NEUROLOGISTS’ DISCUSSION INTENTIONS REGARDING A MEDICAL INNOVATION: AN EXAMINATION OF PSYCHOLOGICAL DETERMINANTS AND PERSONAL NORMATIVE INFLUENCES

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Abstract
Progression of Parkinson’s disease (PD) and use of the mainstay drugs to treat the
disease leads to severe movement disorders with accompanying disability in a portion
of PD patients. Deep brain stimulation (DBS) surgery is an FDA-approved treatment
innovation for disabled PD patients, improving mobility and quality-of-life over and
above the effects found using mainstay drug therapy. This research used the theory of
reasoned action and the theory of planned behavior to examine antecedents to
neurologists initiating a discussion of DBS surgery with a hypothetical PD patient. A
national, cross-sectional mail survey (with online option) was conducted among a
random sample of practicing U.S. neurologists. Participants totaled 86, for a response
rate of 13.9%. Hierarchical linear regression showed that adding perceived behavioral
control (PBC) to attitude and subjective norm resulted in significant $ΔR^2 = .22$ in the
prediction of intention. Of the two personal normative influences proposed as
extensions to the TPB, adding moral norm resulted in a significant $ΔR^2 = .02$, whereas
role identity was non-significant. Mediation analyses showed that attitude partially
mediated the effects of beliefs about the target, DBS surgery. PBC fully mediated
perceived knowledge, whereas treatment benefit certainty was mediated partially by
PBC. Implications for communication campaigns are discussed.
Table of Contents

LIST OF TABLES ........................................................................................................... v
CHAPTER ONE: INTRODUCTION .............................................................................. 1
  Deep Brain Stimulation Surgery as a Parkinson’s Disease Treatment Innovation ..... 1
  Importance to Health Communication Research....................................................... 5
  Purpose of the Research ............................................................................................ 6
  Organization of Dissertation....................................................................................... 7
CHAPTER TWO: LITERATURE REVIEW .................................................................. 8
  Predicting Intentions and Behavior ............................................................................ 8
  Behaviors Studied...................................................................................................... 12
  Physician-initiated Treatment Discussion as (Goal-directed) Behavior ..................... 14
  Extension of the TRA and TPB to the Medical Domain............................................. 19
  Personal Normative Influences.................................................................................. 26
  Antecedents to Attitude and Perceived Behavioral Control....................................... 31
  Summary of Hypotheses............................................................................................ 34
CHAPTER THREE: METHODS................................................................................... 35
  Research Overview.................................................................................................... 35
  Survey Population and Sample ................................................................................ 37
    Survey Population and Sampling Frame ................................................................. 37
    Sampling Frame Coverage ....................................................................................... 39
    Sampling Procedure................................................................................................ 40
  Field Procedures and Time Line ................................................................................ 41
  Elicitation Survey ..................................................................................................... 43
    Questionnaire Development .................................................................................... 43
    Results ..................................................................................................................... 45
  Main Survey Instrument ........................................................................................... 48
    Instrument Layout .................................................................................................. 48
    Clinical Scenario .................................................................................................... 49
    Major Variables ...................................................................................................... 50
    Additional Variables ............................................................................................... 56
  Response Rate Factors.............................................................................................. 57
    Item Non-response ................................................................................................. 57
    Response Rate ....................................................................................................... 58
    Potential Effect of Unit Non-response .................................................................. 60
  Sample Size and Power Estimation .......................................................................... 61
  Data Handling and Analyses ..................................................................................... 62
CHAPTER FOUR: RESULTS....................................................................................... 67
  Sample Characteristics ............................................................................................. 67
  Population Comparison ............................................................................................ 70
  Univariate Statistics .................................................................................................. 72
  Bivariate Correlations .............................................................................................. 74
  Hypotheses ................................................................................................................ 75
    Evidence for Hypothesis 1..................................................................................... 77
    Evidence for Hypothesis 2...................................................................................... 78
LIST OF TABLES

Table 1  Survey Mailings and Dates Mailed .................................................................42
Table 2  Outcome Beliefs of Discussing DBS Surgery .................................................46
Table 3  Beliefs about DBS Surgery ..............................................................................47
Table 4  Rotated Factor Solution for Outcome of DBS Surgery Beliefs .......................54
Table 5  Rotated Factor Solution for Benefit Certainty and Perceived Knowledge ......56
Table 6  Sample Final Dispositions and Response Rate Codes .....................................59
Table 7  Sample Characteristics .....................................................................................68
Table 8  Comparison of U.S. Neurologists by Gender ...................................................71
Table 9  Comparison of U.S. Neurologists by Practice Setting .....................................72
Table 10 Descriptive Statistics and Pearson’s Correlation or Cronbach’s Alpha for
        Major Variables ....................................................................................................73
Table 11 Major Variables’ Bivariate Correlations ..........................................................74
Table 12 Results of a Hierarchical Regression of Discussion of DBS Surgery
        Intentions on TRA/TPB Determinants and Personal Normative Factors......78
Table 13 Bivariate Correlations among Behavioral Intention, Attitude, Positive and
        Negative Beliefs about DBS Surgery .....................................................................84
Table 14 Linear Regressions Testing Whether Attitude Mediates the Effects of
        Positive Beliefs about the Target on Behavioral Intention ...............................85
Table 15 Bivariate Correlations among Behavioral Intention, Attitude, Benefit
        Certainty and Perceived Knowledge about DBS Surgery ...............................87
Table 16 Linear Regressions Testing Whether PBC Mediates the Effects of Benefit
        Certainty about DBS Surgery on Behavioral Intention .....................................88
Table 17 Linear Regressions Testing Whether PBC Mediates the Effects of Perceived
        Knowledge about DBS Surgery on Behavioral Intention ...............................89
Table 18 Summary of Hypotheses, Results, and Evidence .........................................91
CHAPTER ONE: INTRODUCTION

Deep Brain Stimulation Surgery as a Parkinson’s Disease Treatment Innovation

Parkinson’s disease (PD) is a chronic and progressive neurodegenerative disorder. There is no cure for PD and no treatment available to slow the progress of the disease (Moro & Lang, 2006). For decades, the main therapy for management of patients’ PD symptoms has been pharmacological treatment (Simuni & Hurtig, 2008). However, over time a portion of patients develop disabling movement disorders as a consequence of both the disease and medications to treat the disease, leading to a significantly diminished quality-of-life (Rahman, Griffin, Quinn, & Jahanshahi, 2008; Volkmann, 2007).

Parkinson’s disease disproportionately affects the elderly. As the age distribution of our population shifts upward, we can anticipate a greater proportion of our elderly living with such disorders compromising their quality-of-life. Over the next decades, estimates show the proportion of the U.S. population age 65 years old or more will increase from 12.4% in 2000 to 20.6% in 2050 (He, Sengupta, Velkoff, & DeBarros, 2005). Our health care system increasingly will be challenged not only to prevent the occurrence of disorders and diseases in this growing portion of our population, but also to alleviate diminished quality-of-life for those with PD and other chronic conditions.

A treatment innovation for patients with advanced PD, deep brain stimulation (DBS) surgery, provides a context in which to study individuals’ decision making in the early stages of an innovations’ diffusion. Deep brain stimulation surgery is an
innovative treatment for advanced PD movement disorders. It was approved by the U.S. Food and Drug Administration (FDA) eight years ago (U.S.F.D.A., 2002). The surgery involves the implantation of a stimulating device within the brain, which is programmed to emit an optimal constant electrical stimulation to a key brain structure. Deep brain stimulation treatment can alleviate some of the disabling movement disorders from PD and, in doing so, also can provide for a reduction in medication need (Malhado-Chang, Alterman, & Tagliati, 2008). These facts lead to the idea that DBS surgery has a potential relative advantage over continuing pharmacological treatment alternatives for patients in an advanced stage of PD, due to the reduction of physical symptoms and medication load.

Medical literature reports that DBS surgery has become a recommended treatment alternative for those patients suffering disabling PD movement problems (Moro & Lang, 2006; Volkmann, 2007; Weaver et al., 2009). In 2006, the American Academy of Neurology (AAN) updated its practice parameters for treating PD. The AAN review panel examined the clinical evidence for the use of DBS surgery as a treatment for PD movement disorders and, based on clinical evidence, added DBS surgery as a recommended procedure for patients with advanced PD (Pahwa et al., 2006).

Currently, many private insurers provide coverage for the procedure (Marjama-Lyons & Okun, 2005). Medicare and Medicaid issued their approvals for coverage in 2003. These developments have curtailed some financial restraints over the election of DBS surgery as a treatment for advanced PD.
However, estimates of the number of DBS surgical procedures performed suggest that DBS surgery has not been adopted widely as a preferred treatment for advanced PD movement disorders. As of 2006, 35,000 patients worldwide are reported as having received DBS surgery for PD (Song, 2006). Yet in the U.S. alone, estimates for the year 2005 show the prevalence of those suffering with PD at approximately 340,000 persons (Dorsey et al., 2007). It is estimated that approximately ten percent of all PD patients are potential candidates for DBS surgical treatment (AAN, nd). This would suggest that in the U.S. fewer people are having DBS surgery to treat their PD motor complications than might be expected1.

Before patients undergo DBS surgery, potential surgical candidates receive an extensive evaluation by a multi-specialty team of physicians. Neurologists are key participants in the referral process for DBS surgery evaluation, although, referrals may come from neurologists, non-specialist physicians or even patient self-referral. Neurologists would most likely be the primary referring physician, as they would likely be taking care of disabled patients in the advanced stages of PD. The role of neurologists in the medical consultation with PD patients would involve physician-patient discussions leading to exchange of information about possible treatments, including DBS surgery, and joint decision making about the adoption of potential treatments. Given neurologists’ role as a primary source of information about DBS surgery, the present research seeks to understand the influences that affect neurologists in their intentions to discuss DBS surgery with PD patients.

1 Currently, only one company, Medtronic, has received FDA approval to sell a DBS device for treatment of advanced PD movement disorders. This fact makes location of secondary sources regarding number of DBS devices implanted difficult to obtain.
The main goal of this research seeks to shed light on antecedents that can provide insight to processes underlying neurologists’ decision making for adoption of a medical innovation. The nexus between internal processing and external action taking in an individual’s innovation decision process has been identified by Rogers (2003) as a key moment when greater certainty about an innovation leads to motivation for trial, which subsequently leads to confirmed adoption, or rejection, of an innovation. Motivation and resolve to perform a behavior have also been recognized as underlying behavioral intention (Eagly & Chaiken, 1993) in the Theory of Reasoned Action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and the Theory of Planned Behavior (Ajzen, 1985, 1991).

Meta-analyses have shown the usefulness of the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) in predicting a wide variety of people’s intentions and behaviors, such as smoking cessation, use of contraceptives, and voting (Van den Putte, 1993); addictive behavior, eating control, and exercise behavior (Godin & Kok, 1996), as well as intentions and behaviors of physicians such as adherence to medical guidelines, prescribing medications, and patient referrals (Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008). According to the two models, behavioral intention is predicted by people’s attitude toward the behavior, perceived social norms about performing the behavior, and the perceived behavioral control they have over performing the behavior (as added by Ajzen, 1985, 1991 in the TPB). In turn, behavioral intention is the best predictor of the behavior under study. The present research uses these psychological theories of social behavior to examine neurologists’
beliefs and the underlying antecedents to neurologists’ intentions to discuss DBS surgery with their disabled PD patients.

Importance to Health Communication Research

Delivery of quality healthcare is an overarching concern of society today. One major aspect in the current consideration of quality of healthcare delivery is communication between physician and patients, perhaps particularly so among sufferers of chronic, disabling conditions such as PD. Physician-patient interactions during medical consultations have been shown to affect “patients’ behavior and well-being, for example satisfaction with care, adherence to treatment, recall and understanding of medical information, coping with the disease, quality of life, and state of health” (Ong et al, 1995, p. 903). Research in health communication (Rimal, 2001) has focused groundwork attention on the need to understand physician-patient interactions during the medical consultation.

Further research into physician-patient interactions can lead to new efforts to promote enhanced physician-patient communication, such as interventional campaigns encouraging facilitation of physicians’ interchanges with their patients. Health communication intervention campaigns are best able to target interventions to their intended audiences by conducting formative research on the intended audience. Research at the formative stage of a communication campaign allows the designer of a health communication message to base the content of messages on knowledge about behavioral beliefs gained from the same source as will be the target audience of the intervention. Formative research is best guided from theoretical approaches to the study
of human behavioral beliefs, motivations, intentions, and behavior. The TRA and the TPB provide well-developed theoretical approaches to studying persons’ intentions and behaviors.

Understanding these beliefs and motivations that underlie a neurologist’s discussing a treatment option with a patient would allow health communication campaign efforts to be targeted at this audience and better focus the content of communication campaigns at the topics most relevant and, therefore, most likely to affect the intentions and behavior of neurologists. Practically speaking, communication campaigns to increase neurologists’ discussion intentions with PD patients will benefit as a result of this research.

**Purpose of the Research**

This study examines the ability of psychological variables to predict physicians’ intentions to discuss a medical innovation with a patient. Specifically, the intentions of neurologists to discuss DBS surgery with a disabled PD patient are examined using the TRA and the TPB models’ variables, attitude toward the behavior, subjective norm, and perceived behavioral control. Furthermore, this study is the first to examine two personal normative variables related to the self-concept—moral norm and role identity—in the same study for the enhancements they may provide to the prediction of neurologists’ discussion intentions. A national mail survey of a random sample of U.S.

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1 This dissertation research was a part of a related project, involving a three-member team of University of Minnesota investigators, which included Aviva Abosch, M.D., Ph.D., Director of Stereotactic and Functional Neurosurgery in the Department of Neurosurgery, Paul Tuite, M.D., Director of Movement Disorders Center in the Department of Neurology, and the author. Dr. Abosch deserves the credit for proposing the original research question: What barriers exist to neurologists’ adoption of DBS surgery for their disabled PD patients? However, from beginning to end, the hypotheses generation, the design, conduct, analyses, and writing of this dissertation is solely the work of the author.
neurologists is used to gather the data that tests the study’s hypotheses, which will be introduced in the following chapter.

**Organization of Dissertation**

This study is presented in five chapters. Chapter Two reviews the TRA and the TPB as models with which to predict social intentions and behaviors, including the two models’ relevance to the prediction of physicians’ behaviors. Personal normative factors to be examined as extensions to the TPB—moral norm and role identity—are explored. This chapter also presents the rationale for the examination of physicians’ discussion intentions as the dependent variable, as well as the rationale for the development of the hypotheses for this research. Chapter Three provides an explanation of the research methods used to examine the hypotheses, including a discussion of the sampling methods and the development and design of the national mail survey used to collect the data. Methods of analysis to be used for the investigation of each hypothesis are reviewed. Chapter Four presents the results of the data collection. First, descriptive statistics are provided about the sample of neurologists surveyed for this research. Then, univariate and bivariate statistics are used to explore the study’s main variables. Finally, the data analyses results for all hypotheses are presented. Chapter Five discusses the results of this research, directions for further research, limitations of the research, and implications for mass communication campaigns.
CHAPTER TWO: LITERATURE REVIEW

Predicting Intentions and Behavior

Two related psychological models of social behavior provide parsimonious bases for predicting behavioral intention and behavior, the TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and the TPB (Ajzen, 1985, 1991). The first of these, the TRA proposes that the additive effects of two determinants—attitude toward performing a behavior (attitude) and the influence of expected social norms (subjective norms) about performing a behavior—are the proximate predictors of behavioral intention. According to the TRA, behavioral intention then is the proximate predictor of behavior. Behavioral intention recognizes the presence of a psychological step between attitude toward the behavior and behavior, capturing the motivation and resolve a person has to perform a behavior (Eagly & Chaiken, 1993).

The overall attitude toward an object may be described as a person’s tendency to evaluate the attitude object with favor or disfavor (Eagly & Chaiken, 1993). By extension, overall attitude toward performing a behavior is a person’s tendency to evaluate performing a behavior as favorable or unfavorable. The overall subjective norm regarding performing a behavior represents the influence that important others’ expectations about performance of this behavior might have on a person.

The TRA proposes that overall attitude and subjective norm are each determined by their respective underlying beliefs. In particular, attitude is determined by beliefs about the advantages or disadvantages of performing a behavior. Subjective norm is a function of perceived beliefs that significant others may approve or disapprove of your
performing the behavior. These underlying beliefs are those most salient, or accessible\(^3\), in memory about the expected outcomes of behavior (outcome beliefs) and about the expected normative influence of important others (important referents) in regard to the behavior, respectively (Ajzen & Fishbein, 2000).

According to the TRA, an expectancy-value multiplicative formula offers the best determination of overall attitude toward the behavior and overall subjective norm from their respective underlying beliefs. That is, overall attitude toward the behavior \( (At_B) \) is the sum of the scores of the salient outcome beliefs \( (b) \) multiplied by the outcome beliefs’ evaluation \( (be) \), i.e. \( At_B = \sum (b \times be) \). Similarly, overall subjective norm \( (SN) \) is the sum of salient normative beliefs \( (nb) \) multiplied by a person's motivation to comply \( (mc) \) with those beliefs, i.e., \( SN = \sum (nb \times mc) \).

However, some researchers have suggested that the expectancy-value formula may not provide the best measure within the TRA of underlying beliefs (Gagne & Godin, 2000; Van den Putte, 1993). Gagne and Godin found that in predicting health-related behaviors the behavioral and normative belief measures alone without the evaluative component, i.e., \( At_B = \sum b \), correlated as highly with attitude as did the expectancy-value multiplicative score. Armitage, Conner, Loach, and Willetts (1999) found in predicting alcohol and cannabis use among students that hierarchical regressions entering beliefs, evaluations, and the multiplicative terms in three separate blocks more often than not found that the multiplicative terms did not add significantly to the variance explained in intentions.

\(^3\) Termed “salient beliefs” in early publications, the authors also have used the term “accessible beliefs” (Ajzen & Fishbein, 2000). Both the terms, salient and accessible, capture the concept’s basis in memory. Regardless the term used, notably the concept should not be taken to mean the importance of beliefs. Predominant usage seems to remain with salient beliefs.
Ajzen (1985, 1991) introduced the second model of behavior, the TPB, as an expansion of the TRA, taking into consideration a person’s perceived control over performing the behavior. The TPB adds perceived behavioral control (PBC) to the TRA’s two main determinants, attitude and subjective norm, to comprise three proximal determinants that form an additive model predicting behavioral intention. Ajzen describes PBC as distinct from actual control. Perceived behavioral control represents the amount of perceived control a person estimates having over performing the behavior, for example, in particular skills, knowledge, and abilities, and the perceived control a person estimates having over anticipated conditions that could affect the performance of a behavior.

The TPB extends the prediction of behavioral intention and behavior to contexts in which there may not be complete volitional control over one’s actions. For example, one could have the perception of control but have an inadequate assessment of one’s actual ability necessary to complete the task or could be unaware of unexpected impediments to the performance of a behavior. In this case, PBC functions as an additive determinant, along with attitude and subjective norm, in determining the strength of behavioral intention to perform the behavior.

To the extent that a person’s perceptions of control over performing a behavior represent a departure from one’s actual abilities and performance constraints at the time of behavioral performance, PBC is proposed to have a direct additive effect, along with behavioral intention, in predicting behavior. That is, with actual control less than complete, PBC exhibits a direct influence on the performance of behavior, along with the influence of behavioral intention. The more PBC is a reflection of actual control, the
more the effect of PBC on behavior diminishes. Figure 1 presents a diagram showing the direct influence of PBC on behavioral intention, along with a direct influence on behaviors in the circumstance of lack of complete behavioral control.

![Diagram of Theory of Planned Behavior](image)

Figure 1. Theory of Planned Behavior (Ajzen, 1991)

Perceived behavioral control is closely related to one’s perceived self-efficacy in performing a behavior. Self-efficacy (Bandura, 1977) is the “conviction that one can successfully execute the behavior” in an attempt to achieve the desired results (p. 193). Ajzen (1991) has stated that Bandura and his colleagues’ work on self-efficacy shows that the confidence in one’s ability to perform a behavior is related closely to the performance of a behavior (p. 184). The similarity between self-efficacy and perceived behavioral control stems from their joint focus on the perceived ability to perform a behavior, regardless the actual outcome of performing the behavior (Ajzen, 2002). Two
factors appear to underlie PBC, and it is advisable to include both in a measure of PBC (Ajzen, 2002; Ajzen & Fishbein, 2005). The first factor is related to self-efficacy and captures the confidence one has in performing the behavior, and the second factor captures the sense that control over the behavior is up to oneself.

Both the TRA and TPB expect that all other variables are external to the model and are mediated by the model’s main determinants. For example, according to both models, attitude is one of the main determinants of behavioral intention. Beliefs about the outcome of the behavior (and the evaluation of those beliefs) compose the bases of one’s attitude. The same is true regarding the other model determinants, subjective norm and PBC, and the beliefs underlying them. However, the influence of all other factors on behavioral intention, e.g., past behavior, personality variables, or beliefs about the behavioral target of discussion---in the present case beliefs about DBS surgery---would be mediated by one of the three main determinants. Both the TRA and the TPB models are respected for their parsimony in design and their capability to predict social behavior.

Behaviors Studied

Meta-analyses support the conclusion that the TRA and TPB models’ both account for a significant proportion of the variance in predicting many types of social behavior; although, the proportion of variance accounted for by the model does vary by behavior (Ajzen, 1991; Armitage & Conner, 2001; Godin & Kok, 1996; Sutton, 1998; Van den Putte, 1993). In a meta-analysis including behaviors such as smoking cessation, use of contraceptives, and voting, van den Putte found that attitude toward the
behavior and subjective norm, the TRA determinants, explained on average 46% of the variance in behavioral intention while intention accounted for an average 38% of the variance in behavior. Focusing on health behaviors, e.g., addictive behavior, use of seat-belt restraints, eating control and exercising behaviors, Godin and Kok reported a somewhat similar pattern for the TPB, with average $R^2$’s for behavioral intention of .41 and for behavior of .34. Furthermore, the authors found that after adding PBC to the TRA model, the average $R^2$’s increased .13 for behavioral intention and .12 for behavior, providing evidence for the usefulness of PBC as an additional determinant in terms of health-focused behavioral intentions and behaviors.

