## Clinical Focus

# Adherence to Dysphagia Treatment Recommendations: A Conceptual Model

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**Purpose:** Conceptual models of complex health problems are useful when designing targeted clinical interventions and focused research studies. Understanding and studying patient adherence often involves interplay among many factors that influence whether a patient successfully follows recommendations or completes a therapy program. Functional frameworks serve to arrange these factors visually, increasing interpretability and allowing for empirical testing of relationships among concepts. The purpose of this article is to integrate relevant factors from the literature into a comprehensive framework that describes adherence to dysphagia treatment.
**Method:** Using peer-reviewed, published guidelines regarding conceptual model construction, the authors created a list of potential factors that influence patient adherence to dysphagia-related treatment recommendations. During model construction, following extensive review of the literature and existing theories that have been applied in other areas of health care, factors were identified and grouped into conceptually similar domains (clusters). Clