Structural Equation Modeling and the Theory of Planned Behavior in Evidence-based Management

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Abstract

The purpose of this study was to use Structural Equation Modeling (SEM) and the Theory of Planned Behavior (TPB) to predict intention to use evidence-based management (EBMgt) among U.S. healthcare administrators. A cross-sectional, non-experimental study was conducted, using a two-stage cluster sample of 154 health leaders in U.S. healthcare organizations. The data were collected and entered into the Statistical Package for the Social Sciences (SPSS) 22.0. Structural Equation Modeling (SEM) was performed using Analysis of Moment Structures (AMOS) 22.0. The study findings showed that an intention to use EBMgt was statistically and significantly predicted by attitudes ($\beta = 0.55$) and perceived behavioral control ($\beta = 0.38$) at the significance level of < 0.001. The results also showed that education positively moderated the relationship between attitudes and intention to use EBMgt ($p < 0.001$). The findings suggest that the TPB is a useful theory model for predicating healthcare administrators' behavioral intention to use EBMgt.

Keywords: Theory of planned behavior, evidence-based management, healthcare management, decision-making, structural equation modeling, healthcare administrators

Introduction

Evidence-based Management (EBMgt) is defined as making decisions about the management of employees, teams or organizations through the conscientious, explicit and judicious use of four sources of information. The four sources of information include: the best available scientific research findings, organizational data, professional experience and judgment, and stakeholders' values and concerns [1]. The concept of EBMgt is originally derived from Evidence-based Medicine (EBM). EBM started in the early 1990s. Traditionally, care of patients was influenced by the experiences and opinions of physicians who provided patients with treatment and diagnoses. Physicians began to use EBM, a new approach to the practice of medicine, and made their clinical decisions in patient care based on the best available evidence. In the last decade, EBM has extended beyond medicine to the broader context of healthcare.

EBM has influenced prominent scholars in healthcare management in the United States (U.S.). These scholars published articles and strongly advocated the adoption of EBMgt in healthcare management [2, 3, 4]. However, EBMgt has not been widely used by healthcare administrators in the U.S. [4, 5]. Physicians and allied health professionals are generally positive toward the practice of EBM [6-10] while healthcare administrators have been slow to adopt an evidence-based management approach in their own professional practice [3, 5]. A literature review suggests that few studies have examined what factors influence healthcare administrators' behaviors toward the use of EBMgt in today's U.S. healthcare environment.

Theoretical Framework

The theoretical model used in this study was the Theory of Planned Behavior (TPB) developed by Ajzen [11, 12]. This theory includes three independent variables or predictors: attitude, subjective norm, and perceived behavioral control. Attitude usually refers to a person's overall evaluation of the proposed behavior, including how good or bad the consequences are likely to be. In this study, attitude is defined as healthcare administrators' positive or negative feelings or beliefs about the use of EBMgt. Subjective norm is defined as healthcare administrators' perceptions of important peers/colleagues' desires for them to use or not use EBMgt. Perceived behavioral control serving as the third independent variable refers to perceptions about how easy or difficult it is to perform a given behavior. In this study, perceived behavioral control refers to healthcare administrators' perception of ease or difficulty of using EBMgt for healthcare management decision-making.

The TPB uses these three influencing independent variables to predict an individual's behavioral intentions. Behavioral intentions are then used to predict an individual's behavior. By changing these three independent variables, the chance that an individual intends to do a desired action and actually take the action is increased. According to Ajzen [12], the more favorable the attitude and subjective norm with respect to a behavior, the greater the perceived behavioral control; the stronger an individual's intention is to perform the behavior under consideration. Intention refers to an individual's anticipation, plan, and subjective probability toward behavioral performance. The stronger the intention to engage in a behavior, the more likely should be its performance [12].

Ajzen and Fishbein [13] stated that the relationship between intention and actual

performance has been empirically tested in a laboratory setting. As indicated, the relationship between intention and behavior is hard to measure in reality because there are numerous external factors that can affect the relationship. As a result, much of the research found in the literature has focused on behavioral intention rather than an actual behavior because, as Ajzen and Fishbein proposed, finding one's behavioral intention is assumed to predict an actual behavior.