The meta-analysis of Armitage and Conner (2001) reported somewhat lower amounts of variance explained by the TPB for behavior than those reported by Godin and Kok (1996). Although, $R^2$ averaged .39 for the prediction of behavioral intentions by attitude toward the behavior, subjective norm, and PBC, $R^2$ was .27 for the prediction of behavior from behavioral intention and PBC. Armitage and Conner also found that on average PBC contributed 6% and 2% additional variance beyond the TRA variables for the prediction of behavioral intention and behavior, respectively. These amounts were less than the average contributions to the proportions of variance accounted for in the studies reviewed by Godin and Kok.

Is there evidence to suggest that the TRA and TPB models provide adequate bases on which to predict physicians’ behavior involving patient care? In addition to behaviors with outcomes primarily affecting the self, e.g., quitting smoking, exercising, health-protective behaviors, the TRA and TPB have successfully modeled behavioral intentions in contexts where important consequences of the behavior (negative or
positive) potentially affect others as well as the self. Studies of commission of driving violations (Conner, Smith, & McMillan, 2003; Parker, Manstead, & Stradling, 1995) and taking pro-environmental actions (Harland, Staats, & Wilke, 1999) have found that the TPB model’s constructs accounted for 30% to 50% of the variance in behavioral intention. These studies suggest that the TPB can be useful in examining behaviors in which consequences to others as well as to the self are a reasonable assumption.

**Physician-initiated Treatment Discussion as (Goal-directed) Behavior**

Behavioral intention captures a person’s psychological movement beyond the cognitive processing of attitude, subjective norm, and perceived behavioral control to the decision point where a course of action is considered and the motivation to take action has crystallized. In the case of a physician considering taking an action in a patient care setting, behavioral intention can be seen as reflecting a physician’s motivated action toward a goal of optimizing a patient’s health status. The outcome of a physician’s action may lead directly or indirectly to a patient reaching a targeted state of patient health. For example, giving a patient a shot or setting a fracture is an action performed by the physician directly on the patient. These are actions taken directly by the physician on a patient to maintain or improve health status. Examples of indirect actions might be prescribing a medication or referring a patient to a specialist. These indirect actions lead to patient health benefits that in the first case are accomplished by the patient filling and taking the prescribed medication and in the second case, referral to a specialist, the health benefit then may be directly, or again indirectly, enacted by the subsequent actions of the consulting specialist. Similarly, the conversational act of
discussing a treatment option with a patient can be viewed as an indirect action taken to move toward a goal of optimizing a patient’s health status. The intention here is not to categorize physicians’ behaviors on a scale of directly or indirectly health beneficial to the patient, but to emphasize that the simple act of discussing a treatment option with a patient can be viewed as a goal-directed behavior for a physician; it is, of itself, an important behavior to examine.

Physician and patient communication in the course of a medical encounter is a unique form of inter-personal behavior. It is an unusual social context between persons of differing power about issues of importance requiring close cooperation (Ong, de Haes, Hoos, & Lammes, 1995); physician and patient communication can be seen as having three purposes 1) information exchange, 2) creating a good inter-personal relationship, and 3) medical decision-making. Additionally, patient-centered communication undoubtedly plays a role in neurologists’ discussions with their patients having PD. Physicians’ practicing patient-centered care have as a goal providing care that meets “patients’ values, needs and preferences,” allowing for “patients to provide input and participate actively in decisions regarding their health and healthcare” (Epstein et al., 2005, p. 1516).

Research focusing on another type of inter-personal health behavior provides an example emphasizing that differences in behavioral antecedents can be found between a behavior that is an intermediary step to an ultimate goal and a behavior that directly achieves the ultimate goal. In examining two related safe sex behaviors—bringing up condom use (BCU), that is discussing the use of a condom with one’s partner, and actual condom use (ACU), Yzer, Siero, and Buunk (2001) found that different models
incorporating TPB constructs and a measure of past behavior (or habit) predicted the outcomes of the two behaviors. In BCU, social norms played an important role in predicting intentions, with self-efficacy having no significant effect. Habit and intentions played an equal role in predicting BCU behavior. Whereas for ACU intentions, self-efficacy played an important role and social norms had no significant role. Furthermore, for ACU behavior, habit played a more important role than intentions. The authors, citing the work of Chan and Fishbein (1993), suggest that in some contexts discussion may be a necessary prior behavior to achieving a goal, “For women, condom use is a goal and bringing up condom use is the behaviour to attain that goal” (p.411).

Gollwitzer (1993) presents a model of goal achievement that distinguishes between goal intentions and implementation intentions, which helps explain the benefit of taking intermediate actions, such as a physician discussing a treatment option with a patient, in order to reach a more temporally distant goal, overall patient well-being. Goal intentions are the motivational act of identifying and setting overall goals; whereas, implementation intentions are the behaviors planned to achieve the eventual goals.

According to Gollwitzer’s model, implementation intentions are plans for action that will be undertaken in response to situational cues. Development of implementation intentions aids action taking through the involvement of situational cues that when encountered facilitate an automatic response to a cue (Parks-Stamm, Gollwitzer, & Oettingen, 2007). The formation of implementation intentions has been shown to improve initiation of goal-directed action and goal completion (Gollwitzer &
Brandstatter, 1997).

The study of physicians’ development of clinical expertise in treating illnesses gives an indication that the formation of goal and implementation intentions could be related to the development of physicians’ expertise. In developing clinical expertise, physicians are proposed to build not only a large body of knowledge but organizational structures in memory that facilitate the use of that knowledge in clinical settings. One of the organizing features suggested to explain the formation of clinical expertise among doctors is the development of “illness scripts” (e.g., Henk & Remy, 2007; Schmidt & Boshuizen, 1993). Illness scripts form over time based on a physician’s clinical experience caring for patients with similar illnesses. The illness script becomes accessible in memory when encountering cues in a patient’s illness that bear similarities to previously encountered experiences treating the illness. As a patient’s illness progresses, presentations of symptoms act as cues that call to mind similar situations (Schmidt & Boshuizen, 1993, p. 208).

Although illness scripts are conceptualized as organizational features of knowledge storage in the development of clinical expertise, they seem to provide a similar mechanism as implementation intentions to enacting goal attainment, that is, both add an aspect of automaticity to action taking based on goals. Both are proposed to result in facilitated memory activation, which serves to enhance the likelihood of action taking in response to situational cues. Neither process is rooted in conscious consideration at the time of activation but rather in the automaticity of response to situational cues.

It is the case that the TRA and the TPB regard social behaviors as reasoned. Yet,
social behaviors are not necessarily consequent to effortful cognitive processing of beliefs regarding the behavior (Ajzen & Fishbein, 2000). Social behaviors can be reasoned in the sense that a person takes account of the outcome beliefs, normative beliefs, and control beliefs in advance of the behavior. However, the beliefs are “assumed to be available automatically as performance of the behavior is being considered” (p. 14), not necessarily actively processed at the time of behavior. Therefore, an increase in belief accessibility as a consequence of automaticity would be in accord with the processing mechanisms proposed to support both the TRA and the TPB.

The diffusion of innovation model suggests that uncertainty about the outcome of adopting an innovation is a major barrier to forming a positive evaluation of an innovation and moving beyond the decisional stage to the implementation stage of trying the innovation (Rogers, 2003). The action of a physician discussing an innovative treatment option with a patient could be considered an external expression (observable evidence) of a physician’s transition from the decision stage in the individual innovation decision process of Rogers to the active implementation, or trial, stage. The physician who reaches this stage has become more certain that the innovation can perform to meet the goal of striving toward optimal patient health. This certainty in the innovation would lead outwardly to the sharing of information with the patient about the treatment.

It should be stated that although a physician’s sharing of information about a medical innovation likely would involve a greater certainty about the innovation’s benefits, a physician’s discussion of the innovation would include both benefits and risks attendant with the innovation. This emphasizes the uniqueness of physician-patient
discussion where, given the role of expert and health advocate that the physician plays, the physician’s role would be as a guide to the conversation that ensues. That is, the discussion would be guided to fully explore for the patient the potential advantages and disadvantages of the medical innovation.

In summary, optimizing a patient’s health, whether overall or in response to a certain illness is a goal for physicians. Physicians’ behaviors can either take direct action toward that goal or take indirect action that initiates movement closer to that goal, action that initiates movement along the path to optimizing a patient’s health. Once a degree of confidence in a treatment option is achieved, it becomes likely that the physician is motivated to include the treatment option in discussions with a patient. The simple act of discussing a treatment option with a patient can be viewed as a goal-directed behavior. Furthermore, understanding the antecedents that affect discussion of a treatment with a patient will provide information important to our understanding of the personal and social processes that are included in a physician’s decision-making about discussing treatment options.

I next turn to examining the ability of the TRA and TPB models to explain physicians’ behavioral intentions and behaviors.

**Extension of the TRA and TPB to the Medical Domain**

Research applying the TRA and TPB models in the medical care domain shows results buttressing the rationale for using the models to study physicians’ behaviors (Perkins et al., 2007). Godin and colleagues (2008) in reviewing twenty-four physician studies, applying either the TRA or TPB, found that the models’ constructs accounted
for approximately 20\% to 40\% of the variance in behavioral intention and roughly 20\% of the variance in behavior. Behaviors and behavioral intentions examined included adherence to various medical guidelines, glove use, prescribing medication, and patient referrals, among others. The amounts of explained variance in the physician studies comport relatively well with those reported in the previously cited meta-analyses (Armitage & Conner, 2001; Godin & Kok, 1996; van den Putte, 1993). Additionally, these reviews provide further evidence that the TRA and TPB can successfully model behavior in contexts where important consequences of the behavior affect others, as well as the self.

Of most direct relevance to the proposed research are studies that examine the TRA and TPB models’ abilities to predict aspects of physicians’ discussion-related behavior during a clinical exam. Five relatively recent studies were found that qualify as physician initiated discussions during a clinical exam. The behaviors studied include intention to: educate about sexually transmitted diseases (Millstein, 1996), educate about emergency contraception (Kelly, Sable, Schwartz, Lisbon, & Hall, 2008), provide reproductive healthcare information (Busha, 1998), encourage complementary and alternative medicine use by patients among general practitioners in Quebec (Godin, Beaulieu, Touchette, Lambert, & Dodin, 2007), and discuss a diagnosis of dementia with older adults by healthcare workers in Britain (Foy et al., 2007).

A review of these studies finds that the TRA and TPB models significantly predicted behavioral intention; although, the amount of variance accounted for varied widely. Godin et al. (2007) found that among general practitioners in Quebec 83\% of the variance in behavioral intention to encourage complementary and alternative
medicine use among patients was predicted by PBC, attitude toward the behavior, moral norm (a feeling of personal obligation for the behavior), and descriptive norm (the perceived prevalence of the behavior in the professional field); subjective norm was not a significant predictor. Busha (1998) found that among Iowa family practitioners R^2s for the TPB constructs ranged from .29-.50 in predicting intentions to educate about the prevention of sexually transmitted diseases and unwanted pregnancy. A range is presented here because separate regression models were constructed for girls and boys across two age groups, 12-13 year olds and 15 year olds. At the low end, Millstein (1996) found that the TPB variables accounted for 27% of the variance in physicians’ behavioral intentions to educate adolescents about sexually transmitted diseases. Although Millstein reached a lower level of variance accounted for in behavioral intention than the previous studies, the results are within the range of 20% to 40% found in other physician studies (Godin et al. 2008).

In reviewing these TPB studies, PBC often emerged as the most, or one of the most, important predictors of intention (Busha, 1998; Godin et al., 2007; Millstein, 1996). Furthermore, Millstein found that the addition of PBC to attitude and subjective norms significantly added to the prediction of intention among physicians to educate adolescents about sexually transmitted diseases. Millstein also reported that with respect to physician’s self-reported prospective behavior to educate adolescents that both PBC and behavioral intentions were important predictors of behavior. These findings provide support for including PBC in the model used to assess physician behaviors and behavioral intention to have discussions with their patients.

Although, PBC emerged most often as the most important predictor, evidence
suggests that subjective norm also would significantly contribute to the TPB model’s prediction in the proposed research. Foy et al. (2007) examined three behaviors focused on discussing a diagnosis of dementia with patients and consistently found subjective norm the most important predictor, in a model that included both attitude and PBC. The sample included a minority of physicians (13%), the rest of the sample being, for example, clinical psychologists and community psychiatric nurses. It is plausible that the social expectations of revealing a life-altering diagnosis such as dementia would carry more social pressure than the other discussion studies: reproductive health information and the use of complementary and alternative therapies. Furthermore, the large portion of the sample devoted to those who administer psychological care, as opposed to medical care, could well have accounted for the influence of subjective norms in this study.

Kelly et al. (2008) also found subjective norm a stronger predictor than attitude toward the behavior for physicians’ intention to educate women about emergency contraception. Although, this study used the TRA model, comprising attitude and subjective norm, the researchers did include a measure of objective knowledge, which arguably might be considered a broad proxy for one aspect of PBC. In this research, the knowledge measure did not emerge as a significant predictor of intention. Interpreting Kelly et al.’s measure of knowledge as a proxy for PBC, we might view these results in combination with those of Foy et al. (2007) as supporting a significant role for subjective norm in predicting physicians’ discussion intentions with their patients.

To summarize, the research findings presented provide evidence that both the TRA and the TPB have shown explanatory power in predicting behavioral intentions
among physicians, including physicians’ behaviors that can be conceptualized as
discussion-related behavior during a clinical exam. Several behaviors focused on efforts
among physicians to educate patients---about sexually transmitted diseases, emergency
contraception, and reproductive healthcare. The other behaviors were to encourage
complementary and alternative medicine use by patients and to discuss a diagnosis of
dementia with a patient.

The present research proposes to focus on a treatment discussion between a
physician and patient in a context where the physician may be less familiar with the
treatment (DBS surgery) than was the case with the alternative topics discussed in the
cited studies. In light of the fact that DBS surgery appears not to be a commonly
adopted treatment for disabling PD, this research provided the opportunity to examine
the decision making of neurologists while they considered discussion of a medically
approved, but still innovative, treatment option with a patient---who might obtain
benefit from knowledge of and treatment with that procedure, as well as exposure to
some level of risk.

The research findings presented provide evidence not only that the TRA has
explanatory power in predicting many types of self-protective behaviors but also the
ability to model behaviors having important outcome consequences for other, including
physicians’ behaviors that can be conceptualized as discussion between physician and
patient. Based on the past research with physicians using the TRA, both attitude and
subjective norm have proven significant in predicting behavioral intentions among
physicians’ studies.

\[ H1: \text{Attitude toward the behavior and SN will account for a significant portion} \]
of variance in neurologists’ intentions to initiate a discussion about DBS surgery with a Parkinson’s disease patient.

Although, initiating a patient discussion seems a straightforward exercise in control, PBC has emerged as an important predictor of physicians’ behavioral intention to have discussions with patients (Busha, 1998; Godin et al., 2007; Millstein, 1996). It will be important to include PBC as a construct in the proposed research, as perceptions of control have been seen to play an important role in understanding physicians’ intentions to discuss health care matters with their patients. This research is likely to capture more information for the prediction of neurologists’ discussion intentions by adding PBC to the TRA. Therefore, the TPB forms the most relevant model on which to build this research.

\textit{H2: PBC when added to the TRA model of attitude and subjective norm will account for a significant increase in the portion of variance explained in neurologists’ behavioral intentions to initiate a discussion about DBS surgery with the PD patient.}

The relative importance of the main determinants in the TPB is expected to vary across behaviors and situations (Ajzen, 1991, p. 472). With the expectation that neurologists’ carefully weigh the outcomes associated with any potential treatment discussed with a patient, beliefs about the target, in this case DBS surgery, should have a strong influence on attitude toward the behavior—discussing DBS surgery with a disabled PD patient. Given this presumed importance, the effect of beliefs about DBS surgery on attitude would suggest that attitude would be the strongest predictor of behavioral intention.
**H3a:** Attitude will be the strongest predictor of neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient.

Previous studies of diffusion of medical innovations support the proposition that even among highly skilled professionals social influence plays an important role in decision-making regarding physicians’ adoption of a medical innovation, including the influence of opinion leaders (e.g., Burke, Fournier, & Prasad, 2007; Coleman, Katz, & Menzel, 1966). However, the findings from other studies of physicians’ discussion intentions, for example providing preventive health information and encouraging use of complementary and alternative therapies (Busha, 1998; Godin et al., 2007; Millstein, 1996), suggest that PBC can emerge as an important predictor.

In cases where issues of actual control would play an important role in the performance of a behavior, perceived behavioral control is proposed to take on greater importance (Ajzen & Fishbein, 2005, p.196). In the present context, various factors such as certainty about the risks and benefits of DBS surgery and perceived knowledge of DBS surgery are likely to be important influences on PBC. Although, past research on physician behaviors suggests normative social influences likely will be a significant predictor, PBC concerns about having the discussion and the ability to provide knowledgeable information and referrals are likely to be more influential in the immediate social exchange between physician and patient.

**H3b:** Perceived behavioral control will be the next strongest predictor of neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient.
Personal Normative Influences

The TPB, though having a long history of support for the model and its predictions of behavioral intention and behavior, often does not account for a sizable portion of variance in behavioral intention and behavior, leaving open the possibility of adding predictors to the model or of refining the main determinants. For example, a meta-analytic review found that subjective norm was often weaker than attitude and PBC in predicting behavioral intention, leading to the suggestions to improve the normative measure by improving its measurement and expanding the normative component (Armitage & Conner, 2001, p. 471). Additionally, Sparks and Shepherd (2002) have pointed out a more theoretical shortcoming suggesting that expectancy value models of human behavior, like the TRA and the TPB, may focus on man’s self-interest to the exclusion of consideration of moral concerns for others. Ajzen (1991) has stated that in certain contexts where ethical issues are important to consider, moral norm, or personal obligations to perform or refrain from performing a behavior, may be a fourth determinant of behavioral intention.

The present conceptualizations of the TRA and TPB do not include a personal normative measure within their models, but do include social normative influences on behavioral intention, that is, norms influenced by the expectations of important social referents. An early conceptualization of the TRA did include personal norm, along with attitude toward the behavior and social norm, in the modeling of behavioral intention (Fishbein, 1967). That definition of personal norm captured one’s “belief about what he personally feels he should do” as compared to the social normative belief about what
significant others think he should do (p.489). Personal norm later was omitted from
the TRA, given its high correlation with behavioral intention and, therefore, its
tendency to confound an understanding of behavioral intention (Fishbein & Ajzen,

Researchers have continued to examine the role personal normative influences
may have on behavioral intentions. Godin and Kok (1996) in reviewing studies on the
TRA/TPB involving health behaviors noted the role of personal normative influences
and distinguished two unique types: (1) moral norm and (2) self-identity or role identity.
The authors defined moral norm as the feeling of personal responsibility regarding
performance, or not, of a given action, whereas, self-identity or role identity was
defined as “one’s perception of how a person like me should behave” (p.94). Manstead
(2000) defined moral norm as people’s convictions that a behavior is “inherently right
or wrong, regardless the personal or social consequences” (p.12). Sparks and Guthrie
(1998) in their studies differentiated moral obligation (whether or not eating a diet low
in animal fats would be morally right) from self-identity (as a health-conscious person)
in examining persons and their diets. The authors found that both moral obligation and
self-identity had significant effects on intentions to refrain from eating animal fats.

Notably, Conner and Abraham (2001) reported in two studies that the effect of
the personality variable conscientiousness on behavioral intention and behavior was
partially mediated by attitude toward the behavior. However, direct paths also led to
behavioral intention or behavior in the two studies. According to the TPB, personality
variables would be expected to be mediated fully by the TPB’s main three determinants.
These direct paths reinforce the possibility that personal normative influences directly
may affect behavioral intentions and, in the present research, directly may affect neurologists’ behavioral intentions of discussing DBS surgery with their PD patients.

Although both aspects of personal normative influence most likely are constructed through social processes, differences have been suggested in the processes that underlie moral norms and role identity. Manstead (2000), for example, notes the role of socialization processes as important in informing how an individual might develop internalized moral standards. Manstead also cites the individual moral development model proposed by Kohlberg, complementary to models of cognitive development, emphasizing the role highly individualized development may have on the construction of moral norms.

Social influences also likely influence self-identity (Sparks, 2000) [or role identity], in that the behavioral self-expectations that are internalized have been acquired through observance of others in social roles and group memberships from modeling of others’ behaviors and attitudes. Yet, another suggestion has it that the internalization of self-expectations happens over the course of repeating a behavior (Charng, Piliavin, & Callero, 1988). Such would likely be the case for a neurologist who over the course of time has been the primary caregiver in the treatment of PD patients and has been in a position of introducing the patients to new treatment options. Role identity then may provide a unique influence on the neurologist’s behavioral intention.

It seems reasonable that these constructs are related. Both moral norms and self-identity or role identity are based in the self-concept. Both focus on idealized and internalized views of the self and one’s expected behavior. Both constructs appear
based on one’s view of oneself made salient in response to a particular context. In three studies exploring both moral norm and self-identity as a health conscious person, Sparks and Guthrie (1998) found the correlations between the two constructs ranged from .30 to .52.

Why would both personal normative influences arise in the context of neurologists caring for their PD patients? Schwartz (1968) suggests that two conditions are necessary to bring to the fore the role of moral norms in action taking contexts: awareness of consequences to others in one’s own behavior and acknowledgement of responsibility of oneself toward others in taking the action. In his norm activation theory, Schwartz (1977) further suggests that activation of moral norms occurs in response to altruistic motivations that “benefit another . . . without regard for the network of social and material reinforcements” (p. 222). Diminished self-interest in the context appears to be important for eliciting moral norms. A neurologist may have an underlying personal belief that providing a PD patient knowledge of and potential access to DBS surgery is the moral (ethical) thing to do, with the likelihood of the patient’s worsening movement problems. This belief may arise even though the neurologist may not be very familiar with the qualifications of a patient for DBS surgery or may hold a belief that DBS surgery is risky.

