Hicks found that this ethnic difference in intensification could be entirely explained by the presence of diabetes and the number of outpatient visits.[38] Importantly, the association between intensification and subsequent BP control did not differ by race, a finding the authors believe indicates that equally aggressive treatment across racial lines may overcome racial differences in BP control.

Okonofua et al[16] retrospectively studied 7253 hypertensive patients with 4 or more visits during calendar year 2003, at least 1 visit with uncontrolled BP (≥ 140/90 mm Hg) and at least 3 months between the first and last visits of the year. These patients were from diverse practice settings, with most being from private group practices (60%), VA medical centers (26%) and community health centers (8%). Despite a slight improvement in hypertension control from 40% at the beginning of the study period to 45% at the end, therapeutic inertia (failure to begin or increase

Relationship between therapeutic inertia and blood pressure control. From Okonofua 2006



antihypertensive medication at visit where the SBP was > 140 mmHg or DBP >90 mm Hg) was seen in 87% of visits. Patient factors which predicted therapeutic inertia included BP <160/100 mm Hg, older age, diabetes, hypercholesterolemia, and CHF or CVD. No significant differences were found by ethnicity or comparing VA to non-VA patients. The authors went a step further than other studies and linked levels of therapeutic inertia to BP control, finding that BP control was better in patients of physicians who exhibited less therapeutic inertia. (See above figure)

In one of the largest studies to look at clinical inertia, Rodondi et al performed a retrospective cohort study examining 132,444 hypertensive patients enrolled in Kaiser Permanente of Northern California with poor BP control (≥ 160/100 mm Hg). They specifically looked at the frequency and predictors of therapy modifications in response to poorly controlled hypertension at 3 months and 6 months after the index visit. Therapy modification was defined as an increase in dose of 1 medication or more, or switch to another medication in a different therapeutic class (i.e. from beta blocker to

diuretic). An outcome called "appropriate care" included therapy modification or return to control without [pharmacologic] therapy modification; return to control without therapy modification was assumed to be due to nonpharmacologic (lifestyle) recommendations. At 6 months 64% of patients with systolic hypertension and 71% of patients with diastolic hypertension had therapy modifications, and most had "appropriate care" (71% and 82% respectively). Predictors of appropriate care included higher systolic and/or diastolic BP values at baseline, presence of diabetes and/or hypercholesterolemia.[41] Unlike the previous studies which used medical records to ascertain physician behavior, this study used diagnostic codes, BP values, and prescription data. This is an important limitation, because it extrapolates the provider's behavior from the patient's behavior. In this study, a physician who appropriately intensified therapy in response to uncontrolled hypertension in a patient who did not fill the prescription would have been categorized as giving inappropriate care.

Potential Mechanisms of Physician Inertia

In Phillips seminal paper defining clinical inertia, he outlined 3 main contributing factors: overestimation of care provided, use of soft reasons to avoid intensification of therapy, and lack of training and practice organization focused on therapeutic goals.[13] There are several examples of studies in the literature supporting each of these problems proposed by Phillips as they relate to management of hypertension. Cabana et al, after an extensive survey of the guidelines literature, developed taxonomy for and extended the hypotheses for why physicians may not engage in evidence-based patient care.[43] Reasons include 1) lack of awareness of evidence-based recommendations, 2) lack of agreement with recommended treatment thresholds, 3) lack of outcome expectancy, 4) inexperience with recommended therapies and 5) lack of self-efficacy. Evidence from the hypertension and cardiovascular literature in support of these hypothesized causes of physician inertia is summarized below:

Overestimation of care provided

Rose et al examined computerized medical records of 1580 hypertensive VA patients seen on at least 2 occasions during a 2 year study period.[44] For this study, the participating VA centers had a computerized "Hypertension Reminder" that prompts clinicians to respond in one of three ways whenever the most recently recorded BP is greater than or equal to 140/90 mm Hg: adjust medications, enact some other intervention, or provide a reason for not intervening. Medication was initiated or adjusted in 46% of the patients with an elevated BP. The remaining 54% did not have medications changed due to a number of reasons including "patient usually has well-controlled BP on current therapy" (27% of patients). The authors then examined the recorded blood pressure measurement preceding the hypertension reminder. Of the 509 patients who did not have their medications adjusted due to "usual BP control on current therapy", 57% had uncontrolled BP on the most recent measurement, 34% had uncontrolled BP on 2 of the last 3 readings, and 26% had uncontrolled BP on all of the last 3 measurements.