A literature review indicated that the TPB has been applied to numerous disciplines such as public health and nursing [14, 16, 17]. This theory has also been successful in predicting a variety of health behaviors and non-health behaviors, for instance, predicting teachers'intention to use technology, nurses' intention to integrate research evidence into clinical decision-making, and psychologists' intentions to integrate complementary and alternative therapies into their practice [11, 12, 14, 15, 16, 17].

The literature review also indicates that the TPB has not been used in the area of evidence-based management in healthcare. Employing the TPB as a framework to study healthcare administrators' behavioral intention to use EBMgt in healthcare management decision-making may provide important information. As Ajzen [12] suggested, the TPB would be extended and enhanced through its application to more disciplines and populations. In other words, the application of the TPB to EBMgt in healthcare administration could be tested and the outcomes of the study would benefit the development of TPB.

Ajzen [12] stated that the TPB is not an exclusive model to predict intention or behavior, so he suggested that the TPB remain flexible enough to include additional predictors or variables that can capture a significant proportion of the variance in intention. Therefore, in the present study, age, gender, education, and year of management experience were added to the conceptual model as moderators. See Figure 1: Conceptual Model on the next page.

The purpose of the present study was twofold: 1) to apply the Theory of Planned Behavior to identify which were the strongest predictors (e.g. attitude, subjective norm, or perceived behavioral control) in determining behavioral intention to use EBMgt among U.S. healthcare administrators; 2) to explore any effect of demographic characteristics on the intention to use EBMgt. Perhaps the study's results may explain the slow adoption of EBMgt by healthcare administrators and help national health agencies and health management professional organizations better understand healthcare administrators' attitudes and behaviors toward the use of EBMgt in current U.S. healthcare environment.

Methods

Study Design

A cross-sectional, descriptive, and non-experimental study, using a two-stage cluster sampling, was conducted to answer the following research questions.

Research Questions

1) *What are the strongest predictors (attitude, subjective norm, or perceived behavior control) that determines U.S. healthcare administrators' intention to use EBMgt when controlling for age, gender, education, and years of management experience in healthcare settings?*

2) *Does any demographic characteristic (e.g., age, gender, education, or years of management experience in healthcare settings) act as a moderator of the relationships between the independent variable (attitude, subjective norm, or perceived behavior control) and intention to use EBMgt?*

Figure 1: Conceptual Model
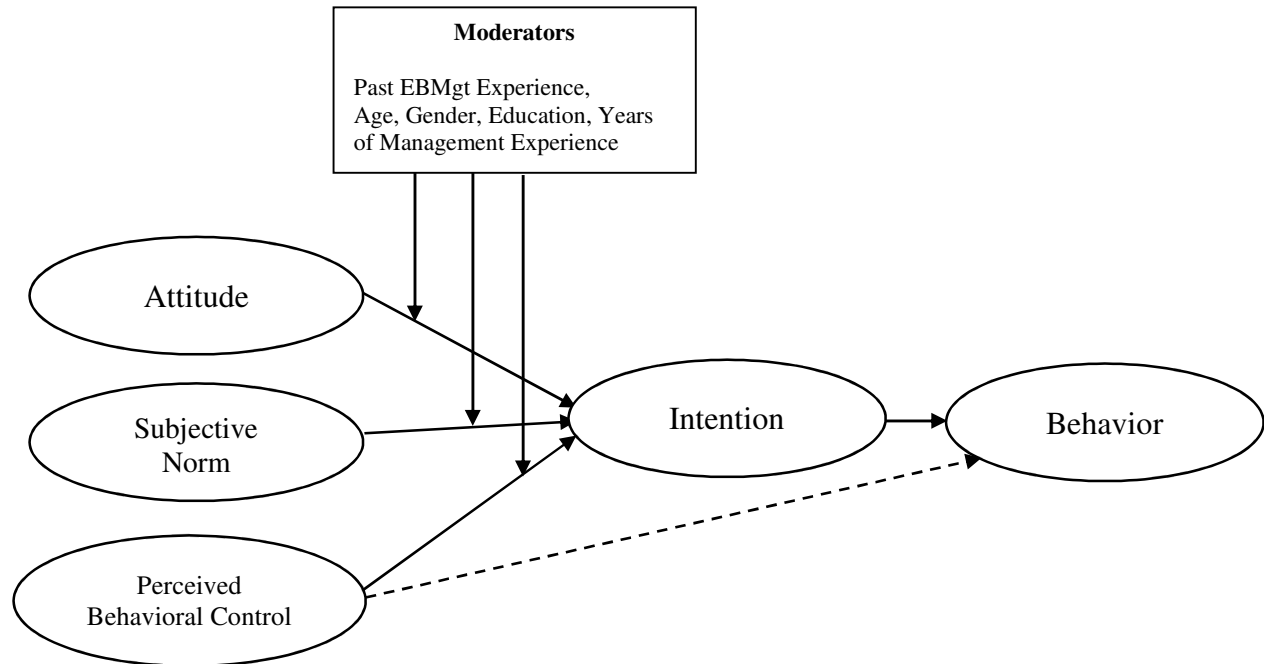
Study Population and Sample