Rivis, Sheeran, and Armitage (2009) in their meta-analysis found when the behaviors studied involved significant consequences for others’ welfare that moral norm added more to the predicted variance in intentions than if the behavior studied did not show substantial consequences for others. The PD patient in the present research is at a point in disease progression with serious disabilities, poor quality-of-life, and very
limited prospects for treatment. Regardless the neurologist’s comfort level with DBS surgery qualifications and processes, it is likely that the neurologist would feel a moral imperative at least to discuss DBS surgery with the patient. This moral imperative would be assumed to put additional pressure in the form of moral norms on the neurologist to contemplate the consequences of discussing the DBS procedure with the patient.

On the other hand, the neurologist may hold the expectation that, as the treating neurologist caring for a disabled PD patient, his or her role in the array of medical providers caring for the patient requires that discussion of potentially viable PD treatment alternatives would be the responsibility of the neurologist. Here the neurologist’s self-expectations for action are cued by an awareness of a position within a social/medical system, as the type of person who in the context acts in a certain manner to provide a patient with important information.

Research on the addition of moral norm to the TPB has found that moral norm has made a significant contribution to the prediction of behavioral intentions. In a meta-analysis, Rivis et al. (2009) found across 28 studies that adding moral norm to the TPB variables added three percentage points on average to the variance predicted in behavioral intentions. Conner and Armitage (1998) in their meta-analysis of eleven studies found that moral norm contributed four percentage points on average to the prediction of behavioral intentions. Conner and Armitage, also, found self-identity made a smaller but significant one percentage point contribution to the explained variance.

In studies of physicians’ and mental health professionals’ intentions to engage in
discussing related behavior with patients, separate studies have examined moral norm and role identity. Each personal normative influence was found to be a significant predictor when included along with the three main determinants of the TPB in the separate studies. Moral norm and PBC were equally the most important predictors of physicians’ intention to encourage patients’ use of complementary and alternative medicine (Godin et al., 2007). Foy et al. (2007) found that perceived role (whether one’s own professional group was perceived as responsible for the behavior) was significant in predicting whether mental health team members intended to explore what a diagnosis of dementia meant to patients.

Both dimensions of personal normative influence (moral norm and role identity) are expected to exert influence on behavioral intention, beyond the main determinants in the TPB model. Additionally, the influence of moral norm is expected to remain significant after role identity is added to the model. The additional consideration for the neurologist of important outcome consequences for the patient will make a unique contribution, adding more predictive power to the model of behavioral intentions, as suggested by Sparks and Shepherd (2002) in a context with a diminished sense of self-interest for the neurologist as well as a high level of concern for another.

**H4:** Even after controlling for role identity, moral norm when added to the three main TPB determinants would account for a significant increase in the portion of variance in neurologists’ intention.

**Antecedents to Attitude and Perceived Behavioral Control**

According to the TPB model, the three main determinants of the TPB, attitude,
subjective norm, and PBC should mediate fully any antecedent influences on behavioral intention. Attitude was hypothesized to be the strongest predictor of neurologists’ behavioral intentions to initiate a discussion of DBS surgery with the PD patient. Attitude toward discussing DBS surgery with a patient should be determined not only by a neurologist’s outcome beliefs about discussing DBS surgery but also by a person’s beliefs about objects on which the behavior is focused. According to Fishbein (1963), attitude toward an object is determined by a person’s beliefs about the object and its relation to “other objects, concepts, values, or goals” (p.233). Neurologists should seriously weigh their beliefs about DBS surgery in developing an attitude toward discussing the surgery with a PD patient.

H5: Attitude will mediate the influence of beliefs about DBS surgery in predicting neurologists’ behavioral intentions to initiate a discussion about DBS surgery.

With any innovation, certainty about the innovation’s relative advantage compared to alternatives is an important factor in determining whether the innovation is considered for trial and whether trial takes place (Rogers, 2003). Uncertainty has been shown to be a significant predictor of neurologists’ clinical decision-making in choice of medication for treating stroke (Gifford, Mittman, & Vickrey, 1996) and in decisions for the management of early Parkinson’s disease (Gifford et al., 1995).

The physician’s role as a healthcare provider to others entrusts the physician with the goal of optimizing a patient’s health status, balanced at the same time with an effort to do no harm. The standard for physicians to balance risks and benefits of appropriate treatment options for patients suggests that high levels of consideration and
certainty should be reached before a physician is willing to discuss a treatment alternative with a patient. Therefore, the level of treatment benefit certainty likely would affect the confidence with which a physician would approach the discussion of a treatment.

\textit{H6a: Perceived behavioral control will mediate the effects of benefit certainty in predicting neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient.}

The innovation decision process proposes that an individual needs to not only acquire awareness that an innovation exists, but also knowledge of how an innovation might be employed and perhaps even an understanding of the principles by which it works before reaching a decision stage to try the innovation (Rogers, 2003). Among the types of knowledge a neurologist would need for discussing a treatment option such as DBS surgery with a PD would not only be awareness of the treatment possibilities for the patient but also knowledge of screening criteria for patient eligibility both for referral and qualification. Greater perceived knowledge of DBS surgery and its treatment parameters likely would add to a neurologist’s perceived ability to engage in a thorough discussion of DBS surgery with a PD patient.

\textit{H6b: Perceived behavioral control will mediate the effects of perceived knowledge in predicting neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient.}
### Summary of Hypotheses

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Hypothesis 1</td>
<td>Attitude toward the behavior and subjective norm will account for a significant portion of variance in neurologists’ intentions to initiate a discussion about DBS surgery with a Parkinson’s disease patient.</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td>PBC when added to the model including attitude and subjective norm will account for a significant increase in the portion of variance explained in neurologists’ behavioral intentions to initiate a discussion about DBS surgery with the PD patient.</td>
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<tr>
<td>Hypothesis 3a</td>
<td>Attitude will be the strongest predictor of neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient.</td>
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<tr>
<td>Hypothesis 3b</td>
<td>PBC will be the next strongest predictor of neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient.</td>
</tr>
<tr>
<td>Hypothesis 4</td>
<td>Moral norm when added to attitude, subjective norm and PBC will increase significantly the variance explained in predicting neurologist’s behavioral intentions to initiate a discussion of DBS surgery. Moral norm will remain significant even after controlling for role identity.</td>
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<tr>
<td>Hypothesis 5</td>
<td>Attitude will mediate the influence of beliefs about the target in predicting neurologists’ behavioral intentions to initiate a discussion about DBS surgery.</td>
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<tr>
<td>Hypothesis 6a</td>
<td>PBC will mediate the effects of benefit certainty in predicting neurologists’ behavioral intentions to initiate a discussion about DBS surgery.</td>
</tr>
<tr>
<td>Hypothesis 6b</td>
<td>PBC will mediate the effects of perceived knowledge in predicting neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient.</td>
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CHAPTER THREE: METHODS

This chapter, first, provides an initial overview of the research design and methods. In the first half of the chapter, the survey population is detailed, along with the sampling frame and sampling procedures for the elicitation and main surveys. The development of the questionnaire and general procedures used to conduct the formative phase of research, the elicitation study is reported. Next, results of the elicitation study follow, as well as the manner in which those results guided the design of the main survey’s questionnaire and procedures. Finally, the methods used in conducting the main phase of research are detailed.

The last half of the chapter begins by describing the overall fielding procedures and timeline for the elicitation and main surveys. Following the details of fielding procedures and the timeline, the main survey’s response rate is reported, including inclusion criteria for completed questionnaires. Next, sample size calculation and power estimation is reviewed. Finally, the last section of this chapter describes data handling and data analytic procedures used to test the hypotheses, and address the research question.

Research Overview

A cross-sectional research design was used to test the hypotheses and to address the research question posed. Data were collected on questionnaires composed of self-report measures. The questionnaires were mailed to potential participants, who were given the options of completing the enclosed paper questionnaire and returning it with the
enclosed postage paid envelope or of completing the questionnaire online at a secure website.

Following a set of questions that completed the screening process, qualifying potential respondents as members of the relevant neurologist population, the questionnaire presented the respondents with a clinical scenario. After presenting the clinical scenario, respondents were asked questions about their intention to discuss DBS surgery now with the PD patient, as well as subsequent questions about their attitudes, subjective norm, PBC, and the outcome beliefs both about discussing DBS surgery now with this patient and about this patient having DBS surgery. Additional questions obtained measures of moral norm and role identity.

Clinical or case scenarios (or hypothetical patient vignettes) are found in many research studies examining physicians’ attitudes and behaviors. For example, clinical scenarios have been used to examine experimental interventions among doctors to implement practice recommendations (Hrisos et al., 2008). In particular, among neurologists clinical scenarios have been used to study adherence to practice recommendations (Gifford & Holloway, 1999), attitudes on healthcare rationing (Holloway, Ringel, Bernat, Keran, & Lawyer, 2000), and end of life patient care (Carver et al., 1999).

The research was conducted in two phases. Approval from the University of Minnesota Institutional Review Board was obtained prior to the start of both phases of research. As guidelines for studies using the TRA and TPB suggest (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), an elicitation survey with the target population was conducted as the first phase of research. One of the main goals of the elicitation survey
was to inform the design of the main survey instrument regarding neurologists’ outcome beliefs about discussing DBS surgery with a PD patient. The other main goal of the elicitation survey was to pilot test the intended survey procedures to be used later in the main survey. The second phase of research was the main survey, comprising the focus of the research reported here.

Survey Population and Sample

Survey Population and Sampling Frame

The survey population was the same for both the elicitation and the main surveys, comprising currently practicing U.S. neurologists who provided clinical care to patients with PD. Although DBS surgery is performed by neurosurgeons, both general neurologists and movement disorder specialists play key roles in referring patients for the pre-surgical evaluation before a patient is deemed an appropriate candidate for DBS surgery. Referrals for DBS surgery evaluation may come from neurologists, movement disorder specialists (a sub-specialty of neurology), primary care physicians, and self-referral (A. Abosch, personal communication, February 21, 2008). However, neurologists or movement disorder specialists are most likely to care for PD patients in the advanced stages of the disease, when consideration of DBS surgery is likely to arise. Therefore, it is most likely that neurologists or movement disorder neurologists would be caring for patients in the advanced stages of PD, when the patient’s movement disorders may have progressed to where DBS surgery could be considered.

Furthermore, the population consisted of those neurologists already aware of DBS surgery as a treatment option for PD. Awareness of an innovation is a minimal
requirement before consideration can be given to the innovation’s attributes and relative advantage (Rogers, 2003). The research focus here was assessing neurologists’ current beliefs, attitudes, and perceptions in a context where underlying beliefs and attitudes about DBS surgery had been informed by acquired information and experience. Therefore, awareness of DBS surgery was a qualifying criterion for the surveys.

Given the passage of eight years since DBS surgery for treatment of PD was approved by the FDA, it is likely that awareness among neurologists of DBS surgery as a treatment for PD is very high. No questionnaire was returned by a potential respondent who reported being unaware of the DBS surgery treatment, including the sixty-one respondents who for other reasons did not qualify for the survey.

The sampling frame chosen to represent this population was the database of currently practicing U.S. neurologists maintained by American Medical Information (AMI), a division of infoUSA. InfoUSA is a national provider of business and consumer information services. Their AMI database contained 17,443 practicing U.S. neurologists. Among those, 12,098, or 69.4%, self-reported a primary specialty in neurology. Constraining the sampling frame to a primary specialty in neurology excluded the related primary specialties of child neurology (N=923), neurosurgery (N=4,414), and critical-care neurosurgery (N=8).

The final sampling frame further was restricted to the 10,316 neurologists in an office- or hospital-based practice (85.3% of the 12,098 primary specialty designated neurologists). Excluded were those working in administration, teaching, residency, and in other non-clinical positions. Studying the latter sets of neurologists would not be
relevant to the study aims, determining antecedents of discussion of DBS surgery with PD patients. Therefore, 10,316 neurologists were eligible for the final sampling frame, serving as the base for AMI’s selection of the random sample.

**Sampling Frame Coverage**

Coverage is the extent to which there is perfect correspondence between the members in the sampling frame and the members of the target population (Groves et al., 2004). According to Groves et al., two types of problems occur in attempting to achieve coverage in random samples: ineligible units and undercoverage. Ineligible units are those members of the sampling frame not part of the target population. Undercoverage occurs when members of the target population do not exist in the sampling frame.

To address cases of ineligibility in the sampling frame, screening questions appeared on both the elicitation and main surveys’ questionnaires. Introductory questions on the surveys’ questionnaires provided the final screening questions for qualifying potential respondents as members of the relevant population. These additional qualifying questions screened out from the sampling frame potential respondents who were ineligible units for the research, addressing the first coverage issue.

The following were the additional qualifying questions appearing on the first pages of both the elicitation and the main surveys’ questionnaires. The potential respondents’ current primary specialty was required to be either movement disorder neurology or adult neurology. Furthermore, potential respondents were required to have a clinical practice, to have at least one patient visit in a typical month with a patient
diagnosed with Parkinson’s disease, and to be aware of DBS surgery as a treatment for Parkinson’s disease. Exclusion criteria included having another current primary specialty, for example, in child neurology, epilepsy or headache treatments, or sleep disorders, or being in training or retired. The elicitation and the main survey’s questionnaires appear in Appendixes A and B.

In comparison to the AMI listing of 10,316 office- or hospital-based U.S. neurologists, the American Medical Association’s (AMA) Physician Masterfile\textsuperscript{4} reports a total of 9,870 U.S. neurologists in the same settings, showing that the list maintained by AMI is relatively similar in coverage to the best available count of neurologists in office- and hospital-based practices in the U.S. Given the respective AMI and AMA Masterfile counts, undercoverage should not represent a problem.

\textit{Sampling Procedure}

Based on these qualifying characteristics, a random sample of 2500 listed U.S. neurologists was acquired from AMI. The sample had been drawn using a systematic $n^{th}$ select procedure. On review of the 2500 listings, eight duplicate listings and one listing without a specific street mailing address were removed from the sample. From the remaining 2491 listed neurologists, two random samples were drawn using SPSS 16. First, 200 neurologists’ names were drawn for use in the elicitation survey. A second random sample of 1000 neurologists’ names was drawn from the remaining 2291 listed neurologists for use in the main survey.

\textsuperscript{4} The AMA Physician Masterfile is considered the most comprehensive listing of all licensed physicians, including both members and non-members of the AMA.
Field Procedures and Time Line

Data for both surveys were gathered through self-report, using a self-administered paper questionnaire or an online version of the same questionnaire. Both survey periods extended over approximately eight weeks, from mailing of the initial contact letter to receipt of the final response. The elicitation survey was conducted from mid-July through mid-September of 2008. The main survey began three and a half months later in mid-December of 2008 and concluded in mid-February of 2009.

Generally, fielding procedures were identical for both the elicitation survey and the main survey. The only difference between the two surveys arose in the timing of potential respondents’ access to the online questionnaire version accompanying each survey. During the elicitation survey, the information to access the online questionnaire version accompanied only the fifth mailing, the final letter urging participation from non-respondents. The main survey’s potential respondents were provided information to access the online questionnaire in both mailings of the paper questionnaire and in the final letter to non-respondents. Table 1 details both surveys’ contact attempts and the mailing dates of each contact attempt with the potential respondents. Table 1 also notes the timing of information sent to access the secure online website hosting each survey.

Five U.S.P.S mailings were sent to potential respondents in both surveys. An initial contact letter introduced the research study to potential respondents, requesting their participation. Two mailings of the survey’s questionnaire followed, separated by approximately three and a half weeks. A reminder postcard was sent out between the two questionnaire mailings. The final contact was a letter urging non-respondents to
participate before the close of the survey. The final letter followed the second questionnaire mailing by approximately two weeks.

<table>
<thead>
<tr>
<th>Contact attempt</th>
<th>Elicitation Survey</th>
<th>Date mailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial contact letter</td>
<td>7/17/2008</td>
<td></td>
</tr>
<tr>
<td>First questionnaire mailing</td>
<td>7/21/2008</td>
<td></td>
</tr>
<tr>
<td>Reminder postcard</td>
<td>7/31/2008</td>
<td></td>
</tr>
<tr>
<td>Second questionnaire mailing</td>
<td>8/12/2008</td>
<td></td>
</tr>
<tr>
<td>Final cooperation request letter</td>
<td>9/5/2008</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact attempt</th>
<th>Main Survey</th>
<th>Date mailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial contact letter</td>
<td>12/9/2008</td>
<td></td>
</tr>
<tr>
<td>First questionnaire mailing</td>
<td>12/12/2008</td>
<td></td>
</tr>
<tr>
<td>Reminder postcard</td>
<td>12/19/2008</td>
<td></td>
</tr>
<tr>
<td>Second questionnaire mailing</td>
<td>1/2/2009</td>
<td></td>
</tr>
<tr>
<td>Final cooperation request letter</td>
<td>1/15/2009</td>
<td></td>
</tr>
</tbody>
</table>

*a*Included information for the potential respondent to access the secure online version of questionnaire.

Information sent to potential respondents to access the secure online version of the questionnaire included the address of the secure website hosting the survey and a pass code unique to each potential respondent. The University of Minnesota (UM) College of Liberal Arts Office of Information Technology’s (CLA/OIT’s) Survey Services programmed both the elicitation and the main surveys’ online questionnaires. Online data security was provided by the UM CLA/OIT’s Survey Services, which hosted both surveys on a secure University of Minnesota website, maintaining the data
files of responses, and transmitting the online data files through secure file transfer procedures.

**Elicitation Survey**

*Questionnaire Development*

As previously discussed, the goals of the elicitation survey were, first, to obtain from the target population outcome beliefs about discussing DBS surgery with a hypothetical PD patient during an office visit—presented as a clinical scenario—and, second, to pilot test some of the questions and procedures to be used in the main survey. This section reports the process used in developing the clinical scenario, the construction of outcome belief questions, and testing of the draft elicitation survey. The elicitation survey questionnaire appears in Appendix A.

The clinical scenario was designed to present the responding neurologists with a setting in which one of their own continuing PD patients (hypothetical) appeared during an office visit\(^5\). The patient depicted was one who symptomatically had advanced PD related movement disorders, which interfered with her quality-of-life, and who had reached optimum treatment with anti-Parkinson’s medications. It is at this stage in advanced PD that DBS surgery has been approved by the FDA as a potential treatment. The clinical scenario was presented to qualified respondents immediately following the screener questions, which appeared in the first section of the elicitation questionnaire.

Next two open-ended questions were designed to ask respondents about their outcome beliefs in discussing DBS surgery with the PD patient. Following advice for

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\(^5\) Dr. Abosch and Dr. Tuite composed the clinical scenario.
the formation of questions in TRA and TPB studies, the outcome belief questions were created to have close compatibility\textsuperscript{6} to the context, timing, action, and target of the behavior (and behavioral intention) of interest (Ajzen & Fishbein, 2005). That is, the phrasing of all questions emphasized the same particular setting (context), time at which the behavior was to occur (timing), behavior to be taken (action), and the main focus of the behavior (target). For example, respondents were asked, “What are benefits or advantages [drawbacks or disadvantages] of initiating a discussion now with your patient about DBS surgery, either for you or for the patient?”

Eight additional questions were included but are not relevant to the hypotheses and research questions examined in this research. As such, they are not discussed here.

Review and feedback on the draft elicitation survey’s clinical scenario and questions were sought from local neurologists who were expert in Parkinson’s disease. Both movement disorder neurologists and adult neurologists were included to represent the views of neurologists with potentially varying familiarity of DBS surgery for PD treatment. Following an initial phone contact, the draft elicitation questionnaire was emailed to eleven neurologists for review. Four neurologists responded to the request for a review. Feedback on the draft questionnaire was obtained through review of the neurologists’ answers on returned questionnaires and a telephone debriefing of several of the neurologists.

Based on discussion with the experts, two questions were revised. The qualifying question regarding the number of PD patients treated was rewritten to obtain the number of PD patient visits the neurologist had in a typical month, from the

\textsuperscript{6} The original works on the TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) used the term correspondence to refer to the compatibility concept discussed here.
previous version asking how many PD patients the neurologist had managed in the past 12 months. The revised version was reported to be easier for the neurologists to calculate and more similar to the manner in which a neurologist views patient volume. Additionally, the measured range of time spent in clinical practice was increased to reflect better the majority of time neurologists in private practice spend in clinical practice. None of the neurologists who comprised the expert panel reported any difficulty with other questions on the draft elicitation questionnaire or with the information provided in the clinical scenario.

Results

Qualified responses were received from 23 of the 200 potential respondents contacted. Four responses were from individuals who did not pass the qualifying criteria for the survey. The elicitation survey began as a mail survey. After recognizing the low response as the survey progressed, information to complete the questionnaire online was included in the final cooperation request letter. Following the date of the final mailing of the cooperation request letter, three of the last six questionnaires were completed online. Based on this response, the main survey included online completion option instructions with the first questionnaire mailing.

Coding of beliefs about discussing DBS surgery was conducted using verbatim transcriptions of the answers to open-ended questions from the paper questionnaires and online questionnaires. Specifically, questions 9 and 10, which asked about the advantages (disadvantages) of discussing DBS surgery now with the PD patient, were

7 Three were from other neurology specialties, and one was a neurologist who did not see any PD patients.
used to elicit the modal salient outcome beliefs about discussing DBS surgery.

Fifteen out of the twenty-three respondents provided answers to the advantages or
disadvantages of discussing DBS surgery. The coding results from the fifteen
respondents’ outcome beliefs of discussing DBS surgery are reported in Table 2.

Two coders independently coded each outcome belief of discussing DBS surgery with the Parkinson’s disease patient. Cohen’s kappa assessing inter-rater agreement was .83.