'Soft reasons' to avoid intensification of therapy

Soft reasons for providers unwillingness to advance therapy proposed by Phillips include the perception that "control is improving", dietary indiscretion, concerns about applying evidence-based medicine from large trials to individual patients, potential side effects and patient aversion to medical therapy. Several studies have examined reasons why physicians may not intensify therapy when indicated for uncontrolled hypertension.[39] In a survey of primary care physicians, the most common reasons for not advancing antihypertensive therapy for uncontrolled BP were 1) need to continue monitoring patient before changing drug regimen, 2) satisfactory BP response, and 3) competing medical problems. Other reasons included "intensifying would have created too many side effects" and "only borderline hypertension".[39, 45]

Reasons for not initiating or titrating antihypertensive medication

Author	Year	Reasons for not intensifying
Ferrari	2004	Awaiting full drug effect or time too short Target almost reached or clear improvement Compliance Good self-measurements Satisfactory reduction of other risk factors Other
Freitheim	2004	Physicians are not accountable to anyone MDs unsure of what treatment goal to use Reluctance and unclear strategy on how to deal with insufficient treatment MDs under-estimating consequence of under-treatment
Oliveria	2002	Need to continue monitoring patient before change satisfactory BP response competing medical problems DBP okay Borderline HTN patient preference compliance intensifying would have resulted in side effects not enough time in clinic
Hyman	2000	Lack of familiarity with guidelines Higher treatment threshold than guidelines Lack of familiarity with general principles of evidence based medicine

Lack of awareness and agreement

Oliveria et al found 48% of physicians report being only somewhat familiar with JNC guidelines, and that on average, physicians would not start antihypertensive therapy below a systolic BP of 150 mm Hg and diastolic BP of 91 mm Hg.[39] Hyman et al found that many physicians would not start therapy for SBP less than 160 mm Hg![45] A study done by Spranger et al indicates that an additional knowledge gap may be awareness of the number of antihypertensive classes needed to control hypertension.[46] A retrospective chart review of 249 hypertensive patients in six community-based primary

care centers revealed that only 33% were controlled to below 140/90 18 months after initiating therapy. These patients were being treated with an average of 1.6 medications per patient, well below the 3 or more medication classes needed for adequate control.