The study population for the research was senior healthcare administrators in the U.S hospitals or multi-health systems. The inclusion criteria were as follows:

1. Participants were either chief executive officers (CEOs) or chief administrative officers (CAOs) who were working at a hospital or multi-healthcare system; and
2. Participants had experience in healthcare administration or healthcare management.

In the present study, the 2014 American Hospital Association (AHA) Guide was used as a primary source for collecting contact information about health system/hospital chief executive officers (CEOs) and chief administrative officers (CAOs). Based on the AHA Guide, a master list of 6,400 hospitals/health systems' CEOs was generated to meet pre-established inclusion criteria. The CEOs or senior administrators in the AHA Guide were listed as contact persons of their hospitals or multi-health systems and represented healthcare organizations. Using a two-stage cluster sampling, 1,210 hospitals/health systems were randomly selected as potential survey participants. They were selected from 14 states out of 50 states across the U.S.

Data Collection

Institutional review board.

Prior to the administration of the survey, a proposal was submitted to Central Michigan University's Institutional Review Board (IRB) to obtain approval for this study.

Survey development.

Qualtrics is secure and reliable web-based software for developing an online survey. It was used for developing an online survey, administering the survey on the Internet, and collecting responses from participants who chose to take the online-mode survey. Additionally, to increase a response rate, mail-mode survey was used for collecting responses if participants did not want to send their responses online.

Procedures.

Hard copies of the survey, with a cover letter and a return envelope, were mailed to 1,210 participants in August 2014. Out of 1,210 potential participants, 500 email addresses were obtained through either online searches or contacting healthcare organizations. An online survey link was distributed to 500 potential participants via email. Prior to the survey, phone calls were made to ensure the accuracy of CEOs' names, job titles, and hospitals' mailing addresses.

The potential participants were provided with a cover letter that stated the purpose of the study. They were informed that their participation was completely voluntary. They could freely withdraw at any time during the survey and to abstain from answering any questions with which they felt uncomfortable. Following the initial mail and online surveys, five online reminders and two mailed postcard reminders were sent to the potential participants who had not completed the survey. All the survey data were kept confidential.

Data Analysis

Following completion of the survey, the data received online were exported directly to IBM® SPSS® 22.0. The mail survey data were entered in Excel and then exported into IBM® SPSS® 22.0. The survey data were screened for missing values, outliers, normality, skewness and kurtosis. Following the data screening, two participants did not engage in their responses to the variables that measured the four variables: attitude, subjective norm, perceived behavioral control, and intention, and therefore were excluded from the analysis.

During the data screening, some missing values were found in some survey items, such as years of management experience, ownership of health organizations. Because the number of missing responses was few, the imputation was not performed. In this study, only responses were analyzed and the missing values were not included for the statistical analysis.

Structural equation modeling.

Structural Equation Modeling (SEM) is a statistical method that takes a confirmatory approach to the analysis of a structural theory bearing on phenomenon [20]. SEM in this study primarily evaluated whether a theoretical model was plausible when compared to observed data. SEM was used to test the relationships between three independent variables - attitude, subjective norm, and perceived behavioral control - and one dependent variable, intention. In using SEM, both measurement model and structural model were established.

The measurement model was tested using factor analysis. First, exploratory factor analysis (EFA) was used for exploring the inter-relationships among the construct variables. Some survey items were removed because they did not measure the variables that were supposed to measure. Maximum likelihood (ML) was used to estimate the model. Following EFA testing, confirmatory factor analysis (CFA) was conducted based on the results of EFA. CFA is effective for confirming the factor structure from EFA, assessing the validity of the measurement model, reliability of factors and determining goodness of fit. Finally, the structural model was employed to test the path coefficient of relationship between the three exogenous constructs/variables (attitude, subjective norm, and perceived behavioral control) and the endogenous construct/variable (intention).

Validity and reliability.
The content validity of the survey instrument was established based on literature reviews and was also assessed by subject matter experts in healthcare administration. A pilot test of the instrument was conducted among 20 healthcare administrators across the nation to validate the measurement items. The instrument was further refined as a result of the pilot test.

Before running the SEM, Cronbach's alpha analysis was employed to determine the internal consistency reliability of the four variables which were also named constructs of the SEM - attitude, subjective norm, perceived behavioral control, and intention. The parameters used for statistical analysis in this study are set at a significance level of (a) 0.05. During the SEM analysis, validity and reliability were also performed to ensure there were no validity and reliability concerns.

Results

General Survey Results
154 CEOs or senior health leaders returned their questionnaires, for a 12.7% response rate. Both online and mail survey distribution methods were utilized in this study. The return results of the two distribution methods were 78 via mail (51%) and 76 via online (49%).

Participant demographic information.
Of the 154 participants who returned questionnaires, 86% (133/154) were chief executive officers, 12% (18/154) were chief administrative officers, and 2% (3/154) were other senior administrators as a contact person for their healthcare organizations. 119 (77%) males and 35 (23%) females participated in this study. As for age, 45% (69/154) of participants were between the ages of 50-59 years; 37% (57/154) were 60 years old or over; and 18% (28/154) were between the ages of 30-49 years.

Concerning education, 7.8% (12/154) had bachelor degree, 81% (124/154) had a master's degree, and 12% (18/154) had a doctoral degree. Regarding years of management experience, 44% (68/154) of the participants reported having more than 30 years of management experience in healthcare settings; 34% (51/154) had 20-29 years of management experience; 22% (33/154) had less than 20 years of management experience.

Internal Consistency Reliability

With regard to reliability, the Cronbach's alpha analysis was conducted for the extracted factors to assess the internal consistency reliability of the Theory of Planned Behavior (TPB) variable. In Table 1, the Cronbach's alpha analysis results indicated that all of the latent constructs met the recommended levels of reliability.

Table 1: Cronbach's Alpha Analysis Results

Factors	Number of Indicators	Coefficient alpha
Attitude Toward EBMgt Use	4	0.89
Subjective Norm	4	0.79
Perceived Behavioral Control	3	0.74
Intention to Use EBMgt	2	0.93

Structural Equation Modeling

Exploratory factor analysis.

As recommended, the KMO test result should be greater than 0.6 and the Bartlett's test should be significant ($p < .05$). The study results showed that the KMO test for sampling adequacy in EFA was 0.88 and Bartlett's test was significant ($p < 0.001$). The communalities for each variable were sufficiently high (all above 0.3), thus indicating the chosen variables were adequately correlated for a factor analysis. Regarding validity, the factors demonstrated sufficient convergent validity, as their loadings were all above the recommended minimum threshold of 0.35. The factors demonstrated sufficient discriminant validity, as the correlation matrix showed no correlation above 0.73, and there were no problematic cross-loadings in pattern matrix. In exploratory factor analysis, cross-loading was tolerable and the goodness-of-fit test was 0.292. This result indicated the reproduced matrix was not significantly different from the observed matrix, which was what we hoped to find in this study.

Confirmatory factor analysis model.

Following EFA testing, attitude (four items), subjective norm (two items), and perceived behavioral control (two items) remained in the EFA. The other items were removed due to either cross-loading or low loading. CFA was used for confirming the factor structure from EFA, assessing the validity of the measurement model, reliability of factors and determining model fit. In CFA, a model fit analysis was performed to determine goodness of fit. Model fit refers to how well the proposed model of the factor structure accounts for the correlations between variables in the dataset (Gaskin, 2014). In this study, all the measures met the recommended thresholds as a guideline from Hu and Bentler (1999).The goodness of fit for the measurement model was sufficient (CMIN/DF (Chi-square/df) = 1.622, CFI = 0.963, GFI = 0.934, AGFI = 0.86, RMSEA = 0.017, and PCLOSE = 1.0).
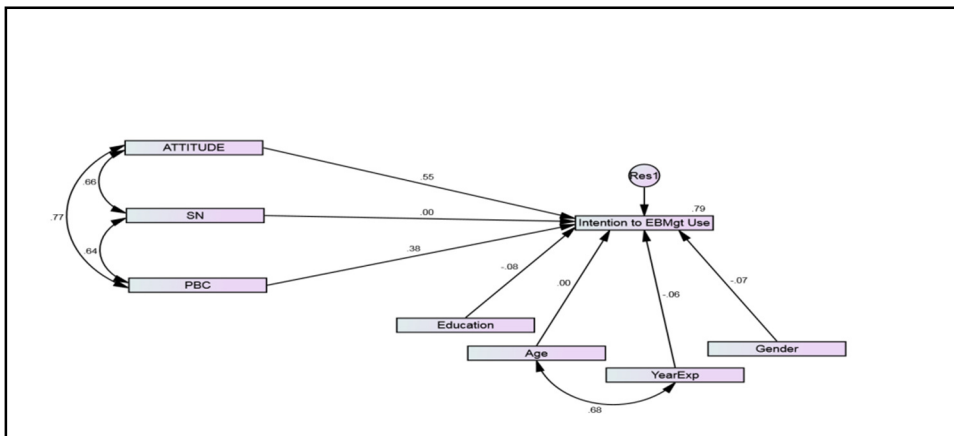
Structural model

The structural model was employed to test the path coefficient of the relationship among the three exogenous constructs (attitude, subjective norm, and perceived behavioral control) and the endogenous construct (intention). Figure 2 showed that the structural model explained 79%

of the total variance in intention to use EBMgt. The results showed that intention to use EBMgt was statistically and significantly predicted by the two TPB constructs: attitude toward the use of EBMgt and perceived behavior control (PBC) ($p < 0.001$). When controlling for the four variables (gender, age, education, and years of management experience) in the structural model, attitude had a significant effect on the intention to use EBMgt ($\beta = .55$), at the significance level of 0.001. The results showed that attitude was the strongest predictor in determining healthcare administrators' intention to use EBMgt ($p < 0.001$).

Perceived behavior control was also a significantly strong predictor that determined the intention to use EBMgt ($\beta = .38$) at the significance level of 0.001. However, subjective norm was not a significant predictive factor in determining healthcare administrators' intention to use EBMgt ($p = 0.963$).

Figure 2: Structural Model

To answer Research Question 2, age, gender, education, and years of management experience in healthcare settings were placed as moderators in the structural model to test if there was an effect on the relationship between the latent variables.

Table 2: Effect of Demographic Characteristics on Latent Constructs (N=152)

Moderators	Relationship between Latent Constructs			Low		High		z-score
				Estimate	P	Estimate	P	
Age	Intention	<--	Attitude	0.318	0.186	0.897	0.000	2.179**
Age	Intention	<--	PBC	1.518	0.000	0.506	0.000	-3.64***
Education	Intention	<--	Attitude	0.049	0.874	0.969	0.000	2.808***
Education	Intention	<--	PBC	1.384	0.000	0.511	0.000	-3.047***

Notes: *** *p*-value < 0.01; ** *p*-value < 0.05; * *p*-value <0.10

Table 2 showed that participant age positively moderated the relationship between attitude and intention to use EBMgt ($p < 0.05$). However, participant age negatively moderated the relationship between perceived behavioral control and intention to use EBMgt ($p < 0.01$). This finding indicated that participants at the age of 50 or older perceived that the use of EBMgt was not easy while younger participants perceived using EBMgt in healthcare management as easy.

Regarding level of education, the higher the level of education participants had, the more positive their attitude was toward the use of EBMgt. Education positively moderated the relationship between attitude and intention to use EBMgt ($p < 0.01$).

Discussion

Many studies have been conducted using the TPB theory to predict the intention to perform certain behaviors in the fields of health education, public health, and nursing. However, few studies have been completed applying the TPB model to healthcare management and healthcare administration. This study expanded the application of the TPB to U.S. healthcare administrators to predict their intention to use EBMgt.

Attitudes

Attitude refers to a person's general feeling of favorability or unfavorability for the concept [12]. Sparks and Shepherd [21] stated that attitude is thought to arise from the combination of a person's belief about the outcome of the behavior and a personal evaluation of that outcome. In general, a person's attitude will be more favorable to a particular behavior if he or she believes that it will lead to a positive outcome or will prevent a negative outcome. For instance, some scholars think that the adoption of EBMgt in healthcare decision-making is critical. They believe that the best practice would produce better outcomes for organization performance and all healthcare stakeholders [4, 22]. They also believe that EBM improves the quality of care and EBMgt improves the quality of management decision-making [23]. Therefore, these scholars strongly supported the acceleration of the adoption of EBMgt in U.S. healthcare organizations. Some of them stated: "It is time for healthcare organizational leaders to join clinicians in using the strongest evidence available to effect change and guide decision-making" [5]. Kovner and Rundall [4] urged healthcare administrators to reconsider the adoption of EBMgt in healthcare management. Kovner and Rundall [4] believed that evidence-based management would improve the competence of decision-makers and their motivation to use more scientific methods when making a decision. Guo et al conducted a needs assessment for developing an EBMgt training program for practicing healthcare administrators [24]. The findings indicated that healthcare administrators had positive attitudes toward the use of EBMgt. With positive attitudes, those participants showed an interest in learning EBMgt principles and process and some attended an EBMgt training program.

If an individual believes a behavior will lead to a negative outcome, he/she will not be in favor of that particular behavior. For instance, some scholars believed that "Given the complexity of decision-making and of the healthcare environment, as well as differences among healthcare organizations, decisions do not necessarily lead to expected outcomes, and results

may not be replicable across organizations" [5]. Kovner and Rundall [4] conducted a study and found that the healthcare managers they interviewed did not use EBMgt in healthcare management, for these health managers had low attitudes toward the use of EBMgt. In the present study, the findings showed that participating senior healthcare administrators had positive attitudes toward the use of EBMgt. Our findings differed from the ones obtained by Kovner and Rundall [4]. This indicates that healthcare systems are changing which have impacted health leaders and mangers' perspectives. Healthcare administrators are influenced by the movement of evidence-based medicine and evidence-based practice. The present study supports Stewart [25], who acknowledged that EBMgt was primarily an attitude of mind. Healthcare administrators' attitudes do matter in regard to evidence-based practice in decision-making. In the present study, attitude was the strongest predictor that influences U.S. healthcare administrators' behavior in practicing EBMgt. The study results were consistent with the findings of studies conducted by Plotnikoff et al. [26] and Guo et al. [24].

Subjective Norm

Subjective norm is perceptions of social pressures to perform or not perform a behavior in question [12]. Perceived social pressure is a combination of the beliefs of significant others and the importance attributed to each of their opinions. In the present study, subjective norm was not a significant predictor of intention to use EBMgt. The research results indicated that healthcare administrators were not influenced much by their peers when choosing methods of their own professional practice in decision-making. They may listen to their peers or colleagues' input on some management issues, but the final decision on determining their personal professional practice would likely be made based on their attitudes and how they perceived the ease of using EBMgt. Therefore, attitude was found to be the strongest predictor in this study population, but not subjective norm. The findings of this study were consistent with some studies in which subjective norm were not found to be a strong predictor of intention [27, 28, 29].

Perceived Behavioral Control

According to Ajzen [12], perceived behavioral control (PBC) is defined as a person's subjective belief about the ease or difficulty of performing a given action. PBC is determined by the total set of accessible controls, such as beliefs about the presence of factors that may facilitate or impede performance of the behavior. These factors influence people's perceptions of their ability to perform that behavior [12]. Therefore, an individual's ability to perform or not perform a given behavior may be predicted by his/her sense of competence, which can be categorized as academic capability, physical appearance, social acceptance, and so forth. This indicates that some behavior is not under an individual's total control. For example, healthcare administrators perceived some barriers to the practice of EBMgt as lack of knowledge and skills in searching information and appraising the quality of research evidence, lack of access to EBMgt resources, and lack of strong evidence due to the research and practice gap. These barriers may negatively influence healthcare administrators' adoption of EBMgt in healthcare management. In the present study, perceived behavioral control was found to be a stronger predictor of intention to use EBMgt among health leaders. The results of the present study were consistent with the findings of other researchers [26, 29].

In summary, attitudes toward the use of EBMgt and perceived behavioral control were significantly predictive of an intention to use EBMgt among senior healthcare administrators, but subjective norm was not. The results confirm the applicability of the TPB to the profession of healthcare administration and management.

Implications of the Study

The results of the present study have significant implications for healthcare management practice in the U.S. First of all, the Theory of Planned Behavior has not been used as a theoretical framework to predict healthcare administrators' intentional behaviors for using EBMgt. With the theory's emphasis on personal beliefs, attitudes, and perceived social expectations, the TPB provides a theory model to predict healthcare administrators' intentional behaviors of using EBMgt. Personal beliefs and attitudes were identified as the strongest predictors in the intention to use EBMgt in healthcare management. Little research on the use of TPB to EBMgt in decision-making has been published. Our study findings contribute to the scholarly literature in the U.S. healthcare management.

The second implication of our study is that the attitudes and perceived behavioral control explained a slow adoption of EBMgt among U.S. healthcare administrators for their management decision-making. This finding might help national health agencies and professional organizations better understand healthcare administrators' perceptions and behavior toward the use of EBMgt in decision-making. The study findings provide useful information for health leaders and policy makers to make informed decisions on the best professional practice for U.S. healthcare administrators in the future.

Third, the outcomes of the present study may help researchers explore possible interventions that change healthcare administrator attitudes and behaviors toward the use of EBMgt. For example, EBMgt educational programs may help practicing healthcare administrators gain EBMgt knowledge and skills and reduce barriers to the adoption of EBMgt. The knowledge and skills obtained through education and training may help healthcare administrator make better decisions and improve the overall performance of their health care organizations and quality of care.

Limitations

This study presented some limitations. The first limitation was that the results could not be generalized to the whole study population of healthcare administrators in the U.S. due to the small sample size. The second limitation was that cross-sectional study does not establish causality.

Future Research

Further study is needed to explore how to promote the intention to use EBMgt through enhancing attitudes and perceived behavioral control among senior healthcare administrators. To increase healthcare administrators' perception of easy use of EBMgt, EBMgt training programs

may be developed to increase healthcare administrators' EBMgt knowledge and skills, which in turn, results in positive behavioral changes.

Conclusions

The Theory of Planned Behavior provided a theoretical framework to predict the intention to use EBMgt among senior health leaders in the U.S. health care organizations. The study results indicated that intention to use EBMgt was significantly predicted by attitudes toward the use of EBMgt and perceived behavior control. It is suggested that the intention would likely lead to the action of using EBMgt practice among healthcare administrators for their management decision-making. The EBMgt movement should focus on promoting positive attitudes, perceived behavioral control, and a culture that embraces EBMgt among healthcare administrators in U.S. health care organizations.

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Acknowledgement

Figure 1: Logic Model of the EBMgt Training Program

EBMgt Training Program Action - Logic Model

Inputs Resources	Outputs Activities	Outcomes - Impacts Short-Term Long-Term

Situation

Healthcare administrators need EBMgt training due to lack of EBMgt knowledge and skills

What We Invest	What We Do	Whom We Reach	Short-Term Results	Long-Term Results
1. EBMgt Teaching Faculty 2. Health Information specialist 3. Funding 4. Teaching facilities and library resources 5. Time 6. Technology	1. Develop an EBMgt training program 2. Conduct two Training workshops 3. Perform pre- and post-assessments 4. Provide consultations 5. Develop an EBMgt Website 6. Provide participants with 3 CE credits	1. Healthcare administra-tors in hospitals and multi-health systems	**Increase** 1. EBMgt knowledge 2. EBMgt searching skills 3. Confidence using EBMgt resources 4. Confidence adopting EBMgt 5. EBMgt implemen-tation	1. More hospital administra-tors adopt EBMgt 2. Improve decision-making 3. Less healthcare cost to individuals & community 4. Improved quality of patient care & well-being

Assumptions

External Factors

Evaluations
Focus on Collecting Data - Analyzing Data - Interpreting Results - Report