Table 2
Outcome Beliefs of Discussing DBS Surgery
(n = 15 respondents; n =26 responses)

<table>
<thead>
<tr>
<th>Belief</th>
<th>N (% of responses)</th>
<th>Cumulative percent^b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides her the opportunity and time to</td>
<td>6 (23.1)</td>
<td>23.1</td>
</tr>
<tr>
<td>consider surgery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Could frighten her</td>
<td>4 (15.4)</td>
<td>38.5</td>
</tr>
<tr>
<td>Provides another treatment option</td>
<td>3 (11.5)</td>
<td>50.0</td>
</tr>
<tr>
<td>May mean I cannot answer all of her</td>
<td>2 (7.7)</td>
<td>57.7</td>
</tr>
<tr>
<td>questions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May lead her to think surgery is the only</td>
<td>2 (7.7)</td>
<td>65.4</td>
</tr>
<tr>
<td>option</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Would demonstrate my concern for her</td>
<td>2 (7.7)</td>
<td>73.1</td>
</tr>
<tr>
<td>Offers her hope for improvement</td>
<td>2 (7.7)</td>
<td>80.8</td>
</tr>
<tr>
<td>Inform her of a different type of</td>
<td>1 (3.8)</td>
<td>84.6</td>
</tr>
<tr>
<td>treatment of which she may not be aware</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Might refuse surgery</td>
<td>2 (7.7)</td>
<td>92.3</td>
</tr>
<tr>
<td>Responsibility to inform patient</td>
<td>1 (3.8)</td>
<td>96.1</td>
</tr>
<tr>
<td>May result in disappointment for her if</td>
<td>1 (3.8)</td>
<td>99.9</td>
</tr>
<tr>
<td>she did not qualify for surgery</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^a Beliefs in the shaded rows were not included on the main survey’s questionnaire.
^b Column total does not equal 100% due to rounding.

Responses to the questions about advantages and disadvantages of initiating a
discussion about DBS surgery elicited additional types of beliefs. Some respondents
gave answers to these questions that were not responsive to the outcome of
discussion about DBS surgery but rather referred to the outcome of DBS surgery for the
patient. Eleven out of twenty-three respondents provided this type of answer. Coding of
this separate belief category provided an opportunity to evaluate the respondents’
beliefs about the target—DBS surgery—underlying attitudes toward the behavior. The
outcome beliefs about DBS surgery were coded separately from the outcome beliefs of
discussion. Outcome beliefs about DBS surgery are reported in Table 3. Selected for
inclusion were the seven most frequently mentioned, accounting for ninety percent of
the responses given.

Two coders independently coded each of the elicited beliefs about DBS surgery.
Cohen’s kappa was used to determine inter-rater agreement. Inter-rater agreement was
.96.

<table>
<thead>
<tr>
<th>Belief</th>
<th>N (percent of responses)</th>
<th>Cumulative percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved quality-of-life</td>
<td>7 (21.9)</td>
<td>21.9</td>
</tr>
<tr>
<td>Reduce on-off fluctuations</td>
<td>4 (12.5)</td>
<td>34.4</td>
</tr>
<tr>
<td>Reduce dyskinesias</td>
<td>4 (12.5)</td>
<td>46.9</td>
</tr>
<tr>
<td>Risk of infection</td>
<td>4 (12.5)</td>
<td>59.4</td>
</tr>
<tr>
<td>Reduce medication needs</td>
<td>4 (12.5)</td>
<td>71.9</td>
</tr>
<tr>
<td>Would lead to risk of stroke</td>
<td>4 (12.5)</td>
<td>84.4</td>
</tr>
<tr>
<td>Reduce motor symptoms</td>
<td>2 (6.2)</td>
<td>90.6</td>
</tr>
<tr>
<td>Medical device failure</td>
<td>2 (6.2)</td>
<td>96.8</td>
</tr>
<tr>
<td>May be only means for improvement</td>
<td>1 (3.1)</td>
<td>99.9</td>
</tr>
</tbody>
</table>

*Beliefs in the shaded rows were not included on the main survey’s questionnaire. 1Column total does not equal 100% due to rounding.
Finally, the elicitation questionnaire included questions designed to check whether the clinical scenario provided sufficient information for decision-making regarding initiating a discussion of DBS surgery with the patient and whether any of the questions were difficult to complete. No respondent suggested that a change in the clinical scenario was required. Additionally, no questions were found difficult to complete.

**Main Survey Instrument**

*Instrument Layout*

The main survey’s questionnaire (see Appendix B) comprised eighty-four questions on an 8-page questionnaire. Questions were presented in three sections: practice characteristics, clinical scenario, and demographics. The practice characteristics section included four screening questions, qualifying the potential respondents for participation in the survey. Qualifying questions required respondents: 1) to have a primary specialty of adult neurology or movement disorder neurology (Question 1); 2) to have a clinical practice and not be a student, resident, or under fellowship (Question 2); 3) to have at least one to five patient visits in a typical month with patients diagnosed with Parkinson’s disease (Question 5); and 4) to be aware of DBS surgery for the treatment of Parkinson’s disease (Question 7). Additional questions in this section asked for the number of neurologists in the practice (Question 3) and the percent of time in a typical week spent in clinical practice (Question 4). These last two questions were asked to allow descriptive results to be presented about the sample.
The clinical scenario section first presented the respondent with the clinical scenario then proceeded to (1) the measures from the TRA and TPB ---behavioral intention, attitude toward the behavior, subjective norm, perceived behavioral control, (2) beliefs about discussing DBS surgery and about the patient having DBS surgery, (3) role identity, moral norm, (4) additional questions about topics not the subject of this research, such as, other social normative beliefs, control beliefs, past behavior, and exposure to information about DBS surgery.

Finally, the demographics section obtained information about gender, age, years in practice, and academic affiliation.

Question items generally were presented in conceptual groupings. Specifically, the questionnaire placed the items measuring attitude toward the behavior, behavioral outcome beliefs, and DBS surgery outcome beliefs within conceptual item sets, related items appeared adjacent to one another. No honorarium was included or promised. However, a copy of the early results was offered to encourage completion of the questionnaire. The time to complete both the elicitation questionnaire and the main questionnaire was held to approximately 15 minutes.

Clinical Scenario

Respondents were instructed to “Imagine that the following patient with Parkinson’s disease has been under your continuing care” and then to answer the following questions.

Your patient is a 62-year-old woman with longstanding dopa-responsive idiopathic Parkinson's disease. She is in your office today
and demonstrates severe motor fluctuations and levodopa-induced
dyskinesias. She has been optimized on her anti-Parkinson's
medications. She reports a significantly diminished quality of life
because of the disabling motor fluctuations and dyskinesias. She has
no significant medical or psychiatric co-morbidities.

Major Variables

Dependent measure

Behavioral intention. Behavioral intention is the subjective probability of
performing a behavior. The essential underlying dimension to intention is the likelihood
or perceived probability of performing the behavior (Fishbein, 2008, p. 836).
Behavioral intention was measured as the mean summated score of two items. The first
item read, “My intention would be to initiate a discussion at this time with the patient
about DBS surgery for her Parkinson’s motor symptoms.” The second item asked,
“How likely is it that you that you would talk to the patient now about DBS surgery for
her Parkinson’s motor symptoms?” Both items used a 7-point scale from 1(not at all
likely) to 7(extremely likely). The Pearson correlation between the two items was .81,
p < .001.8

Main determinants

Attitude toward the behavior. Attitude toward the behavior (attitude) is a
general evaluation of favorableness or unfavorableness toward performing a particular
behavior (Ajzen & Fishbein, 1980, p. 54), the more favorable the attitude toward
performing the behavior the greater the intention to perform the behavior. The measure

8 This analysis and all subsequent analyses included herein were performed using SPSS 16.
of attitude comprised a mean summated scale, using four semantic differential word pairs. Words pairs were adapted from those used in prior TRA and TPB research of physicians (e.g., (Foy, et al., 2007; Kelly, Sable, Schwartz, Lisbon, & Hall, 2008). Following the introduction, “My initiating a discussion about DBS surgery at this time with the patient is,” respondents rated four word pairs on seven-point scales from: bad to good, positive to negative, beneficial to detrimental, and unproductive to productive. Before the scale was created, the positive/negative and beneficial/detrimental word pairs were reversed scored. Principle axis factor analysis resulted in one factor, explaining an estimated 57.81% of the common variance (Eigenvalue = 2.31). Factor loadings ranged from .66 to .82. Cronbach’s alpha = .83.

**Subjective norm.** Subjective norm comprises the effects that social influences have on one’s own behavioral intention. Both injunctive and descriptive norms should be included to best measure subjective norm (Ajzen & Fishbein, 2005). An injunctive norm represents one’s perceptions about how others think one should act, whereas, a descriptive norm represents how one perceives others to act. A meta-analysis by (Rivis & Sheeran, 2003) found by including descriptive norm as a predictor after all three predictors from the TPB had been entered that 5% additional variance was explained in the prediction of intention.

Three items formed the mean summated scale of subjective norm (SN). Two measures of injunctive norms and one measure of descriptive norm were included in the subjective norm scale. Injunctive norms were measured by asking participants whether “The following would support my having a discussion about DBS surgery with the patient” regarding two referent groups, “most people or groups whose opinions I value”
and “most people or groups who are important to me professionally.” The descriptive norm was measured by having respondents rate the item, “Most neurologists whose opinions I value have initiated discussions about DBS surgery” with their PD patients. Ratings for all three items were on a 7-point scale from 1 (strongly disagree) to 7 (strongly agree). Principle axis factor analysis resulted in one factor, explaining an estimated 55.51% of the common variance (Eigenvalue = 1.67). The factor loadings ranged from .62 to .92. Cronbach’s alpha = .77.

**Perceived behavioral control.** In the TPB, (Ajzen, 1985) introduced the concept of PBC to the TRA determinants to better predict behavior that was not under one’s volitional control. The measure includes two components suggested for the best assessment of PBC (1) confidence, as in confidence in one’s ability to perform a behavior, related to one’s self-efficacy and (2) controllability, or the extent to which performance of a behavior is up to the actor (Ajzen, 2002; Ajzen & Fishbein, 2005). Respondents rated the statements “I am confident that I could initiate this discussion now” and “initiating this discussion now would be completely up to me” on 7-point rating scales from 1 (strongly disagree) to 7 (strongly agree). Pearson’s correlation for the two items was low .263, p < .05. Cronbach’s alpha for the two items was .41.

Given the low correlation and low reliability of the two-item scale for PBC, further explorations of the two-item scale were carried out. A principle axis factor analysis was run on confidence and controllability. Only one factor emerged; however, it accounted for only 26.18% of the shared variance. Examination of bivariate correlations with intention showed that confidence was significantly correlated with intention, $r = .826$, $p < .001$, whereas controllability was not, $r = .164$, ns. Therefore,
PBC was measured by the one confidence item.

**Personal normative factors**

**Moral norm.** Moral norm may be viewed as one’s personal feeling of moral obligation to perform a behavior (Beck & Ajzen, 1991). Two items measured moral norm: (1) “I would consider it a personal obligation to discuss DBS surgery now with this patient” and (2) “Discussing DBS surgery now with this patient would be the ethical thing to do.” The items were rated on a 7-pt. bi-polar scale 1 (strongly disagree) to 7 (strongly agree). The mean of these two items comprised the summated score for moral norm. Pearson’s correlation for the two items was .76, p < .001.

**Role identity.** Role identity represents the portion of personal normative influence that has as its basis a social construction of a role the self assumes in a social system. In other words, role identity is the awareness of one’s having a part in a social context and having internalized expected responsibilities as part of that context, which then become a component of one’s identity. Role identity was measured by one item, which read, “I would be the person primarily responsible for initiating a discussion of DBS surgery with this patient,” measured on a 7-pt. bi-polar scale 1 (Strongly disagree) to 7 (Strongly agree).

**Beliefs about the target underlying attitude**

**Beliefs about DBS surgery.** The seven modal salient outcome beliefs about the DBS surgery, identified through the elicitation study, are reported in Table X. All items were measured on a 7-pt. bi-polar scale 1 (Strongly disagree) to 7 (Strongly agree). Principle axis factoring with varimax rotation was conducted to assess the underlying structure of the seven beliefs about the target. Table 4 reports the results of the rotated
factor matrix. The factor analysis resulted in two factors, explaining 72.25% of the common variance. The first factor, positive beliefs, accounted for 49.44% of the common variance (Eigenvalue = 3.461). The second factor, negative beliefs, accounted for 22.81% of the variance (Eigenvalue = 1.596).

Table 4
Rotated Factor Solution for Outcome of DBS Surgery Beliefs

<table>
<thead>
<tr>
<th>Factor</th>
<th>Positive beliefs</th>
<th>Negative beliefs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce dyskinesias</td>
<td>.948</td>
<td>.071</td>
</tr>
<tr>
<td>Reduce on-off fluctuations</td>
<td>.926</td>
<td>.041</td>
</tr>
<tr>
<td>Improve quality-of-life</td>
<td>.823</td>
<td>-.031</td>
</tr>
<tr>
<td>Reduce motor symptoms</td>
<td>.800</td>
<td>.076</td>
</tr>
<tr>
<td>Reduce medications</td>
<td>.614</td>
<td>.228</td>
</tr>
<tr>
<td>Risk of infection</td>
<td>.057</td>
<td>.914</td>
</tr>
<tr>
<td>Risk of stroke</td>
<td>.084</td>
<td>.835</td>
</tr>
<tr>
<td>Eigenvalues</td>
<td>3.461</td>
<td>1.596</td>
</tr>
<tr>
<td>% of variance</td>
<td>49.44</td>
<td>22.81</td>
</tr>
</tbody>
</table>

Note: Factor loadings over .40 appear in bold.

The mean summated score of the five items comprising the first factor were included in the measure of positive beliefs, Cronbach’s alpha = .91. The mean of the two items comprising the negative belief factor made up the measure of negative beliefs ($r = .77$).

**External model factors underlying perceived behavioral control**

**Benefit certainty about DBS surgery.** Benefit certainty about DBS surgery (benefit certainty) was measured by three items on a 7-pt. uni-polar scale 1(not at all certain) to 7(extremely certain). Respondents first were asked how certain they were of both the efficacy and the safety “of DBS surgery for Parkinson’s motor symptoms.” The third question asked how certain they were that the “benefits of DBS surgery for Parkinson’s disease outweigh the risks.” The mean summated score of the three items comprised the measure of benefit certainty. Principle factor analysis resulted in a single
factor, explaining 72.93% of the common variance (Eigenvalue = 2.19). The factor loadings ranged from .81 to .93. Cronbach’s alpha = .89.

**Perceived knowledge.** Perceived knowledge was measured by three items on a 7-pt. uni-polar scale (not at all knowledgeable) to 7 (extremely knowledgeable). Respondents were asked how knowledgeable they were about (1) “articles in peer-reviewed publications about DBS surgery for Parkinson’s disease, (2) “selection of appropriate candidates for pre-operative screening . . . based on current standards of clinical practice,” and (3) “pre-operative screening tests that a patient . . . must pass in order to be deemed appropriate for DBS surgery.” A mean summated score of the three items comprised the measure of perceived knowledge. Principle factor analysis resulted in one factor emerging, which explained 78.86% of the common variance (Eigenvalue = 2.37). The factor loadings ranged from .84 to .94. Cronbach’s alpha = .91.

The six items from benefit certainty and perceived knowledge were also examined in a single factor analysis to confirm that it would be appropriate to treat benefit certainty and perceived knowledge as two separate measures. The correlation between benefit certainty and perceived knowledge was strong, $r = .628, p < .001$. The first principle axis factoring showed that one factor emerged, explaining 60.88% of the common variance. Factor loadings ranged from .71 to .85. However, in the reproduced correlations, 100% of the residuals between the observed and the reproduced correlations were larger than an absolute value of .05, indicating a poor fit to the solution. A second principle axis factoring, with a varimax rotation, was performed that requested two factors to be extracted. This analysis resulted in two factors, explaining a
greater amount of the common variance, 76.38%. Furthermore, the reproduced correlations showed that all residuals were less than an absolute value of .05.

The factor matrix in Table 5 shows the two resulting rotated factors, benefit certainty, eigenvalue 2.205, and perceived knowledge, eigenvalue 2.378, with their factor loadings and percent of variance explained.

![Table 5](image)

Table 5: Rotated Factor Solution for Benefit Certainty and Perceived Knowledge

<table>
<thead>
<tr>
<th>Factor</th>
<th>Benefit certainty</th>
<th>Perceived knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficacy</td>
<td>.726</td>
<td>.392</td>
</tr>
<tr>
<td>Safety</td>
<td>.752</td>
<td>.290</td>
</tr>
<tr>
<td>Benefit Risk</td>
<td>.905</td>
<td>.258</td>
</tr>
<tr>
<td>Knowledge of articles</td>
<td>.292</td>
<td>.780</td>
</tr>
<tr>
<td>Knowledge of patient selection</td>
<td>.340</td>
<td>.870</td>
</tr>
<tr>
<td>Knowledge of screening tests</td>
<td>.303</td>
<td>.842</td>
</tr>
<tr>
<td>Eigenvalues</td>
<td>2.205</td>
<td>2.378</td>
</tr>
<tr>
<td>% of variance</td>
<td>36.746</td>
<td>39.634</td>
</tr>
</tbody>
</table>

Note: Factor loadings over .40 appear in bold.

Additional Variables

Additional information was gathered about the sample of respondents. This information included in Section C requested further practice characteristics (years in practice and whether any academic affiliation was held), and demographic information (sex and age) which can be found in Table 7.
Response Rate Factors

Item Non-response

A balance was sought between maintaining sufficient sample size to achieve power in conducting the analyses and excluding questionnaires with item non-response, i.e., missing data, the failure of individual respondents to answer specific required questions. Of the ninety-seven returned and qualifying questionnaires, seventeen respondents’ questionnaires were missing an answer to one or more questionnaire items that contributed to the measure of an outcome or predictor variable. Inclusion criteria for questionnaires required that no questionnaire would be counted as complete that was missing two or more items from one scaled variable. Furthermore, no questionnaire could have a combination of more than two missing single item measures and/or partially complete scaled measures. These decision criteria identified eleven of the seventeen questionnaires as incomplete questionnaires. These questionnaires were excluded from the data analysis.

The remaining six respondents’ questionnaires with missing values were retained in the sample. On these questionnaires, if a missing value was part of a multi-item scale, the respondent’s scale mean was substituted for the missing value. In the case of single item measures, the group mean was substituted for the individual’s missing value.
Response Rate

The final response rate was 13.9%. The calculation for this response rate was designed by the American Association of Public Opinion Research (AAPOR)\(^9\) and accounts for survey designs in which the sampling frame includes ineligible sampling units, i.e., not qualifying for inclusion in the survey. Ineligible units in a sampling frame are screened out of the survey through additional screening questions in the questionnaire, as was the case in the present research. Response rate 3 of AAPOR (AAPOR, 2008, p. 35) provides for a proportion of the unknown eligibility sampling units to be adjusted through an estimation of eligibility (“\(e\)”).

\[
RR3 = \frac{I}{(I + P) + (R + NC + O) + e(UH + UO)}
\]

Source: AAPOR, 2008

Table 6 reports the final disposition of the 1000 potential respondents contacted for the main study. Responses were received from 158 potential respondents. Among those 158 responses, eighty-six were received from neurologists who met the qualifying criteria included on the questionnaire and further met the inclusion criteria set for questionnaire completion. Another eleven qualified responses were received, but the potential respondents failed to pass the inclusion criteria. One other returned questionnaire indicated that the target individual was deceased at the time of the survey.

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\(^9\) AAPOR is a professional association serving industry research professionals.
The remaining sixty-one responses were from individuals who did not meet the qualifying criteria. Thirty-nine individuals did not have a current primary specialty in movement disorder neurology or adult neurology. Two had no clinical practice, and the remaining twenty individuals had no visits with patients diagnosed with PD in a typical month. The eligibility of the remaining 841 sampling units was undetermined.

Table 6
*Sample Final Dispositions and Response Rate Codes*

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>AAPOR Response Rate Codea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sample mailed</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Returned questionnaires</td>
<td>86</td>
<td>I</td>
</tr>
<tr>
<td>Interview completed &amp; qualified</td>
<td>11</td>
<td>P</td>
</tr>
<tr>
<td>Partial interview &amp; qualified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible, no returned questionnaire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>1</td>
<td>O</td>
</tr>
<tr>
<td>Refusal and breakoff</td>
<td>0</td>
<td>R</td>
</tr>
<tr>
<td>Non-contact</td>
<td>0</td>
<td>NC</td>
</tr>
<tr>
<td>Unknown eligibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown, if household/occupied HU</td>
<td>0</td>
<td>UH</td>
</tr>
<tr>
<td>Unknown, other</td>
<td>841</td>
<td>UO</td>
</tr>
<tr>
<td>Not eligible, completed interviews</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Estimated proportion of cases of unknown eligibility that are eligible</td>
<td>.63</td>
<td>e</td>
</tr>
</tbody>
</table>

*aBased on AAPOR, 2008, p.34.*
Potential Effect of Unit Non-response

It is important to consider the potential effect unit non-response, as suggested by a low response rate, may have on generalizing the survey’s results to the larger population. Unit non-response refers to failure of the identified potential respondent to complete the survey. Among the main causes of unit non-response are failure to deliver the survey request, refusal of a potential respondent to participate, and the inability of a respondent to participate (Groves, et al., 2004).

In particular, non-response is problematic to the extent that non-respondents’ answers to survey questions would differ systematically from those of respondents’ answers (Groves et al. 2004). For example, in the present research, if non-responding neurologists had more experience with DBS surgery than those neurologists who responded, the degree of PBC among the non-responders may have been different systematically from that reported among the final sample respondents. The result could affect the significance and relative importance of PBC in the resulting multiple regression model predicting intention to discuss DBS surgery.

Persons who respond later in a mail survey, that is, after additional mailings, may be more similar to non-responders than to responders; therefore, one suggested assessment of potential non-response bias is to compare early versus late responders to the survey (Armstrong & Overton, 1977). In light of potential non-response bias, an examination was done of differences between early versus late responders to the present survey. Responses to the main survey were coded as wave one, in response to the first questionnaire mailing (46.5%), and wave two, in response to the second questionnaire
mailing (53.5%). *Response wave* then was coded as a dummy variable and entered in the first step of the hierarchical regression. *Response wave* did not emerge as a significant predictor in the hierarchical regression of neurologists’ intentions to initiate a discussion about DBS surgery with a PD patient.

The majority of responses (74.4%) were received through the mail, on paper versions of the questionnaire, as opposed to being completed through the online version of the questionnaire. *Survey modality* (paper or online) was coded as a dummy variable and entered in the first step of the hierarchical regression. No differences by *survey modality* were observed in any hierarchical regression predicting intention to initiate a discussion about DBS surgery with a Parkinson’s patient, inclusive of model testing between the TRA and TPB and subsequent additional model testing of *role identity* and *moral norm*.

**Sample Size and Power Estimation**

Sample size and power for multiple regression were estimated based on past effect sizes, $f^2$, from studies of the TPB using physician samples. (Cohen, Cohen, West, & Aiken, 2003, p. 92) define the effect size $f^2$ for multiple regression as:

$$f^2 = R^2 / 1 - R^2$$

Specifically, among TPB studies of physicians’ discussions with patients, the effect size, $f^2$, for multiple regression of behavioral intentions on the three main TPB determinants generally was close to .37 (e.g., (Millstein, 1996). The power estimation program G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) was used to determine that a sample size of 66 would be needed to detect a significant $R^2$, using three predictors.
and assuming $\alpha = .05$, power $= .80$, and $f^2 = .20$, an even more conservative effect size than the .37 from Millstein.

In the case of hierarchical regression, assuming a small to medium effect size of $f^2 = .10$, with $\alpha = .05$ and power $= .85$, a sample size of 92 was estimated as necessary to detect a significant increase in $R^2$ with four predictors in the reduced model and five predictors in the full model.

**Data Handling and Analyses**

Data were double-entered, and the two data files were compared for inconsistencies. Very few differences were found. All differences were resolved by confirming the correct piece of datum from the answer on the original paper or online questionnaire.

The data first were examined for normality, linearity, and outliers. Shapiro-Wilk’s tests indicated that the distributions for all study variables were non-normal, all $ps < .001$. A closer examination revealed three variables with significant negative skew: intention, $z = -8.28, p < .001$; PBC, $z = -4.02, p < .001$; and role identity, $z = -6.12, p < .001$. Additionally, kurtosis for intention ($K=5.666$, SE=.514) and role identity ($K=2.874$, SE=.514) appeared platykurtic, showing evidence for reduced weight in their distributions’ tails. The other variables were within the range of acceptability for kurtosis, $+2$ or $-2$ (Tabachnick & Fidell, 2007).

The main focus for preparing the data for analysis was seeking a transformation to normalize the dependent variable, intention. Several transformations were tested, including square root and reciprocal transformations; the one that worked best was a
log10 transformation, preceded by a reflection of the variable\textsuperscript{10}. Using a log10 transformation on intention resulted in no significant skew (skewness = .578, SE\textsubscript{skewness} = .260) and kurtosis within the accepted range (kurtosis = -.018, SE\textsubscript{kurtosis} = .514).

Standardized residuals from the hierarchical regression of intention on the study’s major variables were examined for adherence to normality and linearity. A histogram of standardized residuals showed a near normal distribution. The normal P-P plot of standardized residuals showed residuals falling very close to the expected line.

Finally, reflecting scores for one variable creates a difficulty in interpreting relations between the variable and the other major variables in the study. In the present case, by reflecting behavioral intention the direction of the scale became reversed and scores that were high scores (e.g., 7), on the scale of 1 (not at all likely) to 7 (extremely likely), became low scores (e.g., 1). Measures of positive association between behavioral intention and the other variables would result in negative correlation coefficients or negative regression coefficients. To avoid this issue, all other study variables were reflected before the main analyses, so that all variables and scales ran in the same direction, from most positive (1) to most negative (7).

Multiple linear regression and hierarchical linear regression were performed to test Hypotheses 1, 2, and 4. Predictor variables were entered in four blocks. The first block included the two TRA variables, attitude toward the behavior and subjective norm. Perceived behavioral control, from the TPB, was entered in the second block.

\textsuperscript{10} Reflection of a measure is a transformation of scores so that a negatively skewed distribution is reversed into a positively skewed distribution before another transformation is applied to correct the skewness (Tabachnik & Fidell, 2007, p. 88-89). To reflect the intention measure, before the log10 transformation was performed, each score was subtracted from a constant (8) one larger than the largest score (1 + 7 = 8), as suggested by Tabachnik and Fidell.
The last two blocks examined the effect of personal normative influences on behavioral intention. Moral norm was entered first, followed by role identity in the last block.

Standardized residuals from the multiple hierarchical regression were checked for multivariate outliers that might influence the regression analysis. No extreme cases were found, that is, no residuals had a value greater than three standard deviations from the mean. Cook’s distance was used to examine influential points. No value for Cook’s distance was equal to or larger than 1.0. Finally, centered leverage was examined for values greater than $3k/n$, where $k$ equals the number of predictors and $n$ equals the sample size.  

Five cases were found with centered leverage greater than .2093 ($[3 \times 5]/86$). To test their influence, all five cases were removed from the data file and the main analyses were re-run. The results showed no difference in outcome for the main hypotheses tests and only small differences in $\beta$ sizes. Therefore, all five cases were retained in the data file for the final analyses.

Hypotheses 3a and 3b were examined in three ways, using both relative, comparative measures and formal testing. Relative comparisons of the size and rank order of standardized regression coefficients and squared semi-partial correlations provided informal ways to examine relative importance of attitude, subjective norm, and PBC in predicting neurologists’ intentions to initiate a discussion about DBS surgery with the patient. Then, a formal test of regression coefficients within a single multiple regression model (Kutner, Nachtsheim, Neter, & Li, 2004) was applied to test explicitly whether attitude was the most important predictor and whether PBC was the

---

11 When examining centered leverage, as reported by SPSS 16, Cohen, Cohen, West and Aiken (2003) suggest using $3k/n$ with small sample sizes rather than the typical $2k/n$. 
second most important predictor of the three. Kutner et al.’s formula (pp.268, 273) compares full and reduced regression models and their associated error sum of squares—$\text{SSE}_{\text{Full}}$ and $\text{SSE}_{\text{Reduced}}$, respectively—using the following test statistic, which is then compared to a critical $F$ value, with $(df_R - df_F, df_F)$.

$$F^* = \frac{\text{SSE}(R) - \text{SSE}(F)}{df_R - df_F} \div \frac{\text{SSE}(F)}{df_F}$$

Mediation analysis was conducted to address hypotheses 5, 6a, and 6b. A mediating variable “accounts for the relation between the predictor and the criterion” (Baron & Kenny, 1986, p. 1176). A mediator could account for all of the effect (complete mediation) or a portion of the effect (partial mediation) of a predictor on an outcome variable.

To establish formal support for mediation, three regression steps must be tested (Baron & Kenny, 1986; Mackinnon & Dwyer, 1993). Figure 2 portrays the three regressions that are tested. In the first step, the independent variable (e.g., beliefs about the target) must be a significant predictor of the mediator (e.g., attitude toward the behavior)—path a. In the second step, the mediator (attitude) must be a significant predictor of the outcome measure (e.g., intention)—path b. Third, when the mediator is added to the regression of the outcome variable (intention) on the independent variable (beliefs about the target), path $c'$ becomes non-significant—full mediation—or is reduced in size—partial mediation.
Finally, Sobel’s test (1982) on the indirect effects provides a significance check on the mediation results, examining the difference between the direct effect and the indirect effect of the independent variable on the outcome variable. The test examines the ratio of path $a$ times path $b$ divided by the standard error of $ab$, expressed as the equation:

$$\frac{ab}{SE_{(ab)}} = z$$

Where $SE_{(ab)}$ is the standard error of $ab$, expressed as:

$$SE_{ab} = \sqrt{b^2s_a^2 + a^2s_b^2}$$
CHAPTER FOUR: RESULTS

The results are presented in three sections. The first section describes the characteristics of the sample and compares the sample to characteristics of the larger population. The second section reports univariate statistics and bivariate correlations for the major variables examined in the survey. In the third section, results from the tests of the hypotheses are reported.

Sample Characteristics

A total of 86 qualifying neurologists completed the survey. Ages ranged from 32 to 81 years old (M = 54.7, SD = 11.0), excluding four respondents who refused to provide that information. The advanced lower limit on age, 32 years of age, likely reflects the number of years necessary to achieve training in a medical specialty (neurology) or sub-specialty (movement disorder neurology). Years in current primary specialty ranged from two to forty. The mean 20.1 years in specialty (SD=11.0) indicates that on average respondents had considerable experience in their specialty area. Two respondents did not indicate the number of years practicing their current specialty.

Additional demographic and practice characteristics of the 86 responding neurologists are reported in Table 7. The final sample was primarily male (76.7%). One respondent failed to indicate gender. The vast majority of respondents were adult neurologists (93%), with the remainder in the sub-specialty of movement disorder neurology. Clinical practice arrangements varied. The largest proportion of neurologists practiced in a neurology group setting (43.0%). The next largest group of neurologists
were solo practitioners (22.1%). On the other hand, 16.3% practiced in a multi-specialty group and 12.8% practiced in a University-based group; both are settings that likely would increase contact with other related physician sub-specialists, such as movement disorder specialists or neurosurgeons. Less than five percent practiced in other settings: 3.5% in a government hospital or clinic and 1.2% in another unspecified clinical setting. One person failed to supply this information.

Table 7
Sample Characteristics (n = 86)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>66 (76.7)</td>
</tr>
<tr>
<td>Female</td>
<td>19 (22.1)</td>
</tr>
<tr>
<td>(missing)</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td><strong>Primary specialty</strong></td>
<td></td>
</tr>
<tr>
<td>Adult neurology</td>
<td>80 (93.0)</td>
</tr>
<tr>
<td>Movement disorder</td>
<td>6 (7.0)</td>
</tr>
<tr>
<td><strong>Practice arrangement</strong></td>
<td></td>
</tr>
<tr>
<td>Neurology group</td>
<td>37 (43.0)</td>
</tr>
<tr>
<td>Solo practice</td>
<td>19 (22.1)</td>
</tr>
<tr>
<td>Multispecialty group</td>
<td>14 (16.3)</td>
</tr>
<tr>
<td>University-based group</td>
<td>11 (12.8)</td>
</tr>
<tr>
<td>Government hospital or clinic</td>
<td>3 (3.5)</td>
</tr>
<tr>
<td>Other clinical setting (hospital-employed)</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td>(missing)</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td><strong>Neurologists in practice</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>22 (25.6)</td>
</tr>
<tr>
<td>2 to 5</td>
<td>32 (37.2)</td>
</tr>
<tr>
<td>6 to 10</td>
<td>12 (14.0)</td>
</tr>
<tr>
<td>11 to 20</td>
<td>6 (7.0)</td>
</tr>
<tr>
<td>More than 20</td>
<td>13 (15.1)</td>
</tr>
<tr>
<td>(missing)</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td><strong>Percent of time in clinical practice</strong></td>
<td></td>
</tr>
<tr>
<td>More than 90%</td>
<td>57 (66.3)</td>
</tr>
<tr>
<td>75 to 90%</td>
<td>13 (15.1)</td>
</tr>
<tr>
<td>50 to 74%</td>
<td>10 (11.6)</td>
</tr>
<tr>
<td>30 to 49%</td>
<td>2 (2.3)</td>
</tr>
<tr>
<td>10 to 29%</td>
<td>2 (2.3)</td>
</tr>
<tr>
<td>Less than 10%</td>
<td>1 (1.2)</td>
</tr>
<tr>
<td>(missing)</td>
<td>1 (1.2)</td>
</tr>
</tbody>
</table>
Close to two-thirds of the 86 respondents practiced in relatively small practices, either in solo practice (n = 22) or with two to five neurologists in their practice (n = 32). Another 14% practiced in groups of six to ten neurologists. The remaining neurologists were in larger practices that included ten or more neurologists (22.1%). One person did not provide this information.

Overall, the vast majority (93%) of the neurologists appeared to spend most of their time in clinical practice. Two-thirds (66.3%) of the neurologists spent ninety percent or more of their time in clinical practice. Over one quarter (26.7%) spent from fifty to ninety percent of their time in clinical practice. The remaining seven percent spent less than fifty percent of their time in clinical practice. One neurologist did not provide clinical practice information.

The reports of PD patient visits in a typical month showed that over half of the neurologists (54.7%) had from one to fourteen PD patient visits in a typical month. Of those neurologists, 93.5% had at least a 50% time clinical practice, likely indicating that
PD patients represented only a small portion of their clinical practice. Almost forty percent (39.6%) of neurologists had from 15 to 49 PD patient visits in a typical month. The remaining 4.7% had practices in which they saw over fifty PD patients in a typical month. One neurologist did not provide this information.

Practice in an academic setting reasonably could increase the participating respondents’ exposure to advanced treatments for PD, such as DBS surgery. The sample seems to represent neurologists with a potential range of exposure to information about DBS surgery for PD. Nearly half of the 86 neurologists (48.8%) had no affiliation with an academic institution. The other half reported some type of academic affiliation; 16.3% were full-time faculty, 12.8% part-time faculty, and 18.7% volunteered or had some other academic affiliation. One person did not provide this information.

**Population Comparison**

Comparison between sample characteristics and known characteristics of the population provide some measure of assessing the representativeness of a survey’s sample. In the present case, the American Academy of Neurology’s (AAN) most recent report on the demographics and practice characteristics of their member U.S. neurologists (AAN, 2005) includes demographic and practice setting details that can be compared to the current sample’s characteristics on both gender and practice setting.12

Table 8 reports the gender proportions from the current study’s sample in comparison to the gender proportions from the AAN report (2005). Results of a chi-

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12 The AAN’s 2005 report states that a comparison of AAN members to the American Medical Association’s (AMA) Physician Masterfile listing of neurologists found that the AAN member listing of U.S. neurologists included 78.9% of the Physician Masterfile listing of U.S. neurologists. The AMA Physician Masterfile is considered the most comprehensive listing of all licensed physicians, including both members and non-members of the AMA.
square test indicate that there was no significant difference, $\chi^2(1) = 0.01, p = .92$, between the current sample and the AAN sample with respect to proportions of males or females in the samples.

Table 8
Comparison of U.S. neurologists by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Current sample</th>
<th>AAN (2004)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Male</td>
<td>66 (77.6)</td>
<td>5269 (77.7)</td>
</tr>
<tr>
<td>Female</td>
<td>19 (22.4)</td>
<td>1513 (22.3)</td>
</tr>
<tr>
<td>Total</td>
<td>85 (100.0)</td>
<td>6782 (100.0)</td>
</tr>
</tbody>
</table>

*One respondent did not answer. Sample included U.S. hospital and office-based adult neurologists and movement disorder specialists, who had a clinical practice, treated PD patients, and were aware of DBS surgery. *b* The AAN (2004) reported a 57.9% response rate to the member census. Sample included AAN member U.S. neurologists (all specialties and sub-specialties) both with and without a clinical practice.

Table 9 provides a comparison of neurologist reported practice settings for the current study excluding the two least frequently mentioned categories, 4.7% of respondents (government hospital or clinic, n = 3, and hospital-employed, n = 1), along with the same categories of practice settings from the 2004 AAN report. These practice settings comprised neurology groups, solo practice, multispecialty groups, and university-based groups. A chi-square test for differences between the two groups by practice setting was run and was found significant, $\chi^2(3) = 10.88, p < .05$. Examination of standardized residuals found only one standardized residual larger than 2 and that was for university-based groups among the current study (standardized residual = -2.22). This finding indicates that fewer neurologists who practiced in university-based groups than expected were part of the current study’s sample.

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13 The residual is the difference between the observed score and the expected score, which is then turned into a z-score for the standardized residual.
Table 9
Comparison of U.S. neurologists by practice setting

<table>
<thead>
<tr>
<th>Practice setting</th>
<th>Current sample a</th>
<th>AAN (2004) b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Neurology group</td>
<td>37 (45.7)</td>
<td>1874 (33.4)</td>
</tr>
<tr>
<td>Solo practice</td>
<td>19 (23.5)</td>
<td>1571 (28.0)</td>
</tr>
<tr>
<td>Multispecialty group</td>
<td>14 (17.3)</td>
<td>682 (12.2)</td>
</tr>
<tr>
<td>University-based group</td>
<td>11 (13.6)</td>
<td>1480 (26.4)</td>
</tr>
<tr>
<td>Total</td>
<td>81 (100.0)</td>
<td>5607 (100.0)</td>
</tr>
</tbody>
</table>

a One respondent did not answer. Sample included U.S. hospital and office-based adult neurologists and movement disorder specialists, who had a clinical practice, treated PD patients, and were aware of DBS surgery. b The AAN (2004) reported a 57.9% response rate to the member census. Included AAN member U.S. neurologists (all specialties and sub-specialties) with a clinical practice.

Both comparisons above suggest that the current study’s sample was of a reasonable likeness to the larger population of U.S. neurologists from the AAN.

**Univariate Statistics**

Table 10 presents the means, including both the original measure of intention and the reflected and log10 transformed measure of intention, the standard deviations, median, minimum, and maximum of the study’s major variables after reflection. Pearson’s correlation or Cronbach’s alpha is reported for the study’s major variables where the measure comprised two or more than two question items, respectively. The variables reported in Table 10 also include the predictor variables from the TRA, attitude and subjective norm, perceived behavioral control from the TPB, and the two variables external to the TRA/TPB models, moral norm and role identity.
Table 10
Descriptive Statistics and Pearson’s Correlation or Cronbach’s Alpha for Major Variablesa (N = 86)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>αb</th>
<th>r²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentiond</td>
<td>5.95</td>
<td>1.25</td>
<td>6.00</td>
<td>1.00</td>
<td>7.00</td>
<td>.81</td>
<td></td>
</tr>
<tr>
<td>Intentione</td>
<td>.25</td>
<td>.22</td>
<td>.30</td>
<td>.85</td>
<td>.00</td>
<td>.81</td>
<td></td>
</tr>
<tr>
<td>Attitudef</td>
<td>2.12</td>
<td>1.07</td>
<td>2.00</td>
<td>5.25</td>
<td>1.00</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>SN</td>
<td>2.67</td>
<td>1.12</td>
<td>2.67</td>
<td>6.00</td>
<td>1.00</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>2.06</td>
<td>1.29</td>
<td>2.00</td>
<td>7.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moral normg</td>
<td>2.53</td>
<td>1.26</td>
<td>2.50</td>
<td>7.00</td>
<td>1.00</td>
<td>.76</td>
<td></td>
</tr>
<tr>
<td>Role identityg</td>
<td>2.14</td>
<td>1.31</td>
<td>2.00</td>
<td>7.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Reflected variable, unless otherwise noted. bCronbach’s alpha for measures comprising more than two items. cPearson’s correlation for measures comprising two items. dOriginal behavioral intention measure. The original scale ranged from 1 = not at all likely to 7 = extremely likely. eReflected and log10 transformed intention measure. f Reflected bipolar adjectives included beneficial/detrimental, good/bad, productive/unproductive, and negative/positive. g The reflected scale ranged from 1 = strongly agree to 7 = strongly disagree.

The mean of the original measure of behavioral intention was 5.95 (1 = not at all likely to 7 = extremely likely), indicating that on average the respondents were very likely to intend to initiate a discussion about DBS surgery with the PD patient. After refection and log10 transformation, the mean score on intention was .25 (SD = .22), with scores ranging from .00 to .85.

Overall, the mean scores for the study’s reflected main predictor variables were on the more positive end of the scales, and all were relatively consistent. The mean scores varied from a low of 2.67 (SD = 1.12) for SN to a high of 2.06 (SD = 1.29) for PBC (1 = strongly agree to 7 = strongly disagree). Attitude toward initiating a discussion with a PD patient, based on four pairs of semantic differential items, also was on the more positive end of the scale (M = 2.12, SD = 1.07). In all but two cases,
the study’s variables covered the full range of answer categories, from 1 to 7. The means for attitude ranged from 1.00 to 5.25 and for subjective norm from 1 to 6.

**Bivariate Correlations**

Before proceeding with the main analyses, bivariate correlations between behavioral intention and all predictor variables were assessed. Table 11 reports that all major variables had significant, strong positive correlations with intention to initiate a discussion, based on Cohen’s criteria (1988). The correlations with behavioral intention ranged on the lower end from $r = .52$ for SN and role identity to $r = .83$ for PBC, all $p$s < .001.

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral intention (1)</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude toward the behavior (2)</td>
<td>.643***</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective Norm (3)</td>
<td>.518***</td>
<td>.404***</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Behavioral Control (4)</td>
<td>.826***</td>
<td>.628***</td>
<td>.518***</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MN (5)</td>
<td>.664***</td>
<td>.468***</td>
<td>.493***</td>
<td>.622***</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>RI (6)</td>
<td>.522***</td>
<td>.431***</td>
<td>.277**</td>
<td>.594***</td>
<td>.512***</td>
<td>—</td>
</tr>
</tbody>
</table>

**p < .01. ***p < .001.

The bivariate correlations among all predictors were examined to check for indications of multicollinearity. Table X shows that the bivariate correlations among the predictors ranged from $r = .277$, $p < .01$, between subjective norm and role identity to $r = .628$, $p < .001$, between attitude and PBC, close to Cohen’s (1988) criteria for moderate to strong correlations, respectively. Although, some correlations were relatively strong,
Tabachnick and Fidell (2007) have suggested that correlations would need to reach an exceedingly strong level to warrant concern about multicollinearity. According to Allison (1999), one should be concerned about multicollinearity when tolerance is below .40 and VIF is above 2.5\(^{14}\). Results from the final block in the hierarchical regression did find that PBC had a tolerance of .35 and a VIF of 2.6. However, this block did not prove to be a significant one in the analysis. No other variables had a tolerance or a VIF that approached Allison’s criteria. Given the borderline nature of the multicollinearity, the difficulty in identifying the other variables that combine to create multicollinearity, and the critical nature of PBC to the TPB, the decision was made to proceed and include PBC in the analysis.

**Hypotheses**

Hierarchical linear regression was performed to test the first four hypotheses regarding neurologists’ intention to initiate a discussion of DBS surgery with a PD patient. Predictor variables were entered in four blocks. The first two blocks included the TRA variables, attitude toward the behavior and subjective norm, followed by PBC, from the TPB. The last two blocks examined the effect of personal normative influences on behavioral intention. Moral norm was entered first, and then role identity was entered in the last block.