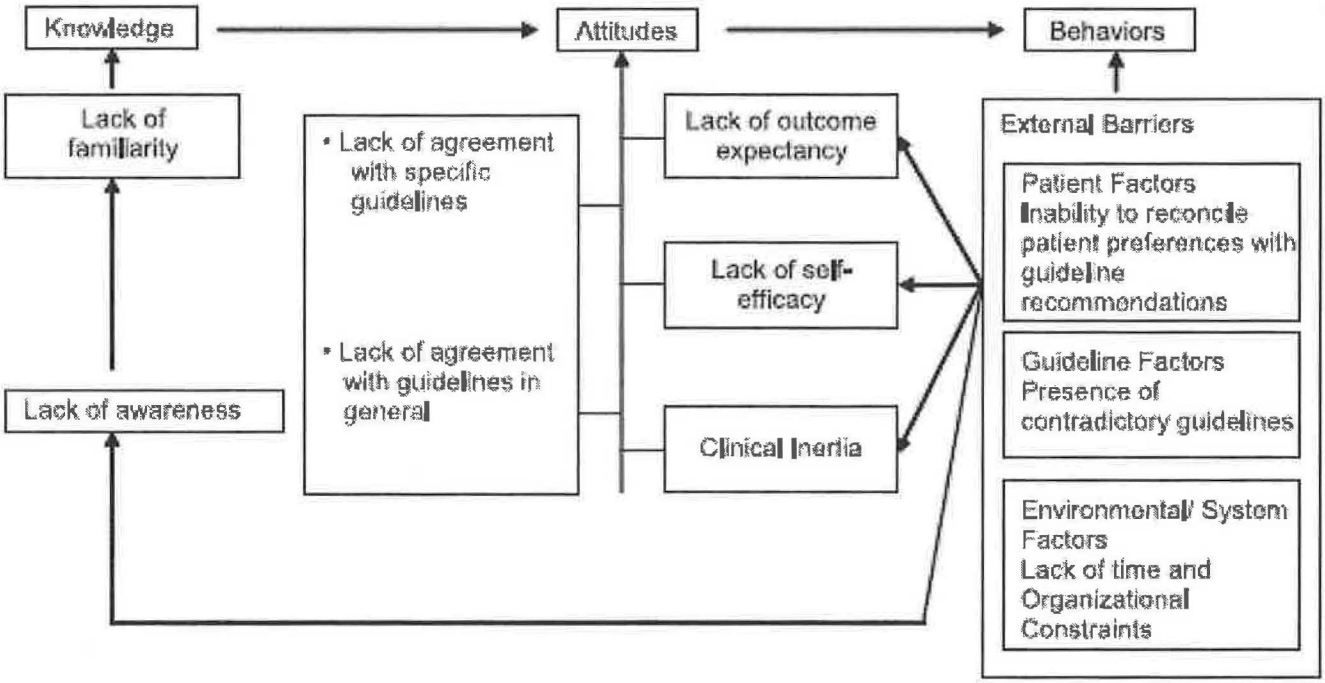
Lack of outcome expectancy

Outcome expectancy, a construct of Bandura's Social Cognitive Theory, is defined as the expectation that a given behavior will result in a desired outcome.[47, 48] In the case of physicians caring for hypertension management, it is the expectation that prescribing medication will be effective in lowering blood pressure. One reason for physicians not implementing evidence-based, life-saving therapy may be the belief that the medication will not be effective, often based on previous experiences when they have not been successful at controlling blood pressure, even with guideline-concordant therapy.[43]

Lack of self-efficacy and experience with recommended therapies

Several other important barriers have been identified, including lack of familiarity with using certain antihypertensive medications, concern about side effects, and lack of self-efficacy related to using antihypertensive medications. [22, 49, 50] Low self-efficacy, defined as belief in one's ability to perform a given behavior, likely results from lack of experience and/or lack of success with certain therapies. [48 43]

Cabana Framework of Barriers to Provider Adherence to Practice Guidelines in Relation to Behavior Change

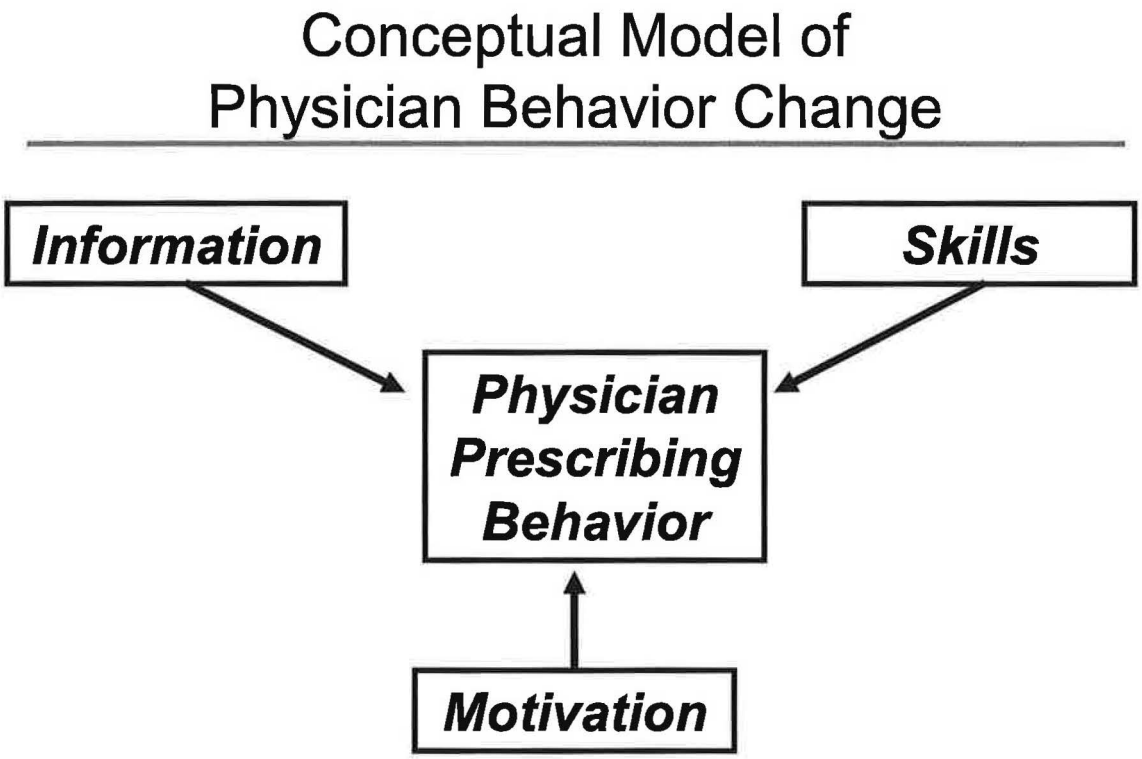


Interventions to Change MD prescribing behavior

Physician prescribing behavior, like most other human behaviors, is inherently complex and difficult to change. Interventions to change physician behavior have been extensively studied in the last 20 years. The Information-Motivation-Behavior Skills model is a behavior theory that has been used to understand and predict human behaviors, and provides a comprehensive framework for understanding physician behavior. The model posits that information relevant to a given behavior, motivation to perform the behavior, and the appropriate skills to perform the behavior are key determinants of performing the behavior.[51]

In the case of antihypertensive prescribing, physicians must first have relevant information to appropriate prescribing (knowledge of guidelines and cardiovascular risk

categories). Second, physicians must have sufficient motivation to take out the prescription pad to initiate or intensify therapy. The motivation component of the Information-Motivation-Behavior Skills model encompasses the attitudes about prescribing, outcome expectancy, and behavioral intention.[51] Finally, a physician must have the skills and self-efficacy to use different classes of antihypertensive medications appropriately (familiarity with using fixed-dose combinations or minimizing side effects).



Information-Motivation-Behavior Skills Model (Fisher et al, 1996)

Most interventions designed to change physician behavior that have been tested encompass a broad spectrum of educational modalities, and generally focus on providing information (increasing knowledge) and skills. Key categories of interventions are summarized below.

Interventions focused on improving knowledge and skills

Didactic Programs and Information only Interventions

Traditionally, interventions to change physician behavior have taken the form of didactic continuing medical education (CME) lectures and dissemination of printed educational materials. In a recent systematic review of CME modalities, didactic lectures overall had no effect on physician performance or patient outcomes.[52] Information-only interventions (i.e unsolicited mailed materials) are generally thought to have little impact on physician behavior or patient outcomes, especially with regard to improving hypertension. [52-56]

Academic Detailing and Opinion leaders

Academic detailing, a face-to-face educational meeting with practicing physicians by a trained professional to discuss a particular aspect of clinical practice, has its roots in the "detailing" efforts used by pharmaceutical representatives. This technique of information dissemination, developed from principles of social influence and social marketing, has been effective for the pharmaceutical industry and in studies aiming to change physician prescribing behavior.[57-59] Sometimes the interventionists are key opinion leaders. Opinion leaders are those who are recognized locally or nationally as experts who set clinical practice norms for a given clinical area (i.e. Norman Kaplan in hypertension). Such leaders are thought to be "educationally influential", and moderately effective at changing physician behavior. [60]

Audit and Feedback

One of the more effective strategies for changing physician behavior, audit and feedback can take many forms to give physicians insight into how their actual practice compares with certain benchmarks. Audits use data from paper and electronic chart review, and at times direct observation of physician practice. Feedback varies by the level at which data is presented to the physician; information on performance can be presented at the individual patient level, or as aggregate patient data for selected patient groups (i.e. patients with hypertension. While there are many questions about what kind of data

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