



Pharmacy Practice

ISSN: 1885-642X

ISSN: 1886-3655

Centro de Investigaciones y Publicaciones Farmaceuticas

Murshid, Mohsen Ali; Mohaidin, Zurina
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Pharmacy Practice, vol. 15, no. 2, 990, 2017, April-June
Centro de Investigaciones y Publicaciones Farmaceuticas

DOI: 10.18549/PharmPract.2017.02.990

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Review

Models and theories of prescribing decisions: A review and suggested a new model

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Received (first version): 4-Apr-2017

Accepted: 25-Jun-2017

Abstract

To date, research on the prescribing decisions of physician lacks sound theoretical foundations. In fact, drug prescribing by doctors is a complex phenomenon influenced by various factors. Most of the existing studies in the area of drug prescription explain the process of decision-making by physicians via the exploratory approach rather than theoretical. Therefore, this review is an attempt to suggest a value conceptual model that explains the theoretical linkages existing between marketing efforts, patient and pharmacist and physician decision to prescribe the drugs. The paper follows an inclusive review approach and applies the previous theoretical models of prescribing behaviour to identify the relational factors. More specifically, the report identifies and uses several valuable perspectives such as the 'persuasion theory - elaboration likelihood model', the stimuli-response marketing model', the 'agency theory', the theory of planned behaviour,' and 'social power theory,' in developing an innovative conceptual paradigm. Based on the combination of existing methods and previous models, this paper suggests a new conceptual model of the physician decision-making process. This unique model has the potential for use in further research.

Keywords

Practice Patterns, Physicians'; Models, Theoretical; Health Knowledge, Attitudes, Practice; Decision Making; Attitude of Health Personnel

INTRODUCTION

To date, research on decision-making by physicians lacks sound theoretical foundations. Most of the current research on prescribing behavior take the exploratory approach to explain or interpret the decision-making process by physicians rather than a theoretical one.¹⁻⁴ Thus, there is the need for an inclusive research entrenched in a sound theoretical basis. A few theoretical models have been employed in the prescription research, and they include attitude-behaviour models like Reasoned Action Theory and the Planned Behaviour Theory.⁵⁻¹⁰

A key proposition of these theories is that individuals are rational in decision-making, and therefore cognitive approach can be utilized to explain behavior.¹¹ A physician's decision-making process is an aspect of prescribing that has been addressed by cognitive models.⁷ However, Godin *et al.*⁸ reported that the theory of TPB has some drawbacks, i.e., the model does not take the emotional approach into consideration.¹² Furthermore, Conner *et al.*¹³ suggested the incorporation of emotional variables as a valuable approach to modifying the behavioral theories.

The prescribing decision is a complex process that involves a number of factors.⁴ In many cases, the decisions of physicians' are multifactorial.¹⁴ Physicians may adopt several strategies when making prescribing decisions¹⁵, and several kinds of critical heuristics in conducting their duties of patient treatment.⁷ Despite the several opinions on

physicians' decision-making in literature, none of the theories can solely explain the drug prescription decision of physicians and its related factors.¹⁶ Consequently, complex theories have been used to understand how several factors influence physician decision-making in general practice.¹⁷ This has resulted in demands for more theoretical research to develop better interventions needed to change the behavior of physicians. According to recommendations made by several researchers, there is a crucial need for further research into the conceptual framework of physicians' prescribing behaviour.⁸ Thus, prescribing research may benefit from having multiple perspective views on decision making.

Remarkably, scholars are less interested in publishing reviews that apply models and theories to explain the factors influencing prescribing behaviour. Hence, only one study has specifically reviewed aspects of theory-based published studies on professional healthcare behaviour.⁸ To date, there is no combined effort reported in the current literature to understand theories relating to the important factors that determine physicians' prescribing decisions. Moreover, understanding of the prescribing behaviour from a theoretical perspective is very limited. To fill this gap, this current review suggests developing a conceptual model for grasping and integrating the different aspects (i.e. theories and models) and views on the prescription decision-making of physicians.

A review of the existing literature showed that there is no consensus among researchers relating the use of theories in exploring physicians' prescribing behaviour and its determining factors. Some studies have attributed inappropriate prescriptions to the behaviour of physicians¹⁷⁻¹⁹ and factors related to their decision-making.²⁰ These factors include marketing efforts of pharmaceutical firms and patient characteristics (requests and expectations).²¹⁻²³ In addition, the poor collaboration

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between physicians and pharmacists has been recognized as a significant factor responsible for an inappropriate prescription.^{24,25} Nevertheless, the understanding of these factors and optimal approaches needed to improve the prescribing behaviour of physicians is incomplete.⁸

The development of theory and analysis is significant because theoretical models can be used to guide research and, subsequently, to propound more globally valuable programs.⁷ More specifically, developing conceptual models of physician prescribing decision will bring rigor and comprehensiveness to the research stream.⁶ So far, few studies have been carried out in this area, with some now outdated to be of significant benefit to predictive value.^{5,6,26-29}

The agency theory and theory of TPB have been used to explain the dual role of a physician as a consumer and intermediary, as well as to provide better insight into how doctors respond.³⁰ The TPB theory is much related to the physician as an individual in his/her role in a clinical environment.⁸ On the other hand, the agency theory refers to the doctor's role as an agent and patient, i.e., that of principal. However, regardless of the role of the physicians, they remain the target of extensive pharmaceutical marketing efforts and considered within the context of persuasion theory and stimulus-response theory. This review considers physicians as individuals and subsequently examines the theory that explains their relationship with pharmacists in a clinical environment. These influences are addressed within the context of social power theory. Therefore, the objective of this paper is to: (1) review previous theoretical models and theories that investigated the impact of marketing efforts, patient characteristics and pharmacist factor on the prescribing decisions of physicians (2) provide a simple theoretical discussion of the significance of factors that affect prescribing decision.