\(^{14}\) According to Allison (1999), extreme multicollinearity occurs when two predictors are perfect linear combinations of each other. Extreme multicollinearity results in the inability to obtain the related coefficient estimates. Whereas extreme multicollinearity can be recognized because of the inability of statistical programs to estimate regression coefficients, Allison suggests near extreme multicollinearity is more of a concern and harder to detect. To assess for multicollinearity, he recommends that when tolerance is below .40 or when the variance inflation factor is above 2.5 one should be concerned about near extreme multicollinearity.
Before examining the specific hypotheses regarding neurologists initiating a discussion about DBS surgery with a PD patient, findings are examined, first, for evidence that neurologists would consider discussing DBS surgery with a PD patient and, second, for evidence that the hypothetical patient in the clinical scenario adequately portrayed a PD patient fitting neurologists’ criteria for significant disability such that neurologists would discuss DBS surgery with this patient. To the first question, neurologists reported they were very likely to agree that “DBS surgery is a treatment I already plan to discuss with Parkinson’s disease patients I believe are appropriate candidates” (M = 6.03, SD = 1.22; 1=strongly disagree to 7=strongly agree). Suggesting that, in general, the neurologists have enough familiarity with DBS surgery to have formed implementation intentions to discuss DBS surgery with appropriate patients. Furthermore, when asked about past discussion of DBS surgery with a PD patient, 93% of the neurologists responded “yes” that they had discussed DBS surgery with a patient in the past. Indeed, 76.7% of the neurologists in the past had referred a PD patient on for DBS surgery evaluation. Fewer neurologists had ever had at least one patient who had undergone DBS surgery (67.4%), and far fewer had ever themselves or had their staff program a DBS device on one of their own patients (26.7%). Follow-up programming of the DBS device may be done by a neurologist or neurosurgeon member of the multi-specialty team or the referring neurologist or a trained medical staff member.

To the second question, the neurologists agreed that “for this patient, DBS surgery would be an appropriate treatment to consider” (M = 6.02, SD = 0.99; 1=strongly disagree to 7=strongly agree). Additionally, the neurologists for the most
part agreed that “DBS surgery provides an advantage over continuing pharmacological treatment for this Parkinson’s disease patient” (M = 5.63, SD = 1.09). These two results indicate that the clinical scenario’s description of the PD patient adequately has met the neurologists’ internal diagnostic criteria for a PD patient sufficiently disabled that they would consider discussing DBS surgery as a treatment alternative with the patient.

Evidence for Hypothesis 1

Hypothesis 1 stated that attitude toward the behavior and subjective norm, the two TRA determinants, would account for a significant portion of variance in neurologists’ intentions to initiate a discussion about DBS surgery with a PD patient. The model including the two TRA determinants was a good fit, $F(2, 83) = 40.277, p < .001$. As predicted by the hypothesis, Block 1 in Table 12 reports that both attitude ($\beta = .518, p < .001$) and subjective norm ($\beta = .309, p = .001$) were significant predictors of neurologists’ intentions. The model accounted for almost half of the variance in behavioral intention, adjusted $R^2 = .48$. The regression analysis suggests that the more positive the attitude toward initiating the discussion and the greater the perceived social normative influences the greater were neurologists’ intentions to initiate a discussion of DBS surgery with the PD patient. This concurs with the TRA, which holds that both attitude toward the act (initiating a discussion about DBS surgery) and social normative pressures are the two major determinants of behavioral intention and should predict a substantial portion of the variance in behavioral intention. Hypothesis 1 was supported.
Evidence for Hypothesis 2

Hypothesis 2 proposed that PBC, from the TPB, when added to the TRA variables, attitude toward the behavior and subjective norm, would account for a significant increase in the portion of variance explained in neurologists’ intentions to initiate a discussion about DBS surgery with the PD patient. As predicted by the hypothesis, adding PBC to the two TRA determinants increased the ability of the model to predict behavioral intention, $\Delta F(1, 82) = 64.286$, $p < .001$, $\Delta R^2 = .223$. Block 2 in Table 12 indicates that 71% of the variance in neurologists’ intentions to initiate a discussion about DBS surgery was accounted for by attitude and perceived behavioral control (adjusted $R^2 = .71$). That is, adding PBC to the two TRA determinants resulted
in an additional twenty-two percentage points of variance explained in neurologists’ intentions. The addition of PBC ($\beta = .653, p < .001$) to the model led to a reduction in the importance of attitude ($\beta = .191, p = .014$), which remained significant. Unexpectedly, subjective norm ($\beta = .102, ns$) became non-significant.

As the TPB would suggest, the neurologists’ perceptions of behavioral control seem to reflect a context in which the behavior under consideration may not be completely under their volitional control. In this case, the TPB suggests PBC would make a significant contribution to predicting behavioral intention. With the entry of PBC in the model, attitude toward performing the behavior was reduced in importance and the influence of social norms became insignificant. The results indicate that among the neurologists the greater they perceived their behavioral control the greater was their intent to initiate a discussion of DBS surgery with the PD patient. The results support the hypothesis based on the TPB that PBC would significantly increase the ability to predict neurologists’ intentions to discuss DBS surgery with the PD patient.

_Evidence for Hypotheses 3a and 3b_

Hypothesis 3a predicted that attitude toward the behavior would be the strongest predictor of neurologists’ intentions to initiate a discussion about DBS surgery with a PD patient. Hypothesis 3b predicted that PBC would be the next strongest predictor of neurologists’ intentions to initiate a discussion about DBS surgery with a PD patient. One measure of the relative importance of significant predictors is their rank order by size of standardized regression coefficients in the regression of behavioral intention on attitude, subjective norm, and PBC. The results from model 2 in Table 12 indicate that
PBC ranks first in importance in predicting neurologists’ intentions to initiate a
discussion with their PD patients (β = .653), followed by attitude toward the behavior (β
= .191). Subjective norm was not a significant predictor (β = .102).

Additionally, one can examine the squared semi-partial correlations to find the
unique variance that each measure accounts for in the prediction of behavioral intention,
that is, beyond the shared variance accounted for by the combination of the two
measures. Squaring the semi-partial correlations reported in Block 2 of Table 12
provides a means to assess and to compare the unique contribution each measure makes
to the prediction of neurologists’ intention to initiate a discussion of DBS surgery.
These results parallel those of the rank ordering of standardized regression coefficients.
Perceived behavioral control emerged as making the largest unique contribution, 22.3%,
to the prediction of behavioral intention (sr² = .223). Attitude uniquely contributed only
2.19% to the prediction of behavioral intention (sr² = .022).

Finally, the regression coefficient comparison formula described by Kutner et al. (2004, p. 268) provided the means formally to test hypotheses 3a and 3b. The formula
provides a test for significant differences between regression coefficients from within
the same linear multiple regression model. Using the full and reduced regression models
comparison detailed in Kutner et al., the β = .653 for PBC was significantly larger than
the β = .191 for attitude toward the behavior, F*(1,83) = 56.666, p < .001.
Unexpectedly, the results indicated that PBC was significantly more important than
attitude in predicting neurologists’ intentions to initiate a discussion of DBS surgery
with the PD patient.
The TPB proposes that the most important determinants of behavioral intention will vary, for example, based on the behavior under consideration or the population. In the present case, attitude was proposed to be the most important determinant based on a neurologist’s motivation to provide an improved outcome for the patient. Nevertheless, PBC emerged as the most important determinant suggesting that beyond concern for a positive patient outcome, the neurologists’ concern over their ability to have the discussion about DBS surgery took precedence in determining their intentions to discuss DBS surgery with the PD patient. Hypotheses 3a and 3b were not supported.

**Evidence for Hypothesis 4**

Hypothesis 4 predicted that adding moral norm to the model predicting neurologist’s intentions to initiate discussion of DBS surgery would significantly increase the variance explained, and that moral norm would remain significant even after controlling for role identity. Blocks 3 and 4 in Table 12 report the results of the test of this hypothesis. As predicted by the hypothesis, adding moral norm to the model containing the three TPB determinants resulted in a significant increase in the ability of the model to predict neurologists’ intentions, $\Delta F(1, 81) = 7.602, p = .007, \Delta R^2 = .024$, explaining 73% of the variance in intentions. Block 3 reports that the $\beta$ for moral norm was $.207, p = .007$. Following entry of moral norm in the model, the $\beta$ for PBC was reduced to $.561 (p<.001)$. Attitude remained a significant predictor, $\beta = .170, p = .023$, though somewhat smaller than the previous model. Subjective norm was not significant, $\beta = .056, ns$. Even with the addition of moral norm, examination of the standardized
regression coefficients shows that PBC remains the most important predictor in the model.

Block 4 in Table 12 reports that controlling for role identity resulted in no discernable increase in variance accounted for by the model, $\Delta F(1, 80) = .028, ns$. Although, role identity was significantly correlated with behavioral intention ($r = .52, p < .001$), role identity may have been too closely associated with the measure of moral norm to garner any additional variance; the correlation between role identity and moral norm was .51. As reported in the Methods chapter, role identity was a weak second factor in the factor analysis, which showed “personal obligation” and “the ethical thing to do” as the primary moral norm factor. In order to check for an independent effect of role identity, without moral norm entered in the model, a separate regression was run entering only role identity in a block after the TPB determinants, attitude, SN, and PBC. Results showed that after adding role identity to the TPB determinants the new model did not reach significance, $\Delta F(1,81) = .224, ns$. Role identity failed to account for any additional variance in explaining neurologists’ intentions to discuss DBS surgery.\(^{15}\)

The results of these analyses indicate that moral norm added a significant amount of explained variance to the prediction of neurologists’ intentions to initiate a discussion of DBS surgery with the PD patient. This finding suggests that as stated by Schwartz’s (1977) norm activation theory, the neurologists were aware of the consequences to the patient in having the discussion. Further, they felt obligated to inform the patient about DBS surgery as a treatment option. It appears that among the

\(^{15}\) Posthoc power analysis indicated that with the obtained effect size of .0003, $\alpha = .05$, and sample size of 86, the power to detect the effect was only .05. The a priori power analysis had used an estimated effect size of .10 in calculating that a sample size of 92 would be able to detect the effect with $\alpha = .05$ at a power of .85.
neurologists a stronger moral norm indicates that they would be more likely to initiate a discussion of DBS surgery. The additional variance accounted for by moral norms was small but significant. However, Hypothesis 4 was only partially supported. Unlike what had been proposed, role identity failed to contribute explained variance to the model. Therefore, the test controlling for role identity could not be performed.

_Evidence for Hypothesis 5_

Hypothesis 5 predicted that attitude would mediate the influence of beliefs about the target in predicting neurologists’ behavioral intention to initiate a discussion about DBS surgery. Before conducting the regression analyses to test for mediation, the correlations among beliefs about DBS surgery, behavioral intention, and attitude were examined for significance. Principle axis factoring had identified two dimensions of beliefs about DBS surgery, positive and negative beliefs. Therefore, two parallel sets of correlations (for positive beliefs and for negative beliefs) were examined and are reported in Table 13.

Table 13 shows that positive beliefs were significantly correlated with behavioral intention ($r = .634, p < .001$); positive beliefs were significantly correlated with attitude ($r = .537, p < .001$). Finally, the correlation between behavioral intention and attitude also was significant ($r = .643, p < .001$). The five beliefs forming the positive beliefs about DBS surgery included improving the patient’s quality-of-life, reducing her motor symptoms, her use of medications, her dyskinesias, and her on-off fluctuations.
The correlations between negative beliefs and behavioral intention and negative beliefs and attitude, however, were both insignificant ($r = -.060, ns; r = .038, ns$, respectively). Given that negative beliefs were not correlated significantly with two of the measures necessary for a mediation test, the following mediation analysis focuses only on positive beliefs about DBS surgery and attitude as a potential mediator for positive beliefs’ effects on neurologists’ intentions to initiate a discussion of DBS surgery with a PD patient.

The first two regression models tested (1) whether positive beliefs about the target were a significant predictor of the mediator, attitude and (2) whether the mediator, attitude, was a significant predictor of the outcome measure, behavioral intention. Table 14 reports the results from these first two regression models. First, the results of Model 1 reveal that positive beliefs were a significant predictor of attitude, $F(1, 84) = 34.056, p < .001, \beta = .537, p < .001$. Next, in Model 2 attitude was a significant predictor of behavioral intention, $F(1, 84) = 59.066, p < .001, \beta = .643, p < .001$. 

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral intention* (1)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Attitude toward the behavior (2)</td>
<td>—</td>
<td>.643***</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Positive Beliefs about DBS surgery (3)</td>
<td>—</td>
<td>.634***</td>
<td>.537***</td>
<td>—</td>
</tr>
<tr>
<td>Negative Beliefs about DBS surgery (4)</td>
<td>—</td>
<td>.060</td>
<td>—</td>
<td>.038</td>
</tr>
</tbody>
</table>

*** p < 0.001.
Table 14
Linear regressions testing whether attitude mediates the effects of positive beliefs about the target on behavioral intention (N = 86)

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables in Model</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>Adj R²</th>
<th>ΔR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attitude → Positive Beliefs</td>
<td>.650***</td>
<td>.111</td>
<td>.537***</td>
<td>.280</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Intention → Attitude</td>
<td>.132***</td>
<td>.017</td>
<td>.643***</td>
<td>.406</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Intention → Positive Beliefs → Attitude</td>
<td>.158***</td>
<td>.021</td>
<td>.634***</td>
<td>.395</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.101***</td>
<td>.022</td>
<td>.406***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>.087***</td>
<td>.018</td>
<td>.424***</td>
<td>.519</td>
<td></td>
</tr>
</tbody>
</table>

*** p < .001

The third regression model in Table 14 tested whether or not adding the mediator, attitude, to the regression of behavioral intention on positive beliefs about the target resulted in a complete reduction (full mediation) or a partial reduction (partial mediation) in the significance of positive beliefs in predicting behavioral intention. The third model was a multiple hierarchical regression, regressing behavioral intention on positive beliefs in step 1, the reduced model, and adding attitude to the model in step 2, the full model.

Table 14 reports that in the reduced model positive beliefs about DBS were a significant predictor of behavioral intention, \( F(1, 84) = 56.555, p < .001, \beta = .634, p < .001 \). In the second step of the hierarchical regression, the full model shows that adding attitude to the prior model resulted in increased variance explained in behavioral intentions, \( F(1, 83) = 22.634, p < .001, \Delta R^2 = .128 \). Attitude was a significant predictor of behavioral intention, \( \beta = .424, p < .001 \). Most importantly for the test of hypothesis 5, for positive beliefs \( \beta = .406, p < .001 \), was smaller than the \( \beta = .634 \) in the reduced model. However, as the significance of the positive beliefs was not eliminated in the full model, the conclusion is that attitude did not mediate fully the effect of positive beliefs.
on behavioral intentions. Rather, attitude partially mediated the effect of positive beliefs about DBS surgery on neurologists’ intentions to initiate a discussion of DBS surgery.

The Sobel test (1982) provided a means to assess the significance of the indirect effect of positive beliefs about the target through the mediator, attitude, on behavioral intention. The Sobel test was significant, $z = 3.728, p < .001$, indicating that the indirect effect of positive beliefs on behavioral intention was significantly different from zero. Positive beliefs about DBS surgery have an indirect effect through the mediator, attitude, on neurologists’ intentions to initiate a discussion about DBS surgery with the PD patient.

Together these findings only partially support hypothesis 5. Other mediators may potentially exist between positive beliefs about DBS surgery and behavioral intention. Although, one would expect beliefs about the target logically to be mediated by attitude, both involve cognitive processes, it is conceivable that other mediators exist. Furthermore, there is the possibility that a direct path exists between positive beliefs about DBS surgery and behavioral intention.

Evidence for Hypotheses 6a and 6b

Hypothesis 6a predicted that PBC would mediate the effects of benefit certainty and hypothesis 6b predicted that PBC would mediate the effects of perceived knowledge in predicting neurologists’ behavioral intentions to initiate a discussion about DBS surgery with a PD patient. The same approach used for testing hypothesis 5 was used in the testing of hypotheses 6a and 6b.
Before hypotheses testing, correlations were checked for significance among the key variables: behavioral intention, PBC, and both certainty about the benefits of DBS surgery, and perceived knowledge about DBS surgery. The results of examining the correlations are presented in Table 15. For hypothesis 6a, benefit certainty was significantly correlated both with behavioral intention ($r = .675$, $p < .001$) and with PBC ($r = .654$, $p < .001$). For both hypothesis 6a and hypothesis 6b, the correlation between behavioral intention and PBC was significant ($r = .826$, $p < .001$). Finally, the correlations between perceived knowledge and behavioral intention ($r = .598$, $p < .001$) and between perceived knowledge and PBC ($r = .628$, $p < .001$) were significant.

Table 15

<table>
<thead>
<tr>
<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral intention (1)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Perceived behavioral control (2)</td>
<td>.826***</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Benefit certainty (3)</td>
<td>.675***</td>
<td>.654***</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Perceived knowledge (4)</td>
<td>.598***</td>
<td>.628***</td>
<td>.607***</td>
<td>—</td>
</tr>
</tbody>
</table>

*** $p < .001$.

Hypothesis 6a was examined first. The results of the three regressions examining hypothesis 6a appear in Table 16. The first two regression models presented test (1) whether benefit certainty was a significant predictor of the proposed mediator, PBC and (2) whether PBC was a significant predictor of the outcome measure, behavioral intention. The results of the first model reveal that benefit certainty was a significant predictor of attitude, $F(1,84) = 62.877$, $p < .001$, $\beta = .654$, $p < .001$. In the
second model, PBC was a significant predictor of behavioral intention, $F(1, 84) = 180.733, p < .001, \beta = .826, p < .001$.

The third model was a multiple hierarchical regression, regressing behavioral intention on benefit certainty in step 1, the reduced model, and then adding PBC to the model in step 2, the full model. Table 16 reports that in the reduced model benefit certainty was a significant predictor of behavioral intention, $F(1, 84) = 70.258, p < .001, \beta = .675, p < .001$. In the second step of the hierarchical regression, the full model shows that adding PBC to the reduced model resulted in increased variance explained in behavioral intentions, $F(1, 83) = 75.154, p < .001, \Delta R^2 = .259$. Perceived behavioral control was a significant predictor of behavioral intention, $\beta = .673, p < .001$. For the test of hypothesis 6a, the $\beta$ for benefit certainty was .235, $p < .01$. This was less than the $\beta = .675$ for benefit certainty in the prior—reduced—model. However, as the $\beta$ for benefit certainty was still significant, these results suggest that PBC only partially mediated the effect of benefit certainty of DBS surgery on behavioral intentions. Hypothesis 6a was partially supported.

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables in Model</th>
<th>$B$</th>
<th>SE $B$</th>
<th>$\beta$</th>
<th>Adj $R^2$</th>
<th>$\Delta R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PBC $\rightarrow$ Benefit certainty</td>
<td>.841***</td>
<td>.106</td>
<td>.654***</td>
<td>.421</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Intention $\rightarrow$ PBC</td>
<td>.141***</td>
<td>.011</td>
<td>.826***</td>
<td>.679</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Intention $\rightarrow$ Benefit certainty</td>
<td>.148***</td>
<td>.018</td>
<td>.675***</td>
<td>.449</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intention $\rightarrow$ Benefit certainty $\rightarrow$ PBC</td>
<td>.052**</td>
<td>.017</td>
<td>.235**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intention $\rightarrow$ Benefit certainty $\rightarrow$ PBC</td>
<td>.115***</td>
<td>.013</td>
<td>.673***</td>
<td>.707</td>
<td>.259</td>
</tr>
</tbody>
</table>

*** $p < .001$
The result of the Sobel test provides evidence that the indirect path from benefit certainty through PBC to behavioral intention was significant \((z = 5.906, p < .001)\). This finding affirms the role of PBC as a partial mediator of the effects of benefit certainty on neurologists’ intentions to initiate a discussion of DBS surgery with the PD patient.

Hypotheses 6b proposed that PBC also would mediate the effects of perceived knowledge on neurologists’ intentions to initiate a discussion about DBS surgery with a PD patient. Table 17 shows that the first of the three regression models found perceived knowledge significantly predicted PBC, \(F(1,84) = 54.618, p < .001, \beta = .628, p < .001\).

The second regression model reported in Table 17 indicates that PBC significantly predicted behavioral intention, \(F(1,84) = 180.733, p < .001, \beta = .826, p < .001\).

Table 17
Linear regressions testing whether PBC mediates the effects of perceived knowledge about DBS surgery on behavioral intention \((N = 86)\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Variables in Model</th>
<th>B</th>
<th>SE</th>
<th>(\beta)</th>
<th>Adj (R^2)</th>
<th>(\Delta R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PBC (\rightarrow) Perceived knowledge</td>
<td>.633***</td>
<td>.086</td>
<td>.628***</td>
<td>.387</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Intention (\rightarrow) PBC</td>
<td>.141***</td>
<td>.011</td>
<td>.826***</td>
<td>.679</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Intention (\rightarrow) Perceived knowledge</td>
<td>.103***</td>
<td>.015</td>
<td>.598***</td>
<td>.350</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intention (\rightarrow) Perceived knowledge</td>
<td>.022</td>
<td>.013</td>
<td>.130</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(\rightarrow) PBC</td>
<td>.127***</td>
<td>.013</td>
<td>.744***</td>
<td>.686</td>
<td>.336</td>
</tr>
</tbody>
</table>

*** \(p < .001\)

The results of the first step in the hierarchical regression (Model 3) reported in Table 17 show that perceived knowledge significantly predicted neurologists’ intentions to discuss DBS surgery with a PD patient, \(F(1,84) = 46.673, p < .001, \beta = .598, p < .001\). Adding PBC, the proposed mediator, to the full model in step 2 resulted in increased variance explained in behavioral intentions, \(F(1, 83) = 90.791, p < .001,\)
Δ$R^2 = .336$. Perceived behavioral control was a significant predictor of behavioral intention, $\beta = .744$, $p < .001$. As predicted by the hypothesis, the $\beta$ for perceived knowledge was not significant in the full model, $\beta = .130$, $ns$. These results suggest that PBC completely mediated the effect of perceived knowledge on neurologists’ intentions to initiate a discussion of DBS surgery with the PD patient. The results of the Sobel test provide evidence that the indirect path was significant, $z = 5.879$, $p < .001$, affirming the role of PBC as mediator for perceived knowledge in predicting neurologists’ intentions to initiate a discussion of DBS surgery with the patient.

Summary of Hypotheses

As an aid to the reader, Table 18 presents a summary of each hypothesis and whether each hypothesis was or was not supported. The type of evidence presented for each hypothesis is also reported, along with the page number on which the results presentation for the particular hypothesis begins.
Table 18
**Summary of Hypotheses, Results, and Evidence**

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Supported?</th>
<th>Evidence provided</th>
<th>Evidence pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Attitude toward the behavior and SN would account for a significant portion of variance in neurologists’ intentions to initiate a discussion about DBS surgery with a Parkinson’s disease patient.</td>
<td>Yes</td>
<td>Multiple regression of attitude and SN on behavioral intention to initiate a discussion of DBS surgery with the PD patient. Significance of regression coefficients.</td>
<td>77-78</td>
</tr>
<tr>
<td>2. PBC when added to the TRA variables would account for a significant increase in the portion of variance explained in neurologists’ intentions.</td>
<td>Yes</td>
<td>Hierarchical multiple regression of PBC in second block following block one (attitude and SN). Significant change in $R^2$. Subjective norm became insignificant.</td>
<td>78-79</td>
</tr>
<tr>
<td>3a and 3b. Attitude would be the strongest predictor and PBC the second strongest predictor of neurologists’ intentions.</td>
<td>No</td>
<td>Rank order of beta coefficients and unique variance for attitude, PBC, and SN. Regression coefficient comparison test.</td>
<td>79-81</td>
</tr>
<tr>
<td>4. Even after controlling for role identity, moral norm when added to the three main TPB determinants would account for a significant increase in the portion of variance in neurologists’ intentions.</td>
<td>Partially</td>
<td>Hierarchical multiple regression of moral norm in block three and role identity in block four, following the three TPB variables. Significant change in $R^2$.</td>
<td>81-83</td>
</tr>
<tr>
<td>5. Attitude would mediate the influence of positive and negative beliefs about the target in predicting neurologists’ intentions.</td>
<td>Partially</td>
<td>Multiple regression and multiple hierarchical regression, with Sobel test.</td>
<td>83-86</td>
</tr>
<tr>
<td>6a. PBC would mediate the effects of benefit certainty on neurologists’ intentions.</td>
<td>Partially</td>
<td>Multiple regression and multiple hierarchical regression, with Sobel test.</td>
<td>86-89</td>
</tr>
<tr>
<td>6b. PBC would mediate the effects of perceived knowledge on neurologists’ intentions.</td>
<td>Yes</td>
<td>Multiple regression and multiple hierarchical regression, with Sobel test.</td>
<td>89-90</td>
</tr>
</tbody>
</table>
CHAPTER FIVE: DISCUSSION

The present study examined the antecedents of neurologists’ intentions to initiate a discussion of DBS surgery, a medical innovation, with a PD patient who was experiencing disabling movement problems. This research belongs in the stream of work in health communication that examines physician-patient interactions in a medical consultation. Furthermore, this research represents an important effort to understand the physician-patient interaction based on the distinctive behavioral beliefs of the physician, which currently is an understudied and significant area for health communication research.

The overall goal of this research was to examine the psychological determinants that would predict whether neurologists would initiate a discussion of DBS surgery with the disabled patient. For this purpose, the determinants from the TRA and the TPB were tested for their ability to predict the neurologists’ discussion intentions. Then, two extensions to the TPB were examined. Moral norm and role identity, both personal normative influences, were examined for their contribution to increasing the ability of the TPB to predict neurologists’ discussion intentions. Although previous studies of physicians’ behavioral intentions and behavior have used the TPB model of behavior, few of those studies have focused on aspects of physicians’ discussions with patients. None has focused on physician discussions of an innovative medical procedure for patients who have serious disabilities. This final chapter reviews some of the major findings from the present research, discusses limitations that should be considered in
interpreting the research and implications for research on the TPB model and applications to the marketing and health communication campaigns.

**Major Findings**

It was proposed that all three determinants, attitude, subjective norm, and PBC, from the TPB model would predict neurologists’ behavioral intentions and, in particular, that PBC would account for a significantly greater proportion of variance in intentions when added to attitude and subjective norm. Both attitude and subjective norm did emerge as significant predictors in the initial model based on the TRA. Both were positively associated with greater intention to initiate a discussion about DBS surgery. Together they accounted for 48% of the variance in neurologists’ behavioral intentions to discuss DBS surgery with the PD patient.

The addition of PBC significantly increased the amount of variance accounted for in behavioral intentions by 22 percentage points beyond attitude and subjective norm, confirming prior findings of physicians’ discussion intentions (Millstein, 1996). Millstein had found that PBC added 12 percentage points beyond attitude and social norm to the prediction of physicians’ intentions to educate young people about sexually transmitted diseases. The present research clearly shows support for the TPB as a model of neurologists’ behavioral intentions to engage in discussion activities about a treatment innovation with a disabled PD patient. However, the addition of perceived behavioral control to the model led to subjective norm losing its significance as a predictor in the model. Even so, 71% of the variance in discussion intention about DBS surgery was accounted for by attitude and perceived behavioral control.
The failure of subjective norm to remain significant was unexpected given that subjective norm had played a significant role in the prediction of past studies of physicians’ discussion intentions and behavior (Busha, 1998; Foy et al., 2007; Godin et al., 2007; Kelly et al., 2008; Millstein, 1996). Additionally, support for the significant role of subjective norm had come from studies of diffusion of medical innovations (Coleman, Katz, & Menzel, 1966; Burke, Fournier, & Prasad, 2007), which found that physicians’ social networks as well as opinion leaders played an important role in the diffusion of medical innovations. Perhaps as neurologists were given the opportunity to consider their perceived behavioral control over having the discussion about DBS surgery they were more sensitive to the context and content of the doctor-patient discussion that would ensue. The interpersonal discussion between neurologist and patient requires the neurologist to be the expert in DBS surgery in order to answer patient questions, to present benefits and risks, and to facilitate making potential referral and treatment decisions.

Despite the expansion of the subjective norm concept in the present research to include professional influences, as well as the descriptive norm component, it seems that among the surveyed neurologists forming behavioral intentions to initiate a patient discussion of DBS surgery does not rest upon cognitive awareness of social influences. This research combined both the injunctive norm (the expectations others have of you) along with the descriptive norm (the observation of what others do) to measure subjective norm. Furthermore, both important others in general and important others professionally were included in the operationalization of injunctive norm to better reflect the differing realms of important others that may be salient in a context where a
social behavior takes place in a structured professional setting. Trafimow (2000) has suggested that if more behavior-specific referents were included in the measure of subjective norm then more support might be found for the importance of subjective norm. In the present case, an argument could be made for including the expectations of patients along with those already included in subjective norm. Patients may be important referents, for example, in that they likely would expect the neurologist to be aware of the latest treatments for PD. Future research should examine this expansion of subjective norm when studying physicians in clinical treatment settings.

Furthermore, an exploration of additional social influence variables, beyond the subjective norm and the descriptive norm, has found evidence that certain explicit social norms may significantly affect behavioral intentions. In a study of smokers’ quitting intentions, van den Putte, Yzer, & Brunsting (2005) found that explicit verbal norms, e.g., having people tell you that quitting smoking is something you should do, was found to be a significant predictor of the respondents’ intentions to quit smoking. In the present research, this explicit verbal norm could take the form of other neurologist colleagues suggesting to the neurologists that they discuss DBS surgery with their patients. Further examination of explicit verbal social norms in the TPB model is warranted.

A major finding of this research was that perceived behavioral control emerged as the most important predictor of neurologists’ discussion intentions with the PD patient. Perceived behavioral control was significantly more important than attitude was in predicting neurologists’ discussion intentions. It appears that neurologists in contemplating discussing DBS surgery, an innovative medical treatment, are very
responsive to what they perceive to be their own ability to discuss DBS surgery. That is, neurologists’ perceptions of their confidence in initiating a patient discussion of DBS surgery were more significant than their overall attitude about having the discussion. In fact, the findings show that the addition of PBC attenuated the impact of attitude on behavioral intention; although, attitude remained a significant predictor of neurologists’ discussion intentions regarding DBS surgery. However, PBC in the form of confidence in having the discussion, or self-efficacy, was more determinative of neurologists’ behavioral intentions. This finding provides a major insight to the focus training interventions might take in seeking to improve neurologists’ abilities to talk with their patients about DBS treatment benefits and risks.

The present results are not supportive of the view of PBC as having both a control (up to me) and a confidence (self-efficacy) component (Ajzen, 2002; Ajzen & Fishbein, 2005) in this context. The control component was not correlated with behavioral intention ($r = .164, ns$). It may well be that asking neurologists if initiating a discussion were “up to me” failed to capture any variance because the neurologists felt that any management over opportunity and time to have the discussion was too obviously under their control. Whereas, the confidence the neurologists had in having the discussion was highly correlated with behavioral intention ($r = .826$). Greater confidence in having the discussion was associated with greater intent to discuss the surgery with the patient. Further research with physician populations should explore the need for a multi-component measure of PBC.

The importance of PBC in predicting neurologists’ discussion intentions was contrary to the hypothesis that attitude would be the most important predictor. The
hypothesis was predicated upon the assumed importance to a neurologist of weighing the potential outcomes of DBS surgery for the patient. These beliefs about the target (DBS surgery) were proposed to play a significant role in the consideration that neurologists would give to the benefits and risks of DBS surgery before deciding to discuss the treatment with the patient. Indeed the influence of beliefs about DBS surgery’s outcome for the patient on behavioral intention was proposed to be mediated by overall attitude toward the behavior, as would be expected by the TPB model. However, attitude only partially mediated the influence of beliefs (positive beliefs) about DBS surgery on neurologists’ discussion intentions with the patient. This finding leaves open the question of whether beliefs about DBS surgery perhaps either directly influenced neurologists’ discussion intentions or perhaps were mediated by PBC, the strongest predictor of behavioral intention. Further research should explore whether beliefs about the target, exert a direct influence on behavioral intention. In the present case were positive beliefs about DBS surgery to have a direct influence on neurologists’ intentions to discuss DBS surgery, those beliefs would become important targets for any communication campaigns whose goal was to increase neurologists’ discussion of DBS surgery with their PD patients.

The measure of attitude toward the behavior used four semantic differential word pairs (bad/good, positive/negative, beneficial/detrimental, and unproductive/productive) from previous studies of physicians based on the TRA/TPB. The four pairs incorporated semantic differential word pairs focused on evaluations of the behavior, both overall evaluative pairings (bad/good and positive/negative) and more specifically instrumental evaluative pairings (beneficial/detrimental and
unproductive/productive). However, experiential, or affective, items such as pleasant/unpleasant were not included in the measure as has been suggested (Ajzen & Fishbein, 2005). Although, it is unlikely that inclusion of experiential items would have led to attitude becoming the most important predictor over PBC, given what was a large difference in their beta weights, it may have been the case that attitude could have garnered more variance by including an experiential effect. For that matter, given the significance of moral norm in the final model, experiential feelings may well have arisen in response to the feelings associated with a moral obligation.

The difference in importance of PBC over attitude toward the behavior was striking. This research provides some insight to factors that appear to influence neurologists’ PBC in initiating a discussion of DBS surgery with a disabled PD patient. Both certainty of treatment benefit and perceived knowledge were associated with the PBC that the neurologists had in discussing DBS surgery with the patient. Although, benefit certainty was mediated only partially by PBC, perceived knowledge was mediated fully by PBC. From the perspective of the neurologist, both underlying factors would seem to contribute to a neurologist’s feeling of mastery over information necessary to achieve two of the purposes of physician and patient communication (Ong et al., 2000): information exchange and arriving at treatment decisions.

Rogers (2003) suggests that the rate at which an innovation is adopted is influenced by several factors that are perceived about the innovation. This research found that the surveyed neurologists perceived DBS surgery as having a relative advantage over treatment with drugs. However, among other perceived innovation factors are trialability and observability of the innovation. Trialability is the ease with
which an innovation “may be experimented with on a limited basis” and observability is the “degree to which the results of an innovation are visible to others” (Rogers, 2003, p. 266). The limitations of both of these factors may have affected neurologists’ PBC in discussing DBS surgery.

Limited experience among neurologists treating disabled PD patients may be a reason the confidence component of PBC emerged as such a strong predictor of neurologists’ discussion intentions. The interaction level a neurologist has with DBS surgery could vary widely. Among the surveyed neurologists, 67.4% had at least one patient who had undergone DBS surgery. Far fewer (26.7%) had ever programmed or had their staff program an implanted DBS device. The neurologist refers the PD patient on for evaluation by a multi-specialty team of physicians, which will assess the suitability of the patient for DBS surgery. The patient may or may not opt to have the surgery, even if approved for the procedure. The surgery, itself, is performed by a neurosurgeon, and follow-up programming of the device may or may not be done by the referring neurologist.

These facts suggest that for the neurologist encounters with DBS surgery may be limited to pre- and post-surgical procedure discussions with the PD patient. Although, it is certainly the case that as relates to post-operative progress by the patient, the neurologist will garner first hand experience of the consequences of DBS surgery. This limited trialability and observability may mean that unless the neurologist has received training or education about DBS surgery, limited experience and knowledge of the procedure may be factors affecting the neurologist’s confidence in discussing the procedure.
This research also examined extensions to the TPB model’s prediction of social behavior. Two personal normative factors were proposed to have direct effects on neurologists’ behavioral intentions. Both moral norm and role identity were proposed to increase the ability of the TPB to predict neurologists’ discussion intentions with the PD patient. It was also proposed that moral norm would remain significant controlling for the effect of role identity. The rationale behind this proposition was that the unique aspects of moral norm having to do with awareness of consequences to the patient, acknowledgement of responsibility for those consequences, along with a diminished self-interest would find that moral norm would remain significant while controlling for another aspect of personal normative influence. Were this the case, an argument could be made that in contexts where these three factors were likely to exist it would be beneficial to add a measure of moral norm in order to best represent the type of normative factors that should be considered in the TPB.

Of the two personal normative influences, moral norm alone was found to have a significant effect on neurologists’ behavioral intentions. The more likely the neurologists were to agree that discussing DBS surgery with the disabled PD patient was a personal obligation and the ethical thing to do the more likely they were to intend to initiate the discussion. This moral obligation was significant beyond the influence of the neurologists’ perceived behavioral control and attitude toward initiating the discussion. The addition of moral norm resulted in an additional two percentage points in explained variance to the prediction of neurologists’ intentions to initiate a discussion of DBS surgery. This increase was somewhat less than the average increases for moral norm found in the meta-analyses of Rivis and colleagues (2009) and Conner and
Armitage (1998), four and three percentage points, respectively. Although, the increase in variance explained in the present research was small, it represents the influence of a different type of norm from the social norms expected to operate within the TPB model.

Why would moral norm emerge as a significant predictor beyond PBC and attitude toward discussing DBS surgery with the patient? DBS surgery is a treatment for PD currently approved for use in late stage PD when the patient has reached the stage of having serious movement disorders (Pahwa et al., 2006). It is not a cure for PD but a treatment for the debilitating symptoms. As such, DBS surgery is a quality-of-life treatment, offering some symptom relief, if the patient qualifies for the surgery and is willing to undergo DBS surgical implantation. The sense of moral obligation may have arisen from the neurologist’s wish to provide hope for some measure of improvement for the PD patient at this late stage of the disease.

Role identity failed to emerge as a separate personal normative influence on neurologists’ intentions to initiate the discussion. The measure of role identity, that the neurologist would be the person primarily responsible for discussing DBS surgery, was adapted from a measure of perceived role used by Foy et al. (2007), whether one’s own medical professional group was perceived as responsible for the behavior. However, it may be that the measure used did not tap self-expectations or that those expectations had not been integrated into a part of the neurologists’ self-concept. Development of role identity has been associated with repeated instances of past behavior (Charng et al., 1988). This research did show that all the surveyed neurologists had discussed DBS surgery at least once before with a PD patient. This research also indicated that the
neurologists in the sample had varying levels of experience seeing PD patients. Approximately half of the neurologists were on the lower end of the range, seeing from one to fourteen PD patents in a typical month. It may be that those neurologists had few PD patients who were at an advanced stage of the disease and, therefore, had few possibilities for DBS surgery to be considered and discussed as a treatment alternative. Limited experience with discussing DBS surgery repeatedly with patients may be one reason that neurologists did not evidence the influence of role identity.

**Limitations**

The findings of this research were based on a sample of U.S neurologists with office- or hospital-based clinical practices who treated at least one PD patients in a month. Given that the survey was a self-administered mail survey, non-response bias must be raised as a threat to the generalizability of the results to the larger population of those neurologists. Although, personalized mailings, repeated contacts, and two survey modalities were used, the response rate achieved was only 13.9%. This response rate suggests that non-response bias could be a limitation to the generalizability of the research results.

Comparison of the survey’s sample with members of the AAN found no differences by gender, but did find that fewer neurologists who practiced in a university-based setting were part of the current study’s sample. If for example, self-selection occurred and neurologists who worked in a university-based setting were more knowledgeable about DBS surgery but less likely to participate in the survey, the
findings may have underrepresented the views of those neurologists. A proxy measure for non-responders (late responders) showed no difference between early versus late responders on the outcome measure. Yet, it is possible that neurologists who did not participate in the research may have had systematically different views than the participating neurologists. Some caution should be exercised in generalizing this research to the larger population.

A further limitation related to sample size was the lack of power for hypothesizing about interactions among PBC and the other predictors in the model. One could imagine that level of PBC might have interacted with attitude, such that a high level of PBC could have resulted in greater discussion intention for neurologists with more positive attitudes than among those neurologists with a low level of PBC regardless of their attitude. As Yzer (2007) notes, interaction effects involving perceived behavioral control may be particularly difficult to detect in observational surveys with small sample sizes and with predictor variables that are heavily skewed and clustered, that is having limited distributions across both ends of the variables’ scales. In the present research, both small sample size and skewed distributions suggested lack of power to hypothesize and test for such an interaction, or other interaction, effects.

Presenting the neurologists with a clinical scenario had the advantage of using a standard patient to whom the neurologists could respond. However, offering a hypothetical patient in a survey does not reflect the reality of the immediate social interchange with a patient. The hypothetical aspect of the present research design might present another threat to external validity. For example, in comparing hypothetical with
actual domestic violence response behavior, Nabi, Southwell, and Hornik (2002) found that both general and specific beliefs about domestic violence were associated more significantly with intentions to talk to a friend than they were with reported behavior about talking to a friend. The authors also found that self-efficacy beliefs had the highest positive correlation with intentions, while those same beliefs had a weak negative association with reported behavior. It is important to note that clinical scenarios have been used in research with neurologists (Carver et al. 1999, Gifford & Holloway, 1999; Holloway et al. 2000), so that the argument can be made that this type of research approach is within the norm. Nevertheless, these findings should be evaluated with this note of caution.

The focus of the present research was an examination of neurologists’ behavioral intentions to discuss DBS surgery with a disabled PD patient. Intentions are important on their own and because intentions are predictive of future behavior. However, no prospective measure of behavior was undertaken to confirm the prediction of behavior by intentions and PBC. Future research should seek to examine whether physicians’ discussion intentions are able to predict subsequent behavior on the part of those initially observed. There is some evidence that among physicians self-reported measures of discussion intention and PBC predicted self-reported measures of prospective behavior. In Millstein’s (1996) study of physicians’ intention to educate adolescents about sexually transmitted diseases, self-reported intentions predicted self-reported behavior six months later.

As with all self-report measures, social desirability can be a problem with respondents’ answers. Social desirability in question answers occurs when the
respondent perceives that there is a preferred way to answer a question that would make the respondent seem to have the most socially acceptable views. One effect of social desirability could have been that the neurologists were less likely to admit that expectations of others would have influenced their intentions. Given the autonomy with which a physician works, this reluctance to admit the influence of the expectations of others may have hindered the detection of subjective norms among the neurologists. The potential effects of social desirability in self-report measures are important to note. However, measures of the TPB antecedents, attitude, subjective norm and PBC, are dependent on self-report questionnaire items as the best current measures of respondents’ general and specific belief perceptions.

Contributions

This research contributes to the stream of research that explores the ability of the TPB to explain social behaviors in a variety of contexts. In particular, this research sought to tap the personal normative component, which Fishbein (1967) originally included in the TRA, in the context of a physician’s treatment discussion with a patient. The present work also was based on Godin and Kok’s (1996) idea identifying moral norm and role-identity as separate personal normative influences, distinct from the other three determinants that comprise the TPB. A particular focus of this work was establishing that moral norm and role identity separately would affect the neurologists’ intentions to discuss DBS surgery with the disabled PD patient. Although, the results failed to show that beyond the TPB determinants both moral norm and role identity
would emerge as separate predictors of neurologists’ discussion intentions, on its own moral norm significantly contributed to the prediction of neurologists’ discussion intentions.

While exploring the potential role of moral norm as an aspect of self-concept, this research proposed that moral norms would be activated in a context where intended behavior has important and acknowledged consequences for another, and thus self-interest would likely be diminished. One also could imagine situations with differentiated levels of considered consequences for others and varying levels of self-interest that might accompany them. For example, one might propose that regarding the use of condoms for safe sex a stronger sense of moral norm would arise among those people with a long-term partner as opposed to those with casual partners. Research focusing on this boundary condition for moral norms could advance our understanding of contexts in which moral norm might play an important role for predictions of social behavior.

Research employing the TPB determinants and their underlying beliefs provides insight to important antecedents for understanding people’s social behavior that would be fruitful in devising marketing and health communication campaigns. The current research suggests that design efforts for marketing materials and appeals to increase neurologists’ discussion intentions with their disabled PD patients should consider emphasizing neurologists’ PBC, attitudes, and moral norms, beyond the safety and efficacy benefit claims that DBS surgery can make. Given that physicians make the decision to use particular medical devices, most marketing efforts for medical devices likely are focused on personal selling (detailing) and sponsorship of continuing medical
education programs, and the like. Still, from a marketing communication perspective in developing communication campaign materials, e.g., product websites, instructional CDs, collateral materials for detailing calls, educational displays at neurology conferences, and medical journal advertisements, the DBS manufacturer could well enhance the effectiveness of communication messages by emphasizing the educational value of the materials and the increased knowledge and confidence with which the neurologist could approach the next discussion of DBS surgery with a PD patient. Furthermore, noting potential quality-of-life improvements for a disabled PD patient might well activate expectations of moral norms.

Advocates of clinical practice guidelines, or medical treatment implementing evidence-based medicine, have had a growing influence since the late 1980s and early 1990s (Woolf, 1990). Proponents of evidence-based medicine view it as a positive move meant to optimize and standardize patient care and control medical expenses. From this public policy perspective, parties interested in designing interventions to increase the treatment discussion of DBS surgery among neurologists and disabled PD patients would similarly benefit and enhance the effectiveness of any intervention by emphasizing the skills and confidence that increased knowledge of DBS procedures would provide neurologists, as well as the potential for meeting the quality-of-life needs of the disabled PD patient.
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APPENDIX A: ELICITATION SURVEY QUESTIONNAIRE
Specialist Care Survey

Thank you for agreeing to participate in this confidential research study.
For the following questions, please mark the best answer, or write in the information requested.

Section A: Practice Characteristics

1. What is your current PRIMARY area of specialty? (Place X in one box only.)
   - [ ] Child Neurology Skip to bottom of page 7, Section C.
   - [ ] Neurosurgery/Neuroradiology Skip to bottom of page 7, Section C.
   - [ ] Movement Disorder Neurology Continue to Question 2.
   - [ ] Adult Neurology Continue to Question 2.
   - [ ] Other (Please specify) ___________________________ Skip to bottom of page 7, Section C.
   - [ ] Retired Skip to bottom of page 7, Section C.

2. Please indicate in which practice arrangement you spend the MAJORITY of your clinical time. (Place X in one box only.)
   - [ ] Solo Practice Continue to Question 3, next page.
   - [ ] Neurology Group Continue to Question 3, next page.
   - [ ] Multispecialty Group Continue to Question 3, next page.
   - [ ] University-Based Group Continue to Question 3, next page.
   - [ ] Government Hospital or Clinic Continue to Question 3, next page.
   - [ ] Staff-Model HMO Continue to Question 3, next page.
   - [ ] Other clinical setting (Please specify.) ___________________________ Continue to Question 3, next page.
   - [ ] Student/resident/fellowship Skip to bottom of page 7, Section C.
   - [ ] No clinical practice Skip to bottom of page 7, Section C.
3. How many neurologists, including yourself, are in your practice?
   ☐ 1 ☐ 2 to 5 ☐ 6 to 10 ☐ 11 to 20 ☐ More than 20

4. In a typical week, what PERCENT of your time is spent in clinical practice?
   ☐ Less than 10% ☐ 10 to 29% ☐ 30 to 49%
   ☐ 50 to 74% ☐ 75 to 89% ☐ 90% or more

5. In a typical month, how many of your patient visits are with patients diagnosed with Parkinson's disease?
   ☐ None Skip to bottom of page 7, Section C.
   ☐ 1 to 5 Continue to Question 6.
   ☐ 6 to 14 Continue to Question 6.
   ☐ 15 to 24 Continue to Question 6.
   ☐ 25 to 49 Continue to Question 6.
   ☐ 50 to 149 Continue to Question 6.
   ☐ 150 or more Continue to Question 6.

6. Are you aware of Deep Brain Stimulation (DBS) surgery for the treatment of Parkinson's disease?
   ☐ Yes, aware Continue to Section B, below.
   ☐ No, not aware Skip to bottom of page 7, Section C.
   ☐ Don't know Skip to bottom of page 7, Section C.

Section B: Clinical scenario
Imagine that the following Parkinson's disease patient is under your care and answer the next questions in the space provided.

Your patient is a 62-year-old woman with longstanding dopa-responsive idiopathic Parkinson's disease. She is in your office today and demonstrates severe motor fluctuations and levodopa-induced dyskinesias. She has been optimized on her anti-Parkinson's medications, but reports a significantly diminished quality of life because of the disabling motor fluctuations and dyskinesias. She has no significant medical or psychiatric co-morbidities.
Specialist Care Survey

7. How likely is it that you would INITIATE a discussion at this time with the patient about DBS surgery for her Parkinson's motor symptoms? Place an X inside a box to indicate the likelihood of initiating this discussion.

- [ ] Extremely Unlikely
- [ ]               
- [ ]               
- [ ]               
- [ ]               
- [ ]               
- [ ] Extremely Likely

8. Please tell us what other information, if any, you would like to have in order to decide whether to initiate this discussion?


9. In the next questions, we are interested in finding out your thoughts about INITIATING a discussion AT THIS TIME with your patient about DBS surgery for her motor symptoms.

What are BENEFITS or ADVANTAGES of initiating a discussion now with your patient about DBS surgery, either for you or for the patient? Please list each on a separate line.

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10. What are DRAWBACKS or DISADVANTAGES of initiating a discussion now about DBS surgery with your patient, either for you or for the patient? Please list each on a separate line.

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11. What INDIVIDUALS, GROUPS, or GUIDELINES (professional or otherwise) important to you would SUPPORT initiating this discussion now with your patient about DBS surgery? Examples might be – particular people or organizations; professional or practice guidelines; or professional sources. Please list each on a separate line.

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12. On the other hand, what INDIVIDUALS, GROUPS, or GUIDELINES (professional or otherwise) important to you would NOT SUPPORT initiating this discussion with your patient about DBS surgery? Please list each on a separate line.

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13. What FACTORS or RESOURCES would FACILITATE initiating a discussion now with this patient about DBS surgery? Please list each on a separate line below.

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14. What FACTORS or RESOURCES would DETER you from initiating a discussion now about DBS surgery? Please list each on a separate line below.

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15. Are there any other issues we have not asked about that might influence your decision to initiate this discussion about DBS surgery now? Please list each on a separate line below.

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* 

16. Before a patient with Parkinson's motor symptoms is approved for DBS surgery, the patient must be deemed appropriate for the surgery by undergoing a series of tests. How likely is it that you would either REFER this patient now or in the next several months for a pre-surgical work-up and/or you would COMMENCE the pre-surgical work-up yourself for DBS surgery? Place an X inside a box to indicate likelihood.

   Extremely Unlikely   ✔   ✔   ✔   ✔   ✔   ✔   ✔   Extremely Likely

17. After the pre-surgical work-up, if this patient were deemed appropriate for DBS surgery, how likely is it that you would RECOMMEND surgery to this patient? Place an X inside a box to indicate likelihood.

   Extremely Unlikely   ✔   ✔   ✔   ✔   ✔   ✔   ✔   Extremely Likely
Specialist Care Survey

18. At any time in the past, have you ever REFERRED a Parkinson's patient you were managing for a pre-surgical work-up for DBS surgery and/or yourself COMMENCED a pre-surgical work-up for DBS surgery?

☐ Yes → How many patients? ________ (Total number)

☐ No

19. At any time in the past, has a Parkinson's patient you were managing ever been given a pre-surgical work-up and deemed appropriate for DBS surgery?

☐ Yes → How many patients? ________ (Total number)

☐ No

20. At any time in the past, have you ever RECOMMENDED DBS surgery to one of your own patients who was deemed appropriate for DBS surgery?

☐ Yes → How many? ________ (Total number)

☐ No

☐ Does not apply. No patient was deemed appropriate for DBS surgery.

21. Have any of your own patients with Parkinson's disease who were deemed appropriate for DBS surgery undergone DBS surgery?

☐ Yes → How many? ________ (Total number)

☐ No

☐ Does not apply. No patient was deemed appropriate for DBS surgery.

22. For how many of your own patients with Parkinson's disease have you or your clinic staff programmed their DBS device, that is, adjusted their stimulation parameters?

☐ None or does not apply.

☐ 1 to 9

☐ 10 to 24

☐ 25 to 49

☐ 50 to 99

☐ 100 or more

CONTINUE TO NEXT PAGE
Specialist Care Survey

23. How knowledgeable would you say you are about the following topics? Place an X inside a box to indicate how knowledgeable.

a) Peer-reviewed publications about DBS surgery for Parkinson’s motor symptoms?
   Not knowledgeable at all    ??    ??    ??    ??    ??    ??    ??    Extremely knowledgeable

b) The selection of appropriate candidates for pre-operative screening for DBS surgery, based on current standards of clinical practice?
   Not knowledgeable at all    ??    ??    ??    ??    ??    ??    ??    Extremely knowledgeable

c) Pre-operative screening tests that a patient with Parkinson’s disease must pass in order to be deemed appropriate for DBS surgery?
   Not knowledgeable at all    ??    ??    ??    ??    ??    ??    ??    Extremely knowledgeable

24. Did you find any of the above questions difficult to complete or unclear? Please let us know. Any other comments?

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

________________________________________________________________________________

   “SKIP” FROM PREVIOUS PAGE START HERE.

Section C: Demographics

25. Are you affiliated with an academic institution?

☐ Yes  ➔  If yes, ☐ Full-time faculty
          ☐ Part-time faculty
          ☐ Volunteer
          ☐ Other (Please specify) ________________________________

☐ No

CONTINUE TO NEXT PAGE
26. How many years have you practiced in your current primary specialty? ____ (Years)

27. What is your gender?
   [ ] Male
   [ ] Female

28. In what year were you born? 19____

Thank you very much for taking the time to complete this questionnaire. Please return your completed survey in the pre-paid envelope provided to:

Akshay A. Gupte
University of Minnesota
Medical School
Department of Neurosurgery
D-425 Mayo Memorial Building, MMC 96
420 Delaware St SE
Minneapolis, MN 55455

For questions, call Rita Langteau. (612) 724-8327

To request a copy of the survey's preliminary report, please print your name and preferred mailing address below.

Report request (preferred mailing address):

(PRINT)
Name: ______________________________
Practice / Organization: ______________________________
Address: __________________________________________
Address: __________________________________________
City: __________________ State: ______ Zip: ________

Again, thank you very much!
APPENDIX B: MAIN SURVEY QUESTIONNAIRE
University of Minnesota  Specialist Care Survey - Page 1

Thank you for agreeing to participate in this confidential research study. For the following questions, please mark the best answer, or write in the information requested.

Section A: Practice Characteristics

1. What is your current PRIMARY area of specialty?  (Place X in one box only.)
   - Child Neurology  Skip to top of page 8, Section C.
   - Neurosurgery/Neuroradiology  Skip to top of page 8, Section C.
   - Movement Disorder Neurology  Continue to Question 2.
   - Adult Neurology  Continue to Question 2.
   - Retired  Skip to top of page 8, Section C.
   - Other (Please specify.) ___________________________  ➤ Skip to top of page 8, Section C.

2. Please indicate in which practice arrangement you spend the MAJORITY of your clinical time.  (Place X in one box only.)
   - Solo Practice  Continue to Question 3.
   - Neurology Group  Continue to Question 3.
   - Multispecialty Group  Continue to Question 3.
   - University-Based Group  Continue to Question 3.
   - Government Hospital or Clinic  Continue to Question 3.
   - Staff-Model HMO  Continue to Question 3.
   - Other clinical setting (Please specify.) ___________________________  ➤ Continue to Question 3.
   - Student/resident/fellowship  Skip to top of page 8, Section C.
   - No clinical practice  Skip to top of page 8, Section C.

3. How many neurologists, including yourself, are in your practice?
   - 1  2 - 5  6 - 10  11 - 20  More than 20

4. In a typical week, what PERCENT of your time is spent in clinical practice?
   - Less than 10%  10 - 29%  30 - 49%  50 - 74%  75 - 90%  More than 90%

CONTINUE TO NEXT PAGE
5. In a typical month, how many of your patient visits are with patients diagnosed with Parkinson’s disease?

- None
- 1 to 5
- 6 to 14
- 15 to 24
- 25 to 49
- 50 to 149
- 150 or more

6. Over the past year, how many of your own Parkinson’s disease patients have been enrolled in clinical trials of pharmacological treatment for Parkinson’s disease?

   (number of patients)

7. Are you aware of Deep Brain Stimulation (DBS) surgery for the treatment of Parkinson’s disease?

- Yes, aware
- No, not aware / Don’t know

---

Section B: Clinical scenario

Imagine that the following patient with Parkinson’s disease has been under your continuing care.

Your patient is a 62-year-old woman with longstanding dopa-responsive idiopathic Parkinson’s disease. She is in your office today and demonstrates severe motor fluctuations and levodopa-induced dyskinesias. She has been optimized on her anti-Parkinson’s medications. She reports a significantly diminished quality of life because of the disabling motor fluctuations and dyskinesias. She has no significant medical or psychiatric co-morbidities.

Please answer the next questions by circling the NUMBER that best fits your answer, marking one answer only.

8. My intention would be to initiate a DISCUSSION at this time with the patient about DBS surgery for her Parkinson’s motor symptoms.

   - Not at all likely
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - Extremely likely

9. How likely is it that you would refer the patient at this time to a specialist to discuss DBS surgery for her Parkinson’s motor symptoms?

   - Not at all likely
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - Extremely likely

CONTINUE TO NEXT PAGE
10. Before a patient with Parkinson's motor symptoms is approved for DBS surgery, the patient must be deemed appropriate for the surgery by undergoing a series of tests. How likely is it that you would either REFER this patient now or in the next several months for a pre-surgical work-up and/or you would COMMENCE the pre-surgical work-up yourself for DBS surgery?

<table>
<thead>
<tr>
<th>Not at all likely</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>

11. After the pre-surgical work-up, if this patient were deemed appropriate for DBS surgery, how likely is it that you would RECOMMEND surgery to this patient?

<table>
<thead>
<tr>
<th>Not at all likely</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>

12. My initiating a discussion about DBS surgery at this time with the patient is . . .

<table>
<thead>
<tr>
<th>. . . beneficial</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>. . . detrimental</th>
</tr>
</thead>
<tbody>
<tr>
<td>. . . bad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>. . . good</td>
</tr>
<tr>
<td>. . . unproductive</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>. . . productive</td>
</tr>
<tr>
<td>. . . positive</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>. . . negative</td>
</tr>
</tbody>
</table>

13. My initiating a discussion now about DBS surgery with the patient would . . .

<table>
<thead>
<tr>
<th>. . . provide her the opportunity and time to consider surgery.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>. . . mean I may not be able to answer all of her questions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>. . . provides another treatment option.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>. . . frighten her.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>. . . demonstrate my concern for her.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>. . . lead her to think surgery is the only option.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>. . . offer her hope for improvement.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>. . . inform her of a different type of treatment option she may not be aware of.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

14. How likely is it that you would talk to the patient now about DBS surgery for her Parkinson's motor symptoms?

<table>
<thead>
<tr>
<th>Not at all likely</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Extremely likely</th>
</tr>
</thead>
</table>

CONTINUE TO NEXT PAGE
<table>
<thead>
<tr>
<th>University of Minnesota</th>
<th>Specialist Care Survey - Page 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>15. For this patient DBS surgery would...</strong></td>
<td>Strongly disagree</td>
</tr>
<tr>
<td>... be an appropriate treatment to consider.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>... improve her quality of life.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>... reduce her dyskinesias.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>... reduce her on-off fluctuations.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>... bring a risk infection.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>... reduce medication needs.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>... lead to a risk of stroke or intracranial hemorrhage.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>... reduce motor symptoms.</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

| **16. Regarding a discussion about DBS surgery with the patient...** | Strongly disagree | Strongly agree |
| ... I am confident that I could initiate this discussion now. | 1 2 3 4 5 6 7 | |
| ... initiating this discussion now would be completely up to me. | 1 2 3 4 5 6 7 | |

| **17. The following would support my having a discussion about DBS surgery with the patient.** | Strongly disagree | Strongly agree |
| AAN practice parameters / guidelines | 1 2 3 4 5 6 7 | |
| Most people or groups who are important to me professionally | 1 2 3 4 5 6 7 | |
| Educational institutions and organizations promoting treatment of Parkinson's disease | 1 2 3 4 5 6 7 | |
| Respected colleagues in neurology | 1 2 3 4 5 6 7 | |
| Movement disorder specialists | 1 2 3 4 5 6 7 | |
| My practice group or the medical administrators in my facility | 1 2 3 4 5 6 7 | |
| My patients with Parkinson's disease | 1 2 3 4 5 6 7 | |
| Most people or groups whose opinions I value | 1 2 3 4 5 6 7 | |

CONTINUE TO NEXT PAGE
18. In my deciding to discuss DBS surgery with this patient, ...  

<table>
<thead>
<tr>
<th>Description</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>... I have ready access to specialists in movement disorder or DBS surgery.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>... insurance and finances are a concern.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>... I have appropriate informational pieces to give to the patient.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>... I have access to authoritative sources of information (e.g., published literature, medical device information).</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>... the patient should have access to other patients who have had the procedure.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>... the patient should have ready access to an available DBS center.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>... I would like to have more experience.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>... I would consider it a personal obligation to discuss DBS surgery now with this patient</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

19. DBS surgery is a treatment I already plan to discuss with Parkinson’s disease patients I believe are appropriate candidates.  

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

20. I would be the person primarily responsible for initiating a discussion of DBS surgery with this patient.  

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

21. Most neurologists whose opinions I value have initiated discussions about DBS surgery with their Parkinson’s disease patients.  

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

22. DBS surgery provides an advantage over continuing pharmacological treatment for this Parkinson’s disease patient.  

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

23. Discussing DBS surgery now with this patient would be the ethical thing to do.  

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

24. Most neurologists whose opinions I value have suggested that I discuss DBS surgery with my Parkinson’s disease patients.  

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Response Options</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>25. How certain are you about:</td>
<td>Not at all certain</td>
</tr>
<tr>
<td>of the efficacy of DBS surgery for Parkinson’s disease motor symptoms?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>of the safety of DBS surgery for Parkinson’s disease motor symptoms?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>that the benefits of DBS surgery for Parkinson’s disease outweigh the risks?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>26. How knowledgeable would you say you are about:</td>
<td>Not at all knowledgeable</td>
</tr>
<tr>
<td>articles in peer-reviewed publications about DBS surgery for Parkinson’s disease motor symptoms?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>selection of appropriate candidates for pre-operative screening for DBS surgery, based on current standards of clinical practice?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>pre-operative screening tests that a patient with Parkinson’s disease must pass in order to be deemed appropriate for DBS surgery?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>27. Thinking back over the past six months:</td>
<td>Yes</td>
</tr>
<tr>
<td>have you read any peer-reviewed neurology journal articles?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>have any of those articles focused on Parkinson’s disease?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>have any of those same articles on Parkinson’s disease focused on movement disorders in advanced Parkinson’s disease?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>have any of those same articles on Parkinson’s disease focused on DBS surgery as a treatment for advanced Parkinson’s disease movement disorders?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>28. Past information:</td>
<td>Yes</td>
</tr>
<tr>
<td>Did you receive any instruction about DBS surgery for Parkinson’s disease in medical school, residency or during a fellowship?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Have you received training about DBS surgery for Parkinson’s disease since your formal medical training ended?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Over the past year, have you attended any sessions focused on DBS surgery for Parkinson’s disease at professional conferences?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Over the past year, have you attended any industry led seminars on DBS surgery for Parkinson’s disease?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Over the past year, have you received visits from any medical device manufacturer’s representative about a DBS device for Parkinson’s disease?</td>
<td>1 2 3</td>
</tr>
<tr>
<td>Over the past six months, have you seen, read, or heard anything in the news media about DBS surgery as a treatment for Parkinson’s disease movement disorders?</td>
<td>1 2 3</td>
</tr>
</tbody>
</table>

CONTINUE TO NEXT PAGE
29. At any time in the past, have you discussed DBS surgery with a Parkinson's patient you were managing?
   ☐ Yes
   ☐ No

30. At any time in the past, have you referred a Parkinson's patient you were managing for a pre-surgical work-up for DBS surgery and/or yourself commenced a pre-surgical work-up for DBS surgery?
   ☐ Yes   How many patients? ________ (Total number)
   ☐ No

31. At any time in the past, has a Parkinson's patient you were managing been given a pre-surgical work-up and deemed appropriate for DBS surgery?
   ☐ Yes
   ☐ No

32. At any time in the past, have you recommended DBS surgery to one of your own Parkinson's patients who was deemed appropriate for DBS surgery?
   ☐ Yes   How many patients? ________ (Total number)
   ☐ No
   ☐ Does not apply. No patient was deemed appropriate for DBS surgery.

33. Have any of your own patients with Parkinson's disease who were deemed appropriate for DBS surgery undergone DBS surgery?
   ☐ Yes   How many patients? ________ (Total number)
   ☐ No
   ☐ Does not apply. No patient was deemed appropriate for DBS surgery, or the patient(s) declined.

34. For how many of your own patients with Parkinson's disease have you or your clinic staff programmed their DBS device, that is, adjusted their stimulation parameters?
   ☐ None or does not apply.  ☐ 25 to 49
   ☐ 1 to 9   ☐ 50 to 100
   ☐ 10 to 24  ☐ More than 100
Section C: Demographics

35. Are you affiliated with an academic institution?

☐ Yes  ➔ If yes, ☐ Full-time faculty
☐ Part-time faculty
☐ Volunteer
☐ Other (Please specify) __________________________

☐ No

36. How many years have you practiced in your current primary specialty? ________ (Years)

37. What is your gender?

☐ Male  ☐ Female

38. In what year were you born? 19______

Thank you very much for taking the time to complete this questionnaire.

Please return your completed survey in the pre-paid envelope provided to:

Akshay A. Gupta
University of Minnesota
Medical School
Department of Neurosurgery
D-425 Mayo Memorial Building, MMC 96
420 Delaware St SE
Minneapolis, MN 55455

For questions, call Rita Langlau. (612) 724-8327

To request a copy of the survey’s preliminary report, please print your name and preferred mailing address below.

(PRINT)

Name: __________________________

Practice/Organization: __________________________

Address: __________________________

City: __________________________  State: _________ Zip: __________

Again, thank you very much!