International Association of Scientific Innovation and Research (IASIR)
(An Association Unifying the Sciences, Engineering, and Applied Research)

ISSN (Print): 2279-0020
ISSN (Online): 2279-0039

International Journal of Engineering, Business and Enterprise Applications (IJEBEA)

www.iasir.net

Quantitative Sciences in measuring the Impact of Communication on Shared Decision Making to Determine Drug Adoption

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Abstract: *Forecasting medical decisions are very challenging due to lack of predictability of physicians' drug acceptance behaviour when multiple choices (in therapeutic segment) exists. The role of communication in medical information transaction among the healthcare provider / stakeholders is either nascent stage or might not have been optimized by pharmaceutical firms in emerging markets like India. We present a tractable model for analyzing the relationship between diverse communication sources and adoption of drug, launched for the first time against other branded drugs in same generic class. The article emphasizes the role of shared decision making in form of drug marketer –physician interaction as well as physician –physician interaction in form of word of mouth. Drawing on recent theoretical explanations, hypotheses were developed and tested using multiple linear regression. Based on data set of 102 physicians treating hypertension, our estimations of the model yield four main implications: (i) marketing communication positively influence physicians' perception on drug benefit but declines to build up intention for drug adoption (jj) referral to professional guideline as well as participation in medical events (seminar / symposia) substantially influence drug adoption decision (iii) word of mouth factor will act as barrier to drug adoption as imitation effect is not realized by young physicians or opinion leaders / senior cardiologists. The article shows lack of programmed shared decision making leads to low drug adoption particularly for drugs treating hypertension where treatment risk is low and multiple substitutes are available in market.*

Keywords: *Pharmaceutical Marketing; Shared Decision Making; Communication Impact; Physician behaviour; Drug Adoption Model*

I. Introduction

During the last two decades, marketing communication has made dramatic advances in pharmaceutical industry and emerging markets like India has been the most lucrative investment destination for multinational corporations. The pharmaceutical industry in India has contributed significant economic growth in recent past, driven by rising consumption level of medicine and strong demand from export markets. With steep 7-8% annual rate of economic growth in recent years, average spending for healthcare services has significantly gone up (*Economic Times*, 2011). The manufacturers experience low entry barrier in India, compared to the advanced countries due to conducive production infrastructure, well conformed international standards and easy availability of cheap and skilled manpower (Robert and Tybout, 1997). However the intensity of market competition has given rise to the patients' clout in alternative brand choices. A typical challenge for pharmaceutical companies is to determine the competitive structure of drug products by not only understanding the consumer / patient's requirement and predicting how well they avail the prescribed drugs but also by assessing the physician's perception on a particular drug performance, the prescription pattern and reflecting on how physician's exposure to the source of drug information can cater to the patients' need ultimately (Vakratsas and Kolsarici 2008). In view of these, many marketing managers are regularly faced with the challenge about which product features to offer and what price to charge to cope up with consumer demand (Goswami,2014).
These decisions need to be reviewed not only on what the customer wants, but also how competitors will react. In academic literature, knowledge on adoption of technology is mostly focused on innovation theories, reflected in empirical studies (Winer 1985; Holak, Lehmann Sultan 1987; Rogers 2003). Many new technologies customized for innovative products fail to gain momentum, while only a few drugs make entry in the market. The spending on advertisement optimization is supported by Generalized Bass Model (GBM) advocated by Bass, Krishnan, and Jain (1994) and firms in monopolistic market are trying to fix price on advertisement expenses. Similarly dual-market diffusion model for a new prescription pharmaceutical (Vakratsas and Kolsarici 2008) distinguishes between an "early" adoption market involving patients with severe health problems, for whom demand is accumulated prior to the pharmaceutical's launch, and a "late" market corresponding to prescriptions for patients with mild problems, which is developed after and potentially triggered by the product's launch. Bass model (2004) not only comprises of innovation effect that comes from adopter's self perception and product utility but also posits imitation effect which stems from interactions between early adopters and

potential adopters of a product. However a product can be new in several ways: it can be entirely new for the market or it can be new for the firm but not for the market or it can be new to the segments. Bass defines imitators as the adopters whose timing is influenced by the pressure of their social system which is supported in current research also (Lee 2013). Moreover, Hofstede (2005) advocated that cultural dimension for studying drug diffusion/adoption.

Over the years, interpersonal communication theories like interaction- centered theories and relationship-centered theories allow us to focus on distinct dimensions of the marketers' relationships with physicians (Webster 1968; Baxter et al. 2008). Both, communication accommodation theory (CAT) by Glies (2008) and Speech Code Theory (SCT) by Philipsen (1992) will be evaluated as these interaction centered theories support the underlying assumption that interpersonal communication is transactional where stakeholders are affected by and affect each other simultaneously. Social Penetration Theory (SPT) and the norm of reciprocity and Communication Privacy Management (CPM) have been used in provider – patient relationship exploration (Bylund et al. 2012). These theories on communication concepts may need to be evaluated for late entrant branded drug launch. Though research on antihypertensive medicine / drug adoption in developed countries has been conducted (Salvia and Macchiarulo et al. 2002) yet extrapolation to developing nations will not be appropriate due to significant disparity in economic and social factors. We examine the applicability of two different (Bass 2004; Hofstede 2005) models by comparing emerging market trends of drug adoption against established / structured markets of developed nations (Salvia 2002; Greving 2006). Therefore, our analysis also sheds light on the mind boggling question — what determines the success for the international firms, as researchers try to figure out why there is a high degree of variation in acceptance of alternative branded drug? (Phelps, 1992, Goswami, 2014).

II. Theoretical background

Factors identification for antihypertensive drug adoption variation

This paper is related to three strands of the literature. First, understanding the sources of medical communication influencing drug prescriptions indicated the role of interpersonal communication with colleague, physicians' characteristics and advertising, marketing drive from pharmaceutical industries (Stolley et al. 1969; Hemminki, 1975; Fretheim et al. 2005). However these studies have used an abstract concept of drug adoption framework that is hard to match data. Second, drug adoption literature has focused on prescription intention of antihypertensive drugs (Salvia et al 2002; Dranove and Huges et al. 2003; Greving 2006; Ronteltap and Trijp et al. 2007) and variations existing in their decision patterns. However these studies have not found the causality for significant variation in drug adoption intentions of practicing physicians. Hence, it is difficult to use reported model to operationalize drug adoption. The gap in traditional procedure to measure drug adoption is identified and addressed for the first time.

Physician characteristics and drug diffusion

Christensen et al. (1981) advocated that physician related characteristic play significant role in adoption level of drugs differing with changing communities. A study focused on Coleman et al.'s findings suggest that earlier adopters of the particular drug were likely to be young or middle aged physicians, rather than older ones (Peay et al. 1988). In another study, findings showed that cosmopolite physicians with strong interpersonal communication channels were drivers of drug adoption (Roger, 2003). However, physician's gender difference was reported to be unlikely having meaningful clinical or economic consequences in drug adoption (Duetz et al. 2003). These findings indicate that the true understanding can be developed by examining the physicians' characteristics including years of medical practice and attitudinal response to source of information.

Information derived from knowledge and memory

Boerkamp et al. (1996) identify habitual decision-making takes place when a choice is made without consideration of alternatives. Variability in physicians' prescribing of new drugs thus relates to level of acquired knowledge of physicians (Prosser H, Walley T. et al. 2006). Greving and Denig et al. (2006) used different categories of antihypertensive drugs like CCB (calcium channel blocker), ACE (acetylcholine esterase inhibitors), ARB (angiotensin receptor blocker), BB (beta-blockers), DIU (diuretics) are used as medication for therapy of hypertension management. From these five alternative antihypertensive drug categories, the physician will select medicine that meets expectations like (i) user- friendly dosage schedule (ii) efficacy in reducing morbidity/mortality (iii) efficacy in lowering blood pressure (iv) efficacy in preventing end organ damage and hence inter-physician variation in adoption decision can be found.

Hypertension can be managed by changing lifestyle (Gupta et al. 2010). The study supports the argument that choice of antihypertensive would be based on information acquired by learning process and would follow the physicians' knowledge for perceived drug benefit. Webb and Sheeran (2006) in their meta-analysis explored causal impact on behaviour showing low adoption intention as explained by social cognitive theory (SCT; Bandura, 1986) used in health behaviour model. Self-efficacy, the belief in one's ability to perform the necessary actions successfully, is an important component of SCT influence physician's perceived behavioral control. Since self efficacy is regarded as a mediator between outcome expectancies and intentions (Health

Action Process Approach model Schwarzer, 1992), perceived behavioral control is determined by perceived presence or absence of resources and opportunities and the perceived ability of these to induce or hinder performance. Therefore it will be interesting to explore perceived drug benefit is hindering physicians' intention to build drug adoption due to following reasons (i) awareness or belief on product can't boost physician or patient's confidence unless there is brand loyalty or trialability success information is coded. According to Brown (2005), the measurement of perceived benefits as a variable, was not frequently standardized leading to poor reliability and validity of the measurement. Salient Value Similarity (SVS) theory identified construct 'Perceived Benefit' indicate judgments of risk and judgments of benefit for a number of different technologies (Alhakami and Slovic, 1994; Frewer et al., 1998; Gregory and Mendelsohn, 1993). Earlier research concluded that consumers were more concerned about perceived risks than benefits (Bhatnagar and Ghose, 2004b).Hence without receiving trialability report from patient or patient's active participation indecision making, perceived risk will be associated more with drug adoption. The negative relationship of perceived benefit i.e. perceived risk will be directly influence drug adoption.

Commercial information source and drug adoption

Prosser et al. (2003, 2006) recommend the role of medical information, provided time and again by pharmaceutical firm to physicians play a crucial role in drug prescription due to the interplay of attitude and information seeking behaviour. The company representatives (detail men / communicator), who visit physicians, create a positive impact on drug acceptance based on their communication skills (Webster 1968). Molloy and Strang et al. (2002) advocated that the better quality of detailing has positive relationship with higher drug adoption level. A few pioneers of marketing research advocate that higher is the organizational drive to lower the product cost, more is the perceived benefit and higher will be the degree of adoption (Dranove and Huges et al. 2003; Ronteltap and Trijp et al. 2007). Literature data is inconclusive to demonstrate the causal relationship between information communications and intention to prescribe branded drug (antihypertensive) in developing nations. One possible reason could be the paucity of empirical work or lack of suitably detailed data or some other constraints.

Information from guidance, participation in seminars

According to Peay et al. (1984), a substantial number of doctors can be identified, using very stringent criteria, as consistently 'professionally-oriented' or 'commercially-oriented' in their information source preferences. Some researchers found that the commercial source of information (detailing by firm's representatives) outweighed professional information source (like updating with national guidelines or participating in educational program arranged by professional societies) in ARB antihypertensive drug adoption by Dutch physicians (Greving and Denig et al. 2006). On the contrary, French physicians preferred primary information sources like consultation of the leading prescription practice guidelines, regular reading of several medical journals and accessing electronic resources rather than simply relying on detail men's information source (Paraponaris and Verger et al. 2004). It is evident from contemporary studies in developed nations that commercial and professional source of medical information for drug adoption, needs to be integrated.

Information from externally available treatment opinion

Early research outlines that medical practitioners, maintaining contacts with socially integrated physicians, introduced a newer drug into their practices more often in comparison to isolated partners and presented a lively interpersonal process of drug diffusion (Coleman et al. 1959). The colleague physician was the most frequently mentioned information source unlike the representatives' communication of information from pharmaceutical industries (Boerkamp et al. 1996). There was clear effect of referrals to an internist or cardiologist on ARB drug treatment and most physicians indicated that they usually continued prescriptions initiated by a hospital physician (Greving and Denig et al. 2006). The perception for ARB drugs as effective medication in lowering blood pressure promotes ARB drug adoption rate. Therefore influence of treatment opinion can be deemed as drivers of drug adoption, which needs to be revalidated in Indian context.

Word of mouth communication or social interaction in medical community

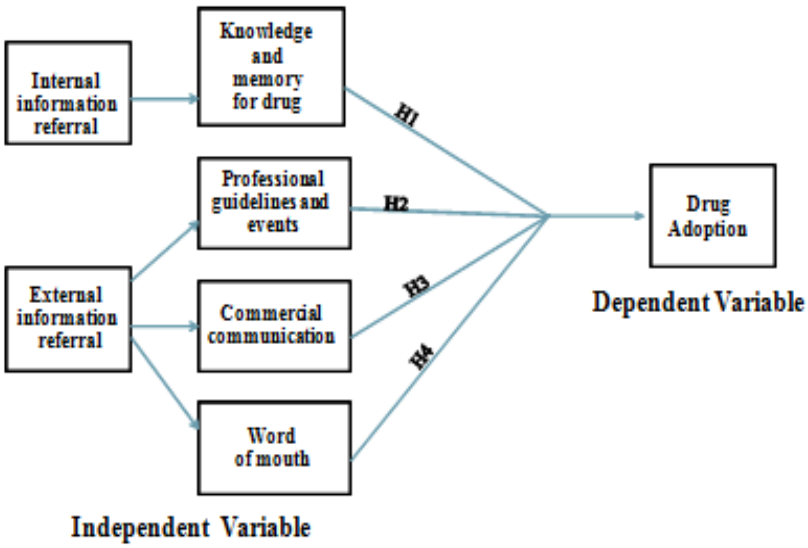
Social interaction in form of word of mouth communication to physicians is applied in predicting drug adoption. Multi-product growth models were first examined in the marketing literature by Peterson and Mahajan (1978) under the assumption of simultaneous (synchronic) launches. They classify co-existing products in the marketplace into four categories: independent, complementary, contingent, and substitute products. Only substitute products generate competition, which is modeled through the introduction of within-brand and cross-brand word of mouth effects related to brand-specific residual markets. Physicians may adopt a drug more than once and each prescription thus dispensed may be classified either as an innovative or an imitative action (avoiding classification of agents). In this sense, the first prescription and repeated purchases / prescriptions may be described through the same model structure. The positive relationship between word of mouth communication between physician - physician and physician-patient can be measured for building intention for drug acceptance (Coleman et al. 1959; Paraponaris et al. 2004; Greving et al. 2006). From an understanding of such relationships, pharmaceutical project managers could stear firms to fix production choice for antihypertensive drugs.

III. Hypotheses, explanatory variables

Conceptual framework and research hypotheses

The physicians' preference for source of potential information can be derived from four primary sources :- (a) drug benefit perceived from basis of physician's knowledge or memory (b) commercial information promoted by organizations (c) exposure to guideline, seminar, symposia (d) information from word of mouth (Goswami, 2014). These factors will affect drug adoption is assumed to vary with years of practicing experience that physicians have. On the basis of our literature review, a conceptual model is presented in figure 1. This model depicts certain hypothesized relationship among the constructs of internal and external source of information.

Figure 1. Theoretical Framework



Since physicians' attitude in form of four constructs will act as determinant to antihypertensive drug adoption, the attitude models have found wider application in explaining consumer adoption and diffusion of information system (Rogers 2003). Roger's adoption model indicates characteristic of innovation depends on the information it carries to the potential adoptee. Degree of adoption will be determined by characteristic of adoptee also (Ronteltap et al. 2007) and communication dynamics has been identified in table 1.

Table1. Hypotheses formation rationale comprising of elements for each factors

Hypo-theses		*Element constructs involving all variables based on research objectives*	*References*
		Reliance on knowledge and memory for Drug benefit (RKMD)	
H1	**RKMD1**	Patient friendly dosage system / schedule is positively related to drug adoption	Boerkamp et al.1996;Ronteltap et al. 2007
	RKMD2	Cost of medicine is negatively related to adoption	
	RKMD3	Efficacy in lowering blood pressure is positively related to drug adoption	
	RKMD4	Efficacy in reducing morbidity and controlling end organ diseases is positively related to drug adoption	
		Exposure to commercial information (CINFO)	
H2	**CINFO1**	Exposure to promotional material from organization is positively related to drug adoption	Prosser et al. 2003, 2006; Dranove and Huges et al. 2003; Ronteltap and Trijp, et al. 2007
	CINFO2	Acceptance of detailmen's visit is positively related to drug adoption	
	CINFO3	Advertisement and reading organizational communication on medicine is positively related to drug adoption	
	CINFO4	Organizational drive for pharmacovigilence, monitoring side effects is positively related to drug adoption	
		Participation in events/guidelines reference (PEGR)	Peay et al. 1984;Paraponaris and Verger et al. 2004; Greving
H3	**PEGR1**	Reading national drug compendium, guidelines is positively related to drug adoption	
	PEGR2	Participation in seminar or symposia is positively related to drug adoption	

	PEGR3	Exposure to educational programs, health campaign is positively related to drug adoption	and Denig et al. 2006
H4		*Information from word of mouth (IWOM)*	Coleman et al. 1959 ; Paraponaris and Verger et al. 2004; Greving and Denig et al. 2006
	IWOM1	Colleague physicians' prescription, is positively related to drug adoption	
	IWOM2	Hospital physicians' prescription, is positively related to drug adoption	
	IWOM3	Hospital physicians' prescription of new drug, is positively related to adoption	
	IWOM4	Patient's own experience with antihypertensive use is positively related to drug adoption	
Experience of physician is positively related to H1, H2, H3 and negatively related to H4 for drug adoption (ADOPT)			Christensen et al. 1981; Peay et al. 1988; Roger 2003

Based on conceptual framework the research methodology for the current study is designed.

IV. Method and research design

Data and sample

An alternative model where several competing model comes into interplay is proposed to be studied using a convenience sampling method. It is a non-probability sampling technique where participants / physicians are selected because of their convenient accessibility and proximity to the researcher. Since physicians are easily available in hospitals, clinic or dispensaries with prior appointment survey can be conducted with ease and in such type of sampling the purpose of research can also be served to a great extent.

Prior to administering the survey with physicians, a one-day focus group interview was conducted with specialist physicians / cardiologist, general practitioners and other specialists who made their important contributions to both the theory and methods and also made helpful suggestions for designing and administering the survey. The group helped us select terminology to use in the survey. The questionnaire items pilot tested for clarity and face validity among five physicians, not related to the study population were revised accordingly. The survey was completed in Delhi NCR region using 71 competed dataset, out of 102 participants.

Operationalization and measurement

We initially selected randomly physicians / specialist name and email-id from hospital lists and sent the questionnaire requesting their feedback unconditionally. Telephone reminders and one follow-up mailing were made to non-respondents to encourage a high response rate but were not successful as doctors were skeptical to share views through internet / electronic media. Out of eighty doctors interviewed, seventy one physicians' views (around ninety percent response rate) are deemed acceptable due to completeness and free from extremity bias. The adoption determinants are aggregated together using additive algebraic property and their individual role is explained by computing descriptive statistic principle using psychometric scale (1-6 Likert measures). The frequency for usage of information that can affect the adoption decision of antihypertensive drugs is also presented by ordinal data in form of a 1-4 Likert scale. The other type of questionnaire reflects Guttman scaling with dichotomous responses that focus on physician's characteristic feature. The adoption of antihypertensive drugs follows an important property of Guttman's model that a physician's entire set of responses to all items can be predicted from their cumulative score because the model is deemed deterministic.

V. Data analysis

The determinants of adoption were studied by linking physician related characteristics and views to their exposure to source of information. All constructs were assessed for reliability, validity, and unidimensionality and hypothesized relationships among the validated constructs were assessed via multiple regression analysis. The four hypotheses as tabulated (Table1) are composed of 24 items. All descriptive and inferential statistical analyses were performed using SPSS package, version 13. Exploratory factor analysis using Principal Component Analysis (PCA) was conducted to check the potential factors that can account for maximum variance of presented model. The loaded factors are used for multiple regression analysis to predict model variations in drug adoption. It evolves from the traditional decomposition method. The general additive decomposition model will include following variables: physician characteristic being explored in terms of years of experience, where 0-3 years experienced are taken as reference against 3-9 years (medium experienced) and 10 years or more (highly experienced) practicing physicians. The four independent and two control variables have been operationalised and summated at each level. Assuming linear relationship between drug adoption by doctors (ADOPT), the dependant variable (DV) and their determinants, H_1 hypothesis i.e. reliability on memory and knowledge for drug benefit (RKMD), H_2 hypothesis i.e. exposure to commercial information (CINFO), H_3 hypothesis i.e. participation in events, guidelines reference (PEGR) and H_4 i.e. information from word of mouth (IWOM) along with dummy variables D_1 (medium experienced=1; rest=0) and D_2 (high experienced=1; rest=0) form regression model as specified below -

$$ADOPT = b_0 + b_1 RKMD + b_2 CINFO + b_3 PEGR + b_4 IWOM + b_5 D_1 + b_6 D_2 + i_a$$

where b_0 is the intercept; b_1, b_2 b_3 and b_4 connotes the slope or estimated coefficients of respective determinants i.e. perceived drug benefit based on knowledge and memory per unit, exposure to commercial information per unit, participation in events per unit and information from word of mouth per unit. The fresh doctors in the experience category of 1-3 years are taken as reference category and has not been directly included in the regression equation. The coefficient b_5 is the difference in predicted adoption for 3-9 years experienced physicians as compared to fresher with 1-3 years experience and coefficient b_6 is the difference in predicted adoption for 10 years experienced physicians as compared to fresher with 1-3 years experience .The intercept, i.e. the respective constant term b_1, b_2 b_3 and b_4 captures explanatory variables and some other adoption variables like physicians' characteristics that are not included in the above model. i_a, represent residual variation or the stochastic error as it depicts random effect of assumed model. The regression model assumes that the slope coefficient of the explanatory variables is identical for all determinants. The reliability (convergent validity) of the items for each construct was computed using Cronbach's alpha (Hair et al. 1988).

VI. Results and discussion

Model Estimation and comparison

The purpose of this paper is to investigate the relationship between physicians' adoption of drug with their attitudinal dimension for using medical source of information. Some of these variables are intrinsically difficult to measure and in other cases we are limited by the availability of data. The cumulative scores on opinions for five categories of antihypertensive drugs are used to measure the drug adoption level. A multivariate model is developed using below mentioned variables and are presented in tabular form with predicted direction. The model with adoption determinant is evaluated at 95% level of confidence. The testing hypotheses were preceded by univariable analyses and data reduction procedure was employed to reduce the number of variables. For the purpose of data reduction, we used the factor analysis using PCA extraction. The extracted factors were rotated to identify variables that load onto single factor. Varimax rotation an orthogonal rotation criterion that maximizes the variance of the squared elements in the columns of a factor matrix is used (Table 2).

Table 2. Factor analysis using Varimax rotation- Loading of measures

Elements	*Rotated Component Matrix*	*Component*		
	Extraction Method: Principal Component Analysis	1	2	3
1.a	Reading Promotional material	0.81		
1.b	Accepting detailman visit	0.70		0.45
1.c	Reading advertisement	0.63	0.5	
1.d	Side effects	0.87		
2.a	Participation Education Program		0.75	
2.b	Participation Seminar and Symposia		0.75	
2.c	Updating with National Guideline		0.71	
3.a	User-friendly dosage preference			0.50
3.b	Efficacy-morbidity reduced			0.81
3.c	Efficacy-blood pressure reduced			0.80

The loaded factor suggests that there is acceptable degree of communality (with good correlation, 0.50-0.87). With few exceptions in single model setups, all the indicators exhibit moderate loadings of above 0.50 across the measurement models. Communality is the total amount of variance an original variable shares with all other variables is included in the analysis (Hair et al., 1988). The factor analysis result shows multidimensionality of scales as 3 factors are identified (Eigen value > 1), explaining 65.5% of total scale variance which can be fitted to a model in order to examine statistical significance.

The selected variables should have sufficient inter-correlations which are usually confirmed by using measures of sampling adequacy i.e. statistical significance of Bartlett's test of sphericity is desired. Individual KMO (On-diagonal of Anti Image correlation Matrix) should be > =0.50 and variables with diagonal anti-image correlations of less that 0.5 is dropped from the analysis as they lack sufficient correlation with other variables (Hair et al., 1988). Since we have removed the responses with extremity bias, with 71 sample-set, result is reliable.

Descriptive Statistics

The descriptive statistics for source of information measured on Likert scale of 1-6, depict that physician rely most on habitual factors like memory, knowledge and professional guidelines as well as participation in seminar and symposia for accepting antihypertensive medicines. The majority of medical practitioners are least influenced by colleague or patient's choice, while prescribing antihypertensive drugs with highest dispersion as compared to other variables. The information from word of mouth are positively skewed as compared to other independent variables which are little unpredictable. However negligible kurtosis also confirms that all variables more or less are distributed normally. Further, the adoption level measured on 10 point scale, show that antihypertensive are prescribed frequently and physicians have acquaintance with all its categories (Table 3).

Table 3. Descriptive statistics of selected variables that fits regression model

Variables (N=71)	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
RKMD	3	6	5.1	0.9	-0.7	-0.5
CINFO	1	6	4.6	1.2	-0.8	0.0
PEGR	2	6	5.0	1.0	-0.8	-0.4
IWOM	1	5	2.9	1.3	0.1	-1.2
ADOPT	5	9	6.9	1.0	0.2	-0.5

Regression analysis is conducted using all three measures of adoption determinants taken together as independent variables (IV) and the strength of the models is reported in Table 4. The F-statistics (3.209) indicates model's statistical usefulness, are significant at 5% (*) level for all variables. The value and significance of F-statistics, which measures the joint significance of all independent and control variables has also improved for demographic variables like physicians' years of their practice years. Therefore for a given set of adoption determinants, predicted adoption is 0.515 units higher for mid experienced and 0.332 units higher for highly experienced physicians compared to fresher or less experienced doctors (Table 4). The three attitudes for using source of information for drug adoption based on years of physician experience correlate moderately with the dependent variable (0.445).

Table 4: Model summary - Multiple regression analysis

Variables	*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.**	*Diagnostic Tests*
Dependent Variable						
ADOPT	*B*	*Std. Error*	*Beta*			*CI^*
INTERCEPT	7.152	0.782		9.146	0.000	1.0
Independent Variable						
RKMD	-0.395	0.151	-0.349	-2.610	0.011	2.1
CINFO	-0.026	0.120	-0.031	-0.221	0.826	3.9
PEGR	0.333	0.130	0.334	2.558	0.013	12.4
Control variables						
Dummy-mid exp (D1)	0.515	0.322	0.219	1.602	0.114	14.9
Dummy- high exp (D2)	0.332	0.305	0.160	1.089	0.280	19.2
F- Statistics	*R*	*R Square*	*Std. Error of the Estimate*		*Sig.**	*DW^^*
3.209	0.445	0.198	0.939		0.012	1.722
CI^ =Condition Index; DW^^=Durbin Watson					**Sig. = p value < 0.05*	

The fixed effect model that best explains the variance will therefore be represented as:

ADOPT= 7.152 - 0.395 RKMD -0.026 CINFO + 0.333 PEGR + 0.515 D1 + 0.332 D2

The result depicts that intercept for RKMD and CINFO are -0.395 and -0.026 respectively, which indicates there is a negative correlation with physicians' drug adoption and both the factors, reliance on memory or knowledge and exposure to commercial information when years of experience are regressed as dummy variables. Relative importance shows that participation in events like seminar, symposia or guideline referral are linked with mid experienced physicians, having the higher impact on the DV (drug adoption) compared to highly experienced physicians. This is also supported by their corresponding *t* value. Though the model is useful to predict the variations in drug adoption; but the proportion of the variation in adoption explained by regression relationship

is poor (R square =0.198).Poor regression might suggest non-linearity, therefore multicollinearity was tested. A condition index greater than 15 indicates a possible collinearity problem. There might be small inter-correlations among independent variables (CI < 13%) in our regressed data. DW in the present data is close to 2 mean reflects negligible autocorrelation. As a consequence, multicollinearity is not a problem in our analysis.

Imitation effect and Cultural Effect

Bass model allows a time domain control, expanding or reducing sales over time under a fixed market potential. This useful re-allocation tool depends on market-mix policies and strategic interventions as supported by imitation model of Enkel and Mezger (2013). The result of present study provides empirical evidence that information communication plays significant role in constructing drug adoption model using theoretical concepts of Bass model of adoption by imitators. H_1, H_2, H_3 are useful for model constructs and H_4 is rejected. The three attitudes for using source of information (excepting H_4 = word of mouth information source) based on years of physician experience correlate moderately with the dependent variable (R=0.445). The findings guide us to predict that the 19.8% of the variation in the overall adoption for the antihypertensive drugs could be explained by these three attitudes and provides opportunity to drug alternative brand switches. Relative importance shows that source of information in form of reliability on memory and knowledge for drug benefit (RKMD) and participation in events, guidelines reference (PEGR) have the highest impact on drug adoption. This is also supported by their corresponding significance value. The dummy variables signifies that with time, adoption of antihypertensive drugs prescription is predicted to be increased for mid experienced physicians (3-9 years) and gets decreased with higher experienced physicians (greater than 10 years). The findings also resonate with prior research that experience of physicians controls drug adoption behaviour even analyzing at global level performance in healthcare community. Higher the experience of physicians (ten years and above), more will be reliance on memory and habits for antihypertensive drug prescription in 99% of the cases (Pearson correlation). Contrary to the findings commonly reported in literature, the present study found that from three years practicing experience and greater the effect of commercial information will significantly impact negatively to the intention for drug adoption. The lower the physicians' experience (less than 10 years), higher will be referral to drug compendium or more will be the intention for participating in seminar or symposia (with 95% confidence interval).

External influence on treatment using word of mouth source of information is insignificant with respect to control variable like years of their practicing experience. The reliability of measurement scale is further supported since the ten element scale on use of sources of information (RKMD, CINFO and PEGR determinants) to predict drug adoption showed acceptable internal consistency. Moreover, this study, by investigating the context of Indian healthcare providers, contributes to the research on emerging economies. Exploring the individual identity based on the social network (Hofstede , 2001), physicians live and work within a cultural environment of healthcare in which certain values, norms, attitudes. External influence on treatment using word of mouth source of information is insignificant with respect to control variable like years of their practicing experience. The young physicians probably are not influenced by social contagion on established therapeutic segment, unlike senior physician/ cardiologists (Bhatia and Wang ,2011), who are social multiplier acting as opinion leaders. In our current study, all reflective constructs, exhibit composite reliability values of 0.79, providing support for reliability of the construct measures.

VII Conclusion

Research contribution and limitation

Our study contributes to the literature in several ways. This investigation is very similar to empirical study to measure drug adoption in developed nation (Greving and Petitti et al. 2006) though findings are different. Even social/cultural effect as observed by western world (Bhatia and Wang 2011) is yet to be established in medical community of developing nation like India. The study is also valuable for its pioneering presence in India, one of the fast growing developing nations of Asia. The empirical study provides the knowledge to multinational firms planning to cross geographical barriers tapping unleashed potential in emerging markets.

The poor scope of adoption of late entrants can be due to multiple factors. However, the main limitation, in our view, is that we do not observe actual physician interactions or patient referrals between physicians. Secondly, study involves physicians of less number and sample size needs to be increased as per the data derived from the research. An important limitation of this study is untapped potential to optimize healthcare supply chain taking into consideration end-user of service/patients such that healthcare chain becomes responsive (Shah, 2004). "Medical gatekeeping" is the process by which healthcare providers allocate resources to patients based on experience and knowledge (Elizabeth 2013) but attempt to measure drug adoption is sparse to the best of knowledge of authors. A much richer understanding of patient-physician partnership in treatment adoption is required as shown in our earlier research (Goswami, 2014). The rising competition on generic drug manufacture in low risk segment like hypertension has given multiple options to prescribers leading to lower drug adoption. Also hospital institutions are not able to measure the demand analytics while late-entrant drugs are getting adopted and patients are and continuous supply to patient chain probably is getting impaired.

Physicians' responses to medical information sources and the extent to which they rely on clinical experience in prescribing drugs can create business knowledge to develop a decision support system as (Akura 2012). Such application in current setting will strengthen our study findings. A comparative study with generic prescription and physicians' role (Rodríguez-Calvillo J A., 2011) needs to be explored. The article shows the convincing role of shared decision making where information on disease treatment communicated from drug marketers to doctors influence medical prescribing behaviour of late-entrant drugs. Finally shared decision making between doctors in form of word of mouth communication plays a critical role for drug adoption and underlying variations due to availability of substitutes/ branded late-entrants in same price range. The opportunity is immense and further study is recommended in larger subject pool.

Declaration

The authors declare that this research article does not reflect opinion/policy of any organization or regulatory institutions but being sole opinion of authors based on contemporary research on society. For any errors authors are responsible and report no conflict of interest.

Acknowledgement

The author thanks the hospital staffs and physicians for their valuable time during various phases of investigation. The authors acknowledge constructive feedback from Professor G. C. Saha at the Centre for Business Analytics and Intelligence, Arthur Lok Jack Graduate School of Business, University of West Indies.

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