METHODS

Relevant previous studies that included models and theories in their research were identified by searching several electronic databases. These databases comprise Google Scholar, Scopus, Pub Med, Science Direct, ProQuest dissertations and current scientific articles indexed in several publications. The literature search approach used combined terms that include 'prescribing behaviour and (model or theory)', 'factors influencing prescribing behaviour' and free text words and medical topic headings such as 'framework and theoretical foundations of physician prescription behaviour'. Furthermore, this review examined references listed in the reviewed articles and dissertations. Several supplementary studies or other articles were also included as examples of the use of theories in elucidating the prescribing decisions of a physician.

Furthermore, studies that examined social and behavioral theories such as the theory of social power, the theory of planned behaviour, persuasion theory and theory of stimulus-response behaviour to identify the effects of marketing efforts, patient characteristics and pharmacist factors on the prescribing decision were included. These theories were examined to understand the important

factors that determine to prescribe drugs and to develop an innovative theoretical paradigm. This review also identifies the studies that focused on developing theoretical models of prescribing behavior.⁵⁻⁸ Studies that involved theoretical prescribing models which do not indicate or support the factors (under study) that affect prescribing behavior were excluded. Studies that included empirical prescribing models were also excluded from the review.

PRESCRIBING MODELS

Previous theoretical models on the prescribing decision

Some studies have attempted to develop theoretical models to explain the factors influencing prescribing behavior of physicians.^{5-8,26-29} The most influential models of physician prescribing behavior are elaborated on in this section as a theoretical background for the proposed conceptual framework.

Knapp and Oeltjen's model²⁶

A simplistic model of physician decision termed Benefit/Risk Ratio Model was developed by Knapp *et al.*²⁶. The model takes into consideration of the demographic variables such as age and site of practice. It also includes four variables such as severity of the disease, possible decisions, benefits and side effects of medication, and physician's specialty. However, the model excluded several factors had been proved to significantly impact on the prescribing.

Hemminki's model⁵

Hemminki⁵ proposed a more complex model of prescribing. The author suggested the incorporation of a number of variables such as years of practice, the number of work hours and the number of patients administered to daily to effectively explain the drug prescribing decisions of physicians. However, the explanatory power of the model is overlooked.

Raisch's model⁷

Raisch proposed very complex model⁷ that incorporates several direct and indirect factors influencing prescribing decisions. The direct factors include formularies, prescribing restrictions and required consultations, while the Indirect factors comprise promotions of pharmaceutical firms and visits by medical representatives (MRs), opinions of colleagues, the scientific data derived from randomized and controlled clinical trials as well as medical training. The demographics variables of physician and practice factors such as case mix and organizational structure were also included. Factors such as individual and practice are thought to affect prescribing decisions by influencing the thought process of the physician. The patient factors that influence the physician prescribing decision such as patient's presenting symptoms and doctor's diagnosis were considered in addition to psychosocial factors.

Gallan's model⁵

Gallan⁵ developed a general theoretical model based on the review of related literature and empirical examination in an outpatient setting. The model incorporated three

main components: predecessors, the process of interpreting the perceived need for a medication therapy into the prescription decision of physician, and outcomes. The predecessors include marketing efforts of pharmaceutical firms, economic and government factors and other variables that affect the drug prescribing decision of physicians.

Singh's model²⁷

Singh²⁷ developed a conceptual model of the dyadic relation between MRs and physician prescribing. The model encompassed three dimensions such as network interconnection aspects, the possibility of transfer of resources (RT), activity integration and circulated actor relationship as predictors of physician prescribing behaviour. RT such as product knowledge gained by the detailing/MRs activities is associated with high prescription behaviour. The relationship between product knowledge and prescribing behaviour is stronger when the interaction between MRs and physicians is strong. Similarly, the higher density of promotional efforts like continuing medical education provided by MRs to doctors and the launch of new drugs are associated with the high prescription rate of physicians.

Kyle, Nissen, Tett's model²⁹

Kyle *et al.*²⁹ made efforts through literature review to develop a qualitative prescribing model that assesses the influence of economic factors on physician prescribing behavior. The model displays an array of direct and indirect commercial impacts on physician prescribing decision. For example, physicians are directly influenced by visits of MRs, sampling, gifts and conference travel. Although these tools have an indirect influence on GPs, it does not appear to be related to pharmaceutical promotion designs.

Godin *et al.*'s model⁸

Recently, Godin⁸ developed a single model based on the TPB to provide a possible framework for studying behaviours and intentions of health care professionals. The TPB was shown to be a suitable theory to explain the prescribing behaviour of physicians. Habit (past behaviour), which is distinct from physician characteristics, has a strong impact on physician prescribing. The authors also reported that non-psychological factors influence choice behaviour.

Stros and Lee's model²⁸

Stros and Lee²⁸ conducted a review of marketing dimensions in the prescription industry to develop a conceptual pharmaceutical marketing model. The review provides insight into marketing factors which are based on marketing mix strategy (4Ps), specifically, product, price, place, and promotion that influence physician prescribing. The results concluded that the policy of promotion such as MRs, advertising, drug sampling, and information) is the most relevant followed by price policy, and then product policy includes branding, product attributes (concerning side effects, risks, safety, efficacy and indication), drug delivery and packaging. The policy of distribution is the least important factor in the pharmaceutical context. Nonetheless, the effect of variables related to the 4Ps marketing mix concept on physician prescription behaviour needs further investigations. The deception of the models

varied and related to study variables, as shown in Table 1 and Table 2.

Theories relevant to factors influencing prescribing decision

This section elaborates on relevant literature related to marketing, social, behavioral and consumer theories. These theories may aid the specification of how drug information sources are processed when decisions to prescribe drugs are made.⁷

Agency theory

The basic concept of agency theory was first established by Jensen and Meckling³¹ in academic literature³², by introducing the initial perspective of different objectives for the theory. Eisenhardt³³ reviewed the concept, context, and principles of the Agency Theory. The theory presents a framework for analyzing relationships between interdependent to identify the problem that exists between parties and mechanism to solve it.³³ The agency relationship occurs when the first party (the principal) relies on the second party (the agent) to perform certain actions on behalf of the client.³⁴

Within the context of this review, the focus is really on two critical agency relationships, that of the physician (agent) and patient (principal), and the pharmaceutical firm (principal) and physician (agent). In the first relationship, the pharmaceutical firms as principal obviously depend on the doctor as the agent to select the drugs they are offered in the market. The patient, in their role as principal, depends on the physician, acting as the agent, to select the appropriate drug. Physicians make decisions of prescribing drugs on behalf of their patients. The principal might be concerned that the agent may not take actions that are in the best interest of the principal.³³ Although these may be the two primary relationships considered in this research, it should be noted that interventions of pharmacists may also influence the physician prescribing of drugs, however this maybe a second agency relationship.

Based on the above approach with respect to the pharmaceutical firm, the pharmaceutical firm (principal) is (1) motivated to sell its products (adapting various marketing efforts) and generate a profit, (2) while full disclosure is required, the firm typically emphasizes only a limited amount of the available information related to both the sale of that product to the physician and its safe use, (3) it believes in its products (drugs), and being at arm's length from the patient: physician relationship, is assuming less risk and (4) its success is often influenced by environmental factors over which it may have little control (within the context of this research i.e. habit persistence and drug cost/benefit ratio).

On the physician-patient relationship, where the patient is the principal. Patients, in fact, rely on the doctor to diagnose and then prescribe the right medicine.³⁵ This dependence originates from the technical skills and specialized knowledge required to make prescribing decisions.¹⁵ The patient (1) is, of course, interested in the most efficient, practical, least invasive moreover, cost effective treatment, (2) may know something about their condition, but does not understand the effectiveness or

Table 1. The summary of prescribing models			
Author	Purpose of study	Variables/ Categories	Key findings
Raisch ⁷ 1990.	To develop a model of methods used to influence prescribing.	<ul style="list-style-type: none"> ● Direct method ● Practice factors ● Indirect methods ● Internal processing ● Psychosocial factors ● Patient ● Practitioner's diagnoses Outcome Practitioner's drug decisions	Two broad categories of factors were identified: direct methods and indirect methods for influencing prescribing. The patient has reported a source of influence on the prescribing decision.
Gallan ⁶ 2005.	To propose the conceptual model based on the review of the influences upon prescribing.	<ul style="list-style-type: none"> ● Marketing Sources -Detailing effectiveness -Gift, sample, -Promotional items -Sales promotion ● No marketing Sources ● Economic factors -Price/cost a drug -Other factors Outcome -Prescriptions –Decisions -Product selection	Several factors as being highly influential on physician prescribing, namely, peer influence, financial considerations, pharmaceutical representatives, drug samples, and direct-to-consumer advertising
Singh ²⁷ 2008.	To proposes a conceptual model of the network connectedness aspects of the physician-salesperson dyad, and its impact on the physician prescription behaviour.	<ul style="list-style-type: none"> -Relationship generalisability -Promotional activities -New Drug Launch Cooperative Efforts -Relationship Strength <ul style="list-style-type: none"> ● Controlling variables -Detailing, the gift was given ● Moderating variables -ELE experience -Physician experience 	Influencing physician prescription behaviour has always proved elusive for pharmaceutical companies' promotion.
Kyle <i>et al.</i> ²⁵ 2008.	To develop a qualitative model demonstrating the synergism between commercial influences on prescribing.	<ul style="list-style-type: none"> ● Direct influence marketing -MRs visits -Conference travel -Gift, sampling, ● Indirect influence -Advertising in journal -Pharmacist -Consumer Outcome Prescribing decision	Many of the influences explored in this model were indirect to prescribing and often do not appear to be related to the pharmaceutical promotion tools.
Stros <i>et al.</i> ²⁸ 2015.	To review the pharmaceutical marketing literature develops conceptual pharmaceutical marketing model.	<ul style="list-style-type: none"> ● Marketing Categories -Product policy -Price policy -Promotion policy -Distribution policy ● Control variables -Market environment -Physician Outcome Prescriptions decisions (Sales)	Promotion policy is the most relevant, followed by price policy, with product design policy only third in importance influencing physician prescribing.

other properties of the prescription alternatives, and have little insight into the physician's the rationale for the selection of one product over another, (3) is the individual to whom an intervention is being prescribed, and, all things being equal, is less inclined to take unnecessary risks, unless it is the only alternative, and finally³⁰ (4) the physician's prescription is a function of many variables over which the patient has little control (within this research, e.g., drug characteristics, drug cost/benefit ratio, habit persistence).

In this case, the effects of the agency may in part caused by the influence of the standard social pressures moreover, thus the impact on prescription. For instance, prescribers may perceive the patient's expectations and requests for a drug as a social pressure to write the drug. Doctors said

that the inability to prescribe medication that the patient wants might hurt the patient - doctor relationship and reduces the possibility of a therapeutic functional cooperation.²² In other words, when the physician meets the patient's wishes for a particular drug through the provision of a prescription, the patient's confidence that the prescription is the right response is enhanced.

Theory of persuasion

Persuasion has an effect on everyone on a regular basis, by controlling decision making or a successful attempt to convince or influence.¹⁵ The persuasion is also defined as a human communication intended to manipulate others by altering their philosophies, principles or points of view.³⁶ Persuasion comprises both emotional and cognition

Factor categories	Factor in the proposed model	Model authors	Theoretical construct
Marketing efforts	Drug information available	Stros et al.	Information
	Brands of the drug	Stros et al.	Brand
	Sales promotion	Raisch	Adverting
		Gallan	Gift, sample, promotional items
		Stros et al.	Gift, sample, advertising
		Kyle et al.	Gift, sample, advertising
		Singh	Promotional activities
	MRs effectiveness	Raisch	Drug representatives
		Gallan	Detailing
		Singh	Detailing knowledge
Patient characteristics	Patient request for drug	Raisch	Patient-physician relationship
	Patient expectations	Raisch	Patient-physician relationship
Pharmacist factors	Pharmacist expert Power	No reported	
	Pharmacist Collaboration		
Contextual factors	Physician habit persistence	Singh	Physician experience
	Cost/ Benefits ratio of a drug	Stros et al.	Price-cost
	Drug characteristics	Stros et al.	Control belief
		Stros et al.	Quality and package
	Trustworthiness between physician and pharmacist	Not reported	

responses to the condition in which people find their selves. Persuasion is an interaction between cognition and emotion that may alter the behavior of an individual towards the objective. Theoretically, persuasion has four key dimensions: (1) sender of information (e.g., representatives of drug companies), (2) the receiver (e.g., a doctor), (3) the exchange between the sender and receiver, either interactive or active, (4) the modification in behaviour (e.g., prescription behaviour), which can be elective, and there is a certain amount of time required for the deal to occur. Persuasion stipulates that behaviour of individuals changes willingly when they are subjected to a particular stimulus, and thus the mind alters the interaction.³⁷ In most cases, this alteration of mind is related to the singular needs of individuals (physicians) and their desires (e.g., prescriptions needed by their patients). Such changes could be achieved instantaneously (prescribing decision), or it may take several days or months or even years (need more conviction).³⁸

Persuasion theory is used in prescription literature to identify better ways of providing interventions to enhance the prescribing behaviour of physicians such as marketing activities.⁷ The theory provides a significant amount of knowledge to solve the questions relevant to pharmaceutical marketing issues in the context of drug prescription.¹⁵ Elaboration Likelihood Model (ELM) is the most extensively used model in the context of persuasion theory.³⁹ Elaboration entails “engaging in issue-relevant thinking.”³⁶ The model proposes that individuals use both cognitive abilities and emotional reaction to interpret data and make decisions. More specifically, ELM model indicates that the source of information (marketing efforts of medical representatives), and the way that can be offered, as well as the receiver characteristics (e.g., doctor), may affect the understanding of the information needed to make appropriate decisions, which in turn has a persuasive influence on behaviour (e.g., physician prescribing).³⁹

ELM model is composed of two methods of persuasion: the focal and peripheral. The focal method comprises a high level of planning and cognitive effort while peripheral method includes a lower level. Petty *et al.*³⁹ suggested that when fewer people are interested in a case, they pay less attention to the information provided and are less motivated to argue cognitively.¹⁵ In contrast, when the incentive for the issue is low, the way of the terminal becomes more significant.³⁶ For example, in commercials, when an individual is not hungry (a necessity), the advertising of hamburger becomes insignificant in the foundation. Watchers or viewers are more inclined to observe the marginal signs, be intrigued by the charisma or integrity of the presenter, the backdrop music or optical glasses. In contrast, hunger draws attention to the food itself. Consequently, marketing efforts of pharmaceutical companies can be studied to validate if the delivery of information through MRs effectively convinced physicians and subsequently change their prescribing behavior.

More specifically, physicians may be influenced in much the same way as any highly involved consumer who can assimilate information and subsequently undertake extensive cognitive processing, an approach described by the ELM model.³⁹ These influences include (but not restricted to) environmental stimuli (patient and pharmacist), personal relationships with MRs and pharmacist, marketing stimuli (drug information, branding, and promotional tools), physician characteristics (e.g., habit persistence), and drug characteristics, all of which emotionally impact on the decision-making of physicians during prescribing.

The buyer behavior – stimulus-response theory

The model of the buyer behaviour stimulus - response (S-R) is similar to the ELM model because both models need emotion and awareness to convince the individual. This model can be related to the black box theory of the school of behaviorism where the emphasis is not on the processes the consumer undertakes but the relationship between the stimuli and the resulting response.⁴⁰ The original

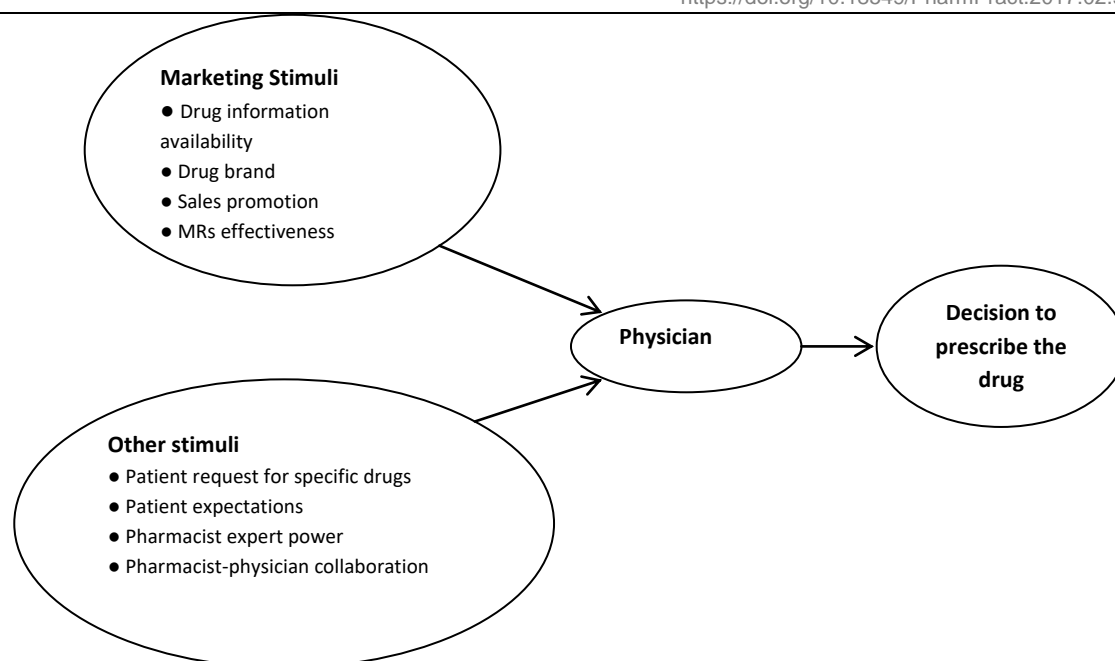


Figure 1. Stimulus-response model of physician behaviour adapted from Kotler (2003).

information deduced from this model is the process of the buyer's (physician) consciousness from external stimuli to the purchase (prescribing) decision. As a consumer, a doctor is confronted with several of the same influences that an individual might face with a typical purchase decision. The model proposes that the stimulus combined with a proper adjustment and specific population will result in a response that can be anticipated by the vendor. The marketing mix factors and other stimuli enter the "black box" which is known as the client (i.e. the physician) and generate some choice replies/purchases. All of these stimuli enter the black box of the buyer and are converted into a range of observed responses of the purchaser. On the other hand, a vendor wants to absorb how stimuli are translated into replies within the black box of the consumer, which consists of two parts.⁴¹ Firstly, the buyer (physician) properties will affect how stimuli are absorbed, visualized and interpreted by the marketing motivators. The characteristics of the purchaser (doctor) can be attributed to private variables such as social and psychological factors.⁴² Secondly, the decision-making process of the buyer (physician) will ultimately define what, if any, buy (prescriptions) behavior occurs (Figure 1).

Pharmaceutical companies offer their products to doctors for the purpose of increasing sales in the market as well as promoting sales revenue.⁴³ Thus, the goal of marketing activities for pharmaceutical companies, such as drug information, free drug samples, and other promotional tools is to stimulate behavioral change in doctors as regards drug prescription. Furthermore, marketing strategies related to product, place, promotion and price are considered tools for motivating the physicians to prescribe specific brands.²⁸ For instance, MRs have proposed expensive dinners to physicians along with an educational program about a new drug, or an innovative use of a drug already on the market. These incentives will likely motivate physicians to prescribe more of the pharmaceutical firm's product discussed at the dinner or program.

Theory of planned behaviour

There are some mid-level theories from social and behavioral science that may aid the understanding of prescribing behavior. The TPB theory is one of the most appropriate and frequently considered behavioral theory when attempting to modify or influence physician prescribing.⁴⁴ In the meta-analysis conducted by Godin *et al.*⁸ the TBP demonstrated high ability to predict the behavior of physicians within the context of health care. TBP has proved to be a successful analytical tool to handle the factors influencing prescribing behavior.^{9,46,47}

This review is based on a model of TPB¹¹ which elucidates and tests the ability of attitude, personal norm and perceived behavioral control to predict behavioural intentions and physicians' prescribing behaviour. Attitude expresses the degree of like or dislike for something, which may affect the "tendency or behaviour" to act in specific ways. To be precise, attitude is the extent to which a physician has a favorable or unfavorable attitude towards marketing efforts will influence their prescribing. The attitude of medical practitioners towards the marketing efforts of pharmaceutical companies will determine their prescribing behaviour. Attitude can be measured as the degree at physicians approve of four factors, specifically, available drug information, drug brand, sales promotion, and effectiveness of MRs.

A second element within the context of the TPB is a function of the influence of subjective norms (SN), namely, the expectation (pressure) to perform according to some group. In this review, this can manifest by social influence (perception of pressure resulting from patient or pharmacist) such as patient demands for drugs, patient expectations, pharmacist expert power and pharmacist-physician collaboration.

The third element within the context of the theory of planned behaviour, consider perceived behavioral control (PBC), which is a function of conduct, as it reflects

Table 3. Factors influencing physician prescribing behaviour and relation to theory			
Factor categories	Factor in the Model	Theory	Theoretical construct
Marketing efforts	Drug information availability	TPB	Attitude
		S-R Model	Marketing stimuli
	Brands of the drug	TPB	Attitude
		S-R Model	Marketing stimuli
	Sales promotion	TPB	Attitude
		S-R Model	Marketing stimuli
	MRs Effectiveness	TPB	Attitude
		S-R Model	Marketing stimuli
Patient Characteristics	Patient request for drug	TPB	Social norm
		S-R Model	Social stimuli
	Patient expectations	TPB	Social norm
		S-R Model	Social stimuli
Pharmacist Factors	Pharmacist expert Power	TPB	Social norm
		S-R Model	Social stimuli
	Pharmacist-physician collaboration	TPB	Social norm
		S-R Model	Social stimuli
Contextual Factors	Physician habit persistence	TPB	Control belief
		S-R Model	Black box -buyer characteristics
	Cost/ Benefits ratio of a drug	TPB	Control belief
		S-R Model	Black box- buyer decision-making process
	Drug characteristics	TPB	Control belief
		S-R Model	Black box - buyer characteristics
	Trustworthiness between physician and pharmacist	TPB	Control belief
		S-R Model	Buyer decision-making process

experience (product knowledge) while anticipating future problems. PBC signifies a physician's perception of the extent to which performance of the behaviour is easy or difficult. PBC is attributed to the existence the variables that may facilitate or hinder the change of the behaviour (e.g., prescribing).¹¹ These factors could be contextual, such as drug characteristics, cost/benefit ratio of a drug, habit persistence of physicians and trustworthiness of physicians in pharmacists (i.e., the responsiveness of physicians' decision making to marketing efforts, patient characteristics and pharmacist factors), thus affecting the prescribing decision of physicians. Thus, this review seeks to extend the model of TBP by including contextual variables as moderators and investigating its influence on the relationship between marketing efforts, patient characteristics, pharmacist factors, and the prescribing decisions of physicians.

Theory of social power

In the context of health care, cooperation and two-way communication between team members are likely to be affected by the social power of the members.⁴⁸ The theory of social power is applied to better understand the role of the expertise of pharmacists in prescribing drugs. Power is defined as the possibility of influence. Social power is defined as the ability of a person/ individual or group of individuals to alter the outlook or behavior of someone else or panel in conformity with the course anticipated by the persuasion.⁵⁰ Social sources of power conveyed by the ability of the person to affect others which play implied or otherwise role in the team's interactions or through team members that provide health care.⁴⁸

French and Raven⁵¹ argue that a key mechanism that changes behaviour is that one person (B) has the power to change the behaviour of the other individual (A). Expert power or expertise refers to the knowledge or work experience of the individual, which is based in most cases on the sources of expertise and intensive education or

credentials. Busch and Wilson⁵⁰ suggested that the strength of experience depends on the perception of influence (doctor) that the effect (pharmacist) has particular and adequate information in the relevant field of knowledge (prescription drugs). For instance, the doctors may have a little knowledge when it comes to the decision to prescribe a new medicine; therefore, they may rely on suggestions of pharmacists about drugs.⁵² In this case, physicians voluntarily adhere to the recommendations of pharmacists because of their expert power.

The theory of social power encompasses two vital elements of power and influence attempts. First, according to control relational theory, during the pharmacist-physician interaction in prescription decisions, the potential of pharmacists' perception to influence physicians will likely lead them to exert power in different tactical forms (by providing information, advice, and recommendations related to drug prescriptions). However, it remains unclear how these mechanisms are applied. Therefore, this review will contend that the expertise of pharmacists influences physician prescribing. Secondly, this review presents trustworthiness as a modulating variable in the relationship between the expert power of pharmacists and pharmacist-physician collaboration, and physician's behavior. Table 3 shows the factors influencing prescribing behaviour and relation to theory.

DISCUSSION

Proposed model

This review employs the integration of the above-mentioned theoretical frameworks as a powerful approach to advance understanding of the complex phenomenon of physicians' decision making as regards drug prescription. Although the main characteristics of this conceptual model are difficult to measure, the descriptive impact of the combined theories and models is better than that of each

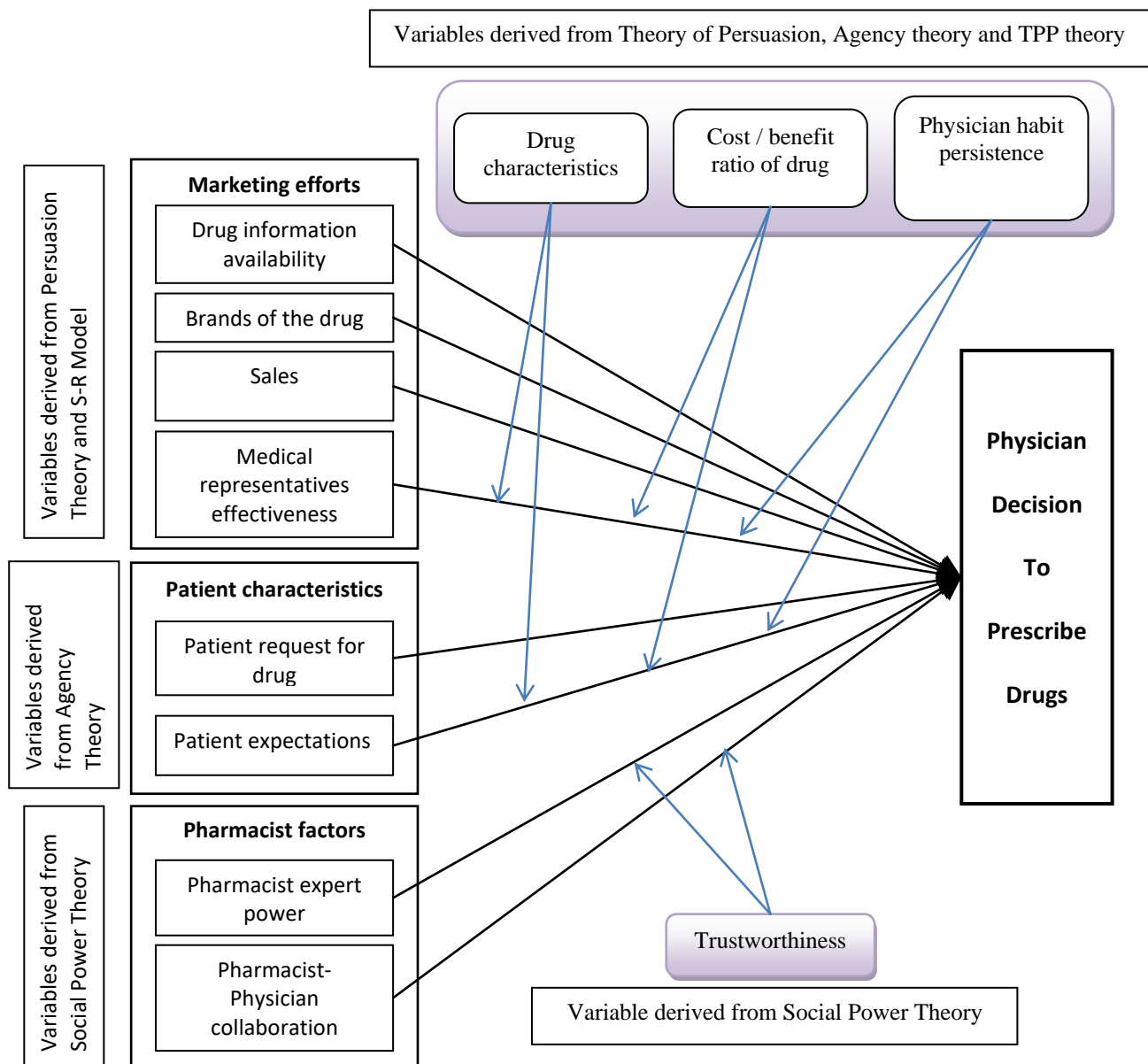


Figure 2. Proposed model of physician prescribing decision.

separate element. Moreover, the use of several theories in the proposed model^{11,31,39,41,51} helps to develop a conceptual approach that validates the existing findings as well as extends the current knowledge base within a new research model. This proposed model is a delineated model where thirteen underlying constructs are identified and combined. The novel model integrates marketing efforts, patient characteristics and pharmacist factors, contextual factors in addition to the influence of trustworthiness on the relationship between physicians and pharmacists (Figure 2). The mechanism effects of these proposed variables and related theories are shown in Table 4.

Furthermore, the proposed model integrates various aspects from seven established theoretical models for the identified and modifies. This study is an alternative attempt to determine physicians' decisions within different theoretical concepts based on various theoretical backgrounds. Nonetheless, this combination offers the potential to develop a new conceptual framework that is

synonymous with the scope of known scholarly works.^{5-8,26-28} Under such a theoretical model, the irrational prescribing phenomena can be investigated, particularly in the developing countries, with the aim of better understanding how the factors contribute to improving physicians' prescribing behavior. Therefore, the proposed theoretical underpinning provides a robust framework that can be tested empirically.

Moderating effect in the proposed model

The proposed model suggests the relationships between the effects of several factors that have been established in different prescribing models on physicians' prescribing decisions. In this model, contextual variables such as drug characteristics, habit persistence, and the cost and benefit of a drug are were selected as moderating variables in the relationship between marketing efforts, patient characteristics and physician prescribing. The framework also includes the moderating effect of trustworthiness on the relationship between the collaboration with the

Factor categories	Component	Effect/ Mechanism	Theory
Marketing efforts	Drug Information	There are various resources of the information drug the physician depends on when prescribing such as scientific studies, medical journals, and the Internet.	-TBP -Persuasion
	Drugs' Brand	Brands often offer points of differentiation between competing drugs and therefore, can be considered crucial in influencing prescribing decision	-TBP -Persuasion
	Promotion sales	Various forms of promotion aimed to persuade physician to prescribe the drug	-TBP -Persuasion
	MRs Effectiveness	MRs used by pharmaceutical companies to convince the physicians to prescribe their drugs and increases the likelihood of a particular prescription.	-TBP -Persuasion
Patient characteristics	Patient request for Drug	Patient request for a drug may contribute to overprescribing but can be beneficial by alerting a doctor to a problem and increasing the attention paid to it.	Agency
	Patient expectations	The patients' expectations are not directly influenced, but the physicians' perception of these expectations that influence prescribing decision.	Agency
Pharmacist factors	Pharmacist-physician collaboration	Collaboration between physicians and pharmacist is the key element in improving the prescribing.	Social power
	Pharmacist expert power	No credible evidence to support the expert power of pharmacist as an independent factor influence prescribing the drug.	Social power
Contextual factors	Trustworthiness	Physician's ability to trust a pharmacist's word and expertise and in turn improving prescribing the drugs.	Social power
	Physician habit persistence	Habit persistence reduces the past behavior and experience and leads to prescribing the drug reputably.	TPB
	The cost-benefit ratio of a drug	The cost-benefit ratio of a drug is critical at the time of the prescribing decision.	TPB
	Drug characteristics	The drug characteristics are important factors for making prescribing decisions include efficacy, quality, side effects and others.	TPB

pharmacist, the expertise of pharmacists and physicians' prescribing decisions. These relationships are based on sound theories or models reported in related studies as mentioned earlier (Figure 2).

Comparison of the model developed in this review with previous models

Several models on prescribing decision have been introduced. However, these models need to be improved to resolve their limitations. Researchers who search for simplicity appeared to have excluded several important factors while those who preferred inclusiveness proposed unreasonably complex models. The review reveals that most of the past theoretical models on the prescribing decision mainly focused on examining the relationship between marketing efforts and physician prescribing. Variables common to all models were MRs and sales promotion (Table 2). The current model is comparable to the Gallan's⁵ and Singh's²⁷ models since it will similarly establish the effect of MRs and sales promotion on prescribing decision. However, this present model differs from Gallen's model given that it considers the influence of other marketing efforts that include available drug information and branding on prescribing. The incorporation of these new variables will enable companies to adapt their current marketing concept based on the market and strategic requirements.²⁸ Furthermore, this is a "physician-targeting" model⁵³ that considers the effect of MRs on drug prescriptions, product properties and salespersons.²⁸

The conceptual model of the study will establish the influence of marketing efforts such as information of drug, brand drug, MRs and sales promotion on prescribing are similar to those outlined in the model of Stros *et al.*²⁸ However, Stros *et al.*, failed to report any moderating effect between marketing efforts and physician prescribing, which indicates a gap in related literature. Thus, the main difference in the present model as compared with the previous model is that this review selects the prescribing

decisions of physicians as a dependent variable and then includes the contextual factors as moderator variables. The current model also models the effect of contextual factors (moderating variables) on the influence of patient request and patient expectation on physician prescribing decision.

Furthermore, the present model is similar to Raisch,⁵ model because it attempts to conceptualize the effect of the interactions between patients and physicians on prescribing, but differs in the respective factors both models consider. Several variables that have been found to be important in previous studies: patients' requests and expectations.²² Thus, the current model focuses on the effect of patients' requests and expectations on physician prescribing.

Kyle *et al.*²⁹ model reported direct and indirect commercial influences on physicians' prescribing decisions. The model developed in this review is similar to the model of Kyle *et al.*, since they both consider the direct effect of marketing efforts (MRs, sales promotion i.e. sampling and gifts) on prescribing and propose other marketing influences such as drug information and brand. Although Kyle *et al.*²⁹, suggested that recommendations by pharmacists influence prescribing, but were not included in their model. Thus, the model proposed in this review is more comprehensive since it incorporates the effect of pharmacist expertise and pharmacist-physician collaboration on physician prescribing. This research also suggests the moderating effect of trustworthiness on the influence of these factors on physicians' prescribing decisions. Overall, the conceptual model developed by this review differs from the established models in various ways. The conceptual model links the effect of various individual-oriented constructs derived from different perspectives with physician behavior decision.

Theoretical implications of proposed model

Given the interdisciplinary nature of this review, the proposed model incorporates relevant theories from a

number of disciplines. Consequently, this research has several different approaches to identify variables in the development of a conceptual model. The literature review identified two key theories (TPB and S-R model) related to the nature of the relationship between prescribing decision and pharmaceutical marketing, patient characteristics and pharmacist variables (see Table 3).

At the same time, the proposed model is a “hybrid” paradigm which represents different points of view in the prescribing decision behavior. However, it is clear that the model does not effectively analyze these views since only portions of the various perspectives are considered. Thus, this study does not confirm that the proposed model represents a general paradigm of the process of prescribing decision-making of physicians. Instead, this study is an attempt to enhance the understanding of the relations derived from the theory between several constructs in the area of the prescribing behaviour of physicians. For example, the proposed model could help resolve the argument over how the marketing strategies of drug companies and patient characteristics influence prescribing behaviour. More specifically, this model explores the extent of the effect of marketing efforts and the aspects of the relationship between patients and doctor prescriptions that may depend on contextual variables. In addition, this review suggests that physicians should endeavour to build their relationships with patients and pharmacists in a community setting. Moreover, it is worthwhile to draw attention to how power theory elucidates the role of the pharmacist, which has been modified “from the dispenser to influencer”.⁵⁴

Managerial implications of proposed model

The proposed theoretical framework presented in Figure 2 has important implications for physicians, health care policymakers, and pharmaceutical companies. Furthermore, based on the outcomes of this conceptual model, pharmaceutical marketers can design their marketing strategies to improve the marketing of pharmaceutical products and measure the effects of their current activities on prescription rates. The expected findings of this model may enable managers to define which situations and investments are more likely to influence the prescribing behaviour of physicians. For example, the non-responsiveness of physicians to marketing efforts is indicated by the low-level of their knowledge of product attributes and benefits in addition to their high habit persistence.

It is also important to highlight that, unlike drug characteristics, building habit persistence, and drug benefits/costs that will moderate the central link in this framework are to a large extent under managerial control. Professional medicine organizations and State Boards of medicine can incorporate the abovementioned concepts into their tactics and strategies to develop guidelines related to interactions between physician and pharmaceutical company, physician and patient as well as physician and pharmacist. Thus, effective application of the findings of this conceptual research in relationship building could improve drug prescription by physicians.

Suggestions for future research

Future research could focus on individual factors of the proposed model. For example, there are many voids in the current knowledge of how different theoretical perspectives and constructs may complement each other in the physician decision-making process. Since this paper is based on a review of existing theories in prescription literature, its findings are subject to quantification of the proposed relationship. The impact of marketing factors on prescription behavior also needs to be examined to identify a more effective tool for providing information to physicians. Meanwhile, future research should also examine variables that may moderate the relationship between marketing efforts and physicians’ decision making. The significance of patients’ request for drug and patient expectations could be examined through survey design (i.e., questionnaires or interviews). Improving patient characteristics that influence prescribing may entail the examination of moderating variables as suggested in the model. Therefore, it will be helpful to examine the influence of pharmacist factors such as expert power (expertise) and collaboration on prescribing. The relative importance of these factors could then be evaluated through moderating the trustworthiness between physicians and pharmacists. Future research can also incorporate new factors from latest literature into the existing model to update it to a current level, given the dynamic nature of the topic. In addition, future research can address the physician/pharmacist characteristics, formulary and managed care.

CONCLUSIONS

This study developed a model based on the review of prescribing models, behavioral theories and factors influencing prescribing behavior. This conceptual model suggests possible relationships between several basic variables related to physician decision prescribing: marketing strategies, patient characteristics, contextual factors, physician perception of pharmacist collaboration, expert power, and trustworthiness and drug characteristics, physician habit persistence. The framework of the model is limited to these aforementioned factors; however, the model can be used as a framework for developing and testing effects of these factors on prescribing in developed and developing countries. Finally, there is a need for further research to empirically determine the validity of the proposed model and to establish whether the effects of the marketing efforts, patient characteristics and pharmacist factors on prescribing are indeed moderated by the contextual variables that have been proposed.

CONFLICT OF INTEREST

The authors have no conflict of interests declare.

FUNDING

No funding was received for the preparation of this manuscript.

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