

THE USE OF THE THEORY OF PLANNED BEHAVIOR TO PREDICT FACTORS INFLUENCING PHYSICIANS' DECISION TO PRESCRIBE EXTEMPORANEOUS COMPOUNDING DOSAGE FORM FOR PEDIATRIC OUTPATIENTS

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Received: 11 April 2016, Revised and Accepted: 16 April 2016

ABSTRACT

Objective: To explore the potential utility of the theory of planned behavior (TPB) in predicting intentions to prescribe extemporaneous compounding dosage form and to determine the salient beliefs associated with this intention.

Methods: A cross-sectional survey design was utilized in this study. Participants of 249 physicians from Yogyakarta province completed a questionnaire based on the TPB. The questionnaires assessed TPB variables that are beliefs, attitude, subjective norm (SN), the perception of control, intention, and an additional variable of past behavior. The data were analyzed with multiple linear regressions.

Results: Attitude, SN, and perception of control of the TPB components accounted for 58.6% of the variance in the prescribing intentions. The model was statistically significant ($p < 0.001$). Attitude had the strongest impact on intentions. The additional variable of past behavior increased 61.9% to the explained variance in intentions ($p < 0.001$). Participants' beliefs in the benefit of compounding prescription were the strongest predictor of the decision to prescribe.

Conclusion: The TPB model provides information that attitudes, norms subektif, and perceived behavioral control were useful predictors for intentions to prescribe compounding. Past behavior variable increases the proportion to explain the variance of intention. The aAttitude was the most powerful predictor of physicians' intention to prescribe extemporaneous compounding dosage form for pediatric outpatient.

Keywords: The theory of planned behavior, Extemporaneous compounding, Pediatric outpatients, Prescription.

INTRODUCTION

Pediatric prescribing is a complex decision and errors may occur at any stage during prescribing, preparing, and administration by parents. Pediatric patients, whose needs are not met by manufactured products, rely on the extemporaneous compounding dosage form [1]. Compounded drugs may be sub- or super- potent and contaminated. However, unlike commercial drug manufacturers, health professionals are not required to report evidence-based clinical practices and adverse events associated with compounded drugs.

A theory has the potential to offer an underlying framework for studying clinical behavior. Several theories have been formulated to help predict and understand health-related behavior. One of the well-tested psychological theories is the theory of planned behavior (TPB). The TPB has been used successfully in predicting a wide range of health professional behavior [2-4]. According to the TPB, specific behaviors can be predicted by the strength of an individual's intention to enact that behavior. Intentions are, thus, the precursors of behavior and the stronger the intention, the more likely it is that the behavior will occur. The intention strength is determined by three variables: Attitudes toward the behavior, subjective norm (SNs), and perceived behavioral control (pbs) over it. These variables, in turn, are based on salient beliefs about the behavior [4,5].

This study explored the potential utility of the TPB (attitudes, SNs, and pbc) plus past behavior to predict intentions to prescribe extemporaneous compounding dosage form and to determine the salient beliefs associated with this intention.

METHODS

A cross-sectional survey design was utilized in this study. Participants of 249 physicians from Yogyakarta province completed a questionnaire

based on the TPB. The participants were general practitioners, dentists, pediatricians, and pediatric dentists. Participants were recruited through private and government agencies, as well as requested directly to the volunteer. In addition, snowball sampling techniques were also used - in which enrolled participants referred friends and acquaintances. The participants were informed that their responses would be kept confidential, and consent was confirmed by the completion and submission of the survey.

Instruments

The questionnaire was divided into two sections. The first section was demographic characteristics of the surveyed respondents. The second section of the questionnaire was designed to measure the constructs of the TPB which consisted of 42 statements. Two types of scales were used for the section two of the questionnaire: (1) Likert-like scales, from one (strongly disagree) to seven (strongly agree) and (2) bipolar scales (-3 to +3). Four items were developed for the intention scale which consists of likert-like scales. Attitudes were measured by 16 items consisted of two subscales. The first subscale in likert-like scales consisted of four direct and six indirect statement items, measured direct attitude, and behavior beliefs (bb). The second subscale in bipolar scales consisted of six items and measured outcomes evaluation (oe). The social norms scale consisted of 10 items. The seven items measured direct SNs and normative beliefs (nb) about the expectation of referents or other people using likert-like scales. The three items in bipolar scale measured motivation to comply (mc) with other people's expectations. pbc is a function of beliefs about factors likely to facilitate or inhibit the behavior (control beliefs [cb]). Assessing pbc involved 10 items measuring direct pbc and indirect cb using likert-like scales. The last four items in bipolar scales measured the perceived power to influence behavior (ib). The past behavior was measured directly in terms of compounding prescribing experiences during the last 3 months. Two items asked past experiences: (i) Over the last 3 months, how often do

you prescribe compounding for pediatric outpatients? and (ii) What percentage of extemporaneous compounding dosage form have been prescribed over the last 3 months.

Scoring the TPB factors

The TPB hypothesizes that an individual’s action is a function of three factors - his/her attitude, SNs, and pbc. Direct statements were calculated by adding each score ratings and then calculated its mean value. Indirect statements were the sum of the product of two judgments made by the individual: One primarily factual regarding the consequences of compounding prescribing and the other evaluative. The behavioral belief dimension (unlikely-likely, scored from 1 to 7) was multiplied by evaluative dimension (bad-good, scored from -3 to +3). Overall, a score that has been generated then summed so that a high summary score always indicated stronger or more positive beliefs [6].

Statistical analysis

The purpose of this study was to investigate the ability of the TPB to predict factors that influencing compounding prescription. Simple descriptive statistics were used to analyze the demographic data. A multiple regression analysis was performed to determine the predictors of participants’ intention to prescribe compounding. The intention was regressed on attitudes, SNs, and pbc. Attitudes were regressed on the product of behavioral beliefs and oe. SNs were regressed on the product of nb and mc. Finally, pbc was regressed on the product of cb and perceived facilitation. A p=0.001 was considered significant in all statistical tests conducted.

Ethics approval

The study was approved by the Ethics Committee of Faculty of Medicines, Universitas Gadjah Mada, Yogyakarta, Indonesia. In accordance with the ethical approval, consent to participate was given by the return of completed questionnaires.

RESULTS

Participants

Demographic data of participants are shown in Table 1. A total number of 249 participants completed questionnaires with the time period of study. The participants included 27% male and 73% female. In general, mostly participants were general practitioners (69.5%), worked in primary health care institutions and provided additional private practice.

Correlations and descriptives

In Table 2, mean scores, standard deviations and correlations among the variables are presented. Table 2 shows that correlations between TPB predictors and intention are statistically significant with attitudes are the strongest. The high correlation value of attitude to intention showed that attitudes are the most considered in deciding to prescribe extemporaneous compounding dosage form. Past behavior, the extension variable was also significantly correlated with intention.

Validity of the TPB components

Analyses of reliability were conducted to each component of the TPB model including past behavior. The Cronbach’s alpha of the TPB model was 0.916. The Cronbach’ alpha for each construct was 0.745 for the 16 items of attitudes items, 0.717 for the 10 items of SNs, 0.864 for the 10 items of pbc, 0.876 for the four items of intentions, and 0.916 for the two items of past behavior.

Basic TPB model predicting intention

Fig. 1 shows a diagram representing the results of multiple regression analysis to predict factors influencing physicians to prescribe extemporaneous compounding dosage form for pediatric outpatients. The diagram presents relation of the predictors (attitudes, SNs, and pbc) with the intention variable, and the correlation of supported predictor variables.

Intention as a function of attitude, SNs, pbc, and using past behavior as moderator

In general, participants indicated that they intended to prescribe extemporaneous compounding dosage form with an average score of 18.02±4.663 (range 1-28). The results show that each of the attitudes, SNs, and pbc were positively and significantly correlated with intentions to prescribe extemporaneous compounding dosage form. Attitude, SN, and perception of control of the TPB components accounted for 58.6% of the variance and the model was statistically significant (p<0.001). The addition of the past behavior in the model significantly increased the proportion of variance accounted for 61.9% (p<0.001). Attitudes were the strongest predictor with a mean value for the direct attitudes (four items) of 19.90±4.051 (range 1-28). The dominant statement of attitudes was “Giving my pediatric outpatients with compounding prescription is (harmful in score 1 to beneficial in score 7)” with means responses of participants were 5.00±1.294. The results of Pearson coefficient analysis between TPB components and intention showed that the statement about benefits of compounding prescription gave the highest correlation value of 0.697 (p<0.01).

The relationships between attitudes to behavioral beliefs and oe

The results of regression analysis (Fig. 1) showed that relationships between attitudes to six items of bb and six items of oe explained 54.8% variance of attitudes. The most powerful statement influencing attitudes was the bb, “If I prescribed compounding, I was able to treat my patients according to their clinical condition”. Participants’ responses on this question gave the mean score of 5.28±1.273 (range 1-7) and the strength of the relationship was r=0.693 (p<0.001). Furthermore,

Table 1: Demographic characteristics of respondents

Demographic variable	Number of respondents (%)
Gender	
Male	68 (27)
Female	181 (73)
Qualification profiles	
General practitioner	173 (69.5)
Dentist	46 (18.5)
Pediatrician	24 (9.6)
Pediatric dentist	6 (2.4)
Practicing years	
0-5	95 (38.3)
6-10	63 (25.7)
11-15	31 (12.4)
16-20	19 (7.6)
21-25	18 (7.2)
26-30	12 (4.8)
>30	4 (1.6)
Not filled	6 (2.4)

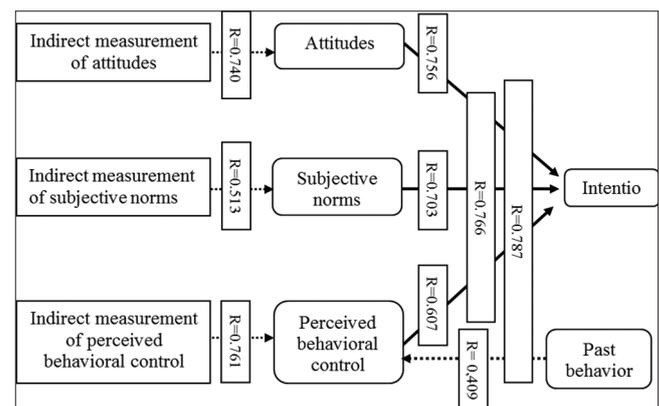


Fig. 1: Summary of regression result

Table 2: Correlations between int, att, SNs, pbc, indirect measurement of att ($\sum (bb \times oe)$), indirect measurement of sn ($\sum (nb \times mc)$), indirect measurement of pbc ($\sum (cb \times ib)$) and past behavior (n=249)

S.no	Konstruk	1	2	3	4	5	6	7	8	Mean±SD
1	Att	-	0.29	0.587	0.429	0.515	0.527	0.700	0.391	19.90±4.051
2	$\sum (bb \times oe)$	-	-	0.227	0.350	0.330	0.455	0.264	0.274	75.93±26.771
3	Sn	-	-	-	0.419	0.306	0.341	0.600	0.424	16.36±3.757
4	$\sum (nb \times mc)$	-	-	-	-	0.347	0.458	0.445	0.230	25.90±17.367
5	pbc	-	-	-	-	-	0.686	0.537	0.381	21.12±4.338
6	$\sum (cb \times ib)$	-	-	-	-	-	-	0.528	0.410	37.80±18.710
7	int	-	-	-	-	-	-	-	0.534	18.02±4.663
8	Past behavior	-	-	-	-	-	-	-	-	8.29±3.470

p<0.001. int: Intention, Att: Attitudes, pbc: Perceived behavioral control, SNs: Subjective norms, bb: Behavior beliefs, oe: Outcomes evaluation, nb: Normative beliefs, mc: Motivation to comply, cb: Control beliefs, ib: Influence behavior, SD: Standard deviation

another statement of bb, "If I prescribe compounding, my patients will be able to administer (practically) some active substances in a one-time administration" gave a significant correlation ($r=0.386$, $p<0.001$). The mean score of responses to these questions was 5.47 ± 1.448 .

The relationships between SNs and nb and mc

The results of regression analysis showed that relationships between SNs and nb and mc explained 26.3% variance of SNs. The results suggested that variables of nb and mc did not show high relationships. These results suggested that factors of social pressure did not influence the SNs.

The relationships between pbc and cb and ib

The results of regression analysis showed that relationships between pbc and three items of cb and three perceived power to ib explained 57.9% variance of pbc. The most powerful statement that influenced pbc was the statement of cb, "I have the knowledge in prescribing extemporaneous compounding dosage form for pediatric outpatients." Participants' responses on this question gave a mean score of 5.55 ± 1.214 (range 1-7) and the strength of the relationship was $r=0.658$ ($p<0.001$). Furthermore, the statement of perceived power to ib "Having facilities for compounding at the pharmacies enable me to prescribe compounding for my pediatric outpatients" showed a significant correlation ($r=0.604$, $p<0.001$). The mean score of responses to these questions was 1.85 ± 1.310 (range -3 to +3).

DISCUSSION

In daily practice, it is difficult to find registered drugs with suitable formulations for children [7]. Pediatrics, whose needs are not met by manufactured products, relies on the compounding prescriptions. Compounding prescriptions should reflect that the use of compounding products always consistent with the quality use of medicines principles. For oral administration of drugs in children, the bioavailability, the taste, the composition, and the absence of toxic ingredients are important factors [7]. The current study was to identify factors influencing physicians' decision to prescribe extemporaneous compounding dosage forms for pediatric outpatients based on TPB.

TPB model suggests that intention is jointly determined by attitudes, SNs, and pbc [5]. The strength of intention to prescribe was predicted well by the variables specified in the TPB. The proportion of variance explained by the model increased significantly when a measure of past prescribing behavior was added. This suggests that the frequency of compounding prescribing in the past has an effect on the intention to prescribe in the future, which is not solely mediated by attitudes, SNs and perceived control. One reason for compounding prescribing was that pediatricians have clinical experience in compounding medicine use. Therefore, it is important to document pediatricians' experiences. The successful application of TPB to predict intention is consistent with previous studies in which the theory can be effectively applied to predict and explain intention [3,4]. The results also supported TPB with the addition of past behavior [4,8].

The strongest predictor is attitude. This suggests that the intention to prescribe compounding is more influenced by participants' attitudes. Although attitudes showed the strongest predictor to intention but the factors that influence prescribing decisions vary depending on the purpose of treatment. Study about health care professionals' intentions to use clinical guidelines showed that the strongest factor for the physicians was the perceived behavior control, while the key factor for the nurses and the other professionals was the SN [9].

Attitudes of participants in prescribing compounding were based on their beliefs toward the benefits of compounding dosage form. Compounding has been known for the ability to prepare a medicine that is not commercially manufactured, unavailable, or being used for off-label purposes [1]. In the current study, the results showed that the benefits in compounding was their beliefs that by compounding prescription they can adjust the treatment for pediatric according to the clinical condition. Prescribing decisions were also influenced by their beliefs about increasing patients' adherence in administering the medicines. By compounding, physicians can ask pharmacies to add flavor enhancers to the compounding formula. If a patient has difficulty in administering tablets or capsules, compounding can facilitate the patient in taking medication. Therefore, attitude beliefs in compounding need to be understood by policymakers if they want to improve drug use for pediatrics. Interventions that challenge the beliefs will be more effective in reducing the frequency of compounding. For example, emphasis on the importance of responsibility to report evidence-based medicines may be a challenge to the attitudes.

The current study showed that SN is the weak predictor of intentions. SN in terms of compounding prescribing decision is measured by whether compounding influenced by nb or related to the motivation to meet the expectations of others. The decision to prescribe compounding showed that social pressure did not affect participants. The decisions were likely to be determined by the physicians' desire. Prescribing decisions, in general, are influenced by a wide range of factors. Regarding peer influence on drug selection, 75% of the physicians reported being affected by department heads and colleagues of the same specialty [10]. Factors influencing uptake of new medicines in secondary care were complex [11]. Clinical trial investigators and Drug and Therapeutic Committees appeared to have influence due to their research and understanding of evidence base [11]. Pharmaceutical representatives may also influence prescribing decisions through funding of meetings and academic detailing [11]. Although patients brought regarding medication, the physicians' opinions were the strongest determinants of prescribing [12]. In current study showed that social pressure did not influence compounding prescribing. Deciding to prescribe compounding was based on their own judgment. This is understandable because compounding prescribing is more likely decision to change the drug dosage forms, not a decision to choose drugs. Physicians' clinical decision is generally associated with the decision to select drug for treatments, while the decision to choose dosage form can be decided by themselves or assisted by pharmacists.

pbcs is a function of beliefs about factors likely to facilitate or inhibit the behavior (cb). The results showed that cb about the knowledge of compounding were the strongest predictive factors in pbcs construct. Participants believed of their competency to prescribe compounding since compounding prescribing has been taught to physicians in their formal study at the university. The availability of compounding facilities was also influential in determining prescribing. Although the numbers of drugs are made in extemporaneous compounding dosage form has been decreased, the facilities remain available in many countries. Many pharmacies in the United States provide compounding facilities to improve their pharmaceutical care. They stated that they had a closer relationship with patients receiving compounded preparations than with patients receiving only manufactured products [13]. Consequently, it is crucial for the pharmacies as the last line of the health professions to ensure the quality of compounding [14]. Physicians prescribe extemporaneous compounding if the formulas for their patients are not available. Therefore, providing suitable formulas for pediatric as physicians' desire would be effective to reduce compounding drug uses. If the compounding remains to be desired, policy on the competence of the pharmacy that provides compounding drugs need to be enforced.

The current study provides information about the process underlying the decision to prescribe compounding for pediatric outpatients. It appears that physicians prescribed compounding in the past can be expected to have the intention to prescribe the compounding. Therefore, if the intention to prescribe compounding has become habits, intervention such as prompts to promote cognitive processes may be effective. It has shown that the strength of the belief about the benefits of compounding was the best behavioral belief. As a consequence, interventions using persuasion techniques that challenge this belief would be expected to be more effective in reducing the frequency of compounding. For example, physicians who intend to prescribe were more likely to agree that they would give compounding if the suitable formula for children were not available. Therefore, providing formulas as physicians desired would be effective. Responsible off-label included compounding prescribing requires physicians to: (1) Report sufficient evidence to justify an off-label use; (2) give additional information and research when no adequate evidence; and (3) inform patients about the uncertainties with off-label prescribing [15]. Therefore, information about the responsibility of compounding in treating pediatric may be also helpful in challenging or endorsing the view of compounding.

The limitation of this study is the absence of a measure of actual prescribing. In the absence of measures of actual behavior, we cannot assume that these findings reflect the existence of a routine behavioral response. Mostly participants were general practitioners, female, worked in the primary health cares and government hospitals. The characteristics of participants can affect the results of this study. Therefore, these findings can not be fully generalized to the population as a whole.

CONCLUSION

Despite its limitations, results of this study are consistent with the TPB framework and provide insight into the factors underlying compounding prescribing. The model provides information that attitudes, norms subtektif, and pbcs were useful predictors for intentions to prescribe compounding. The past behavior variable increases the proportion to explain the variance of intention. Attitude was the most powerful predictor of physicians' intention to prescribe extemporaneous compounding dosage form for pediatric outpatient.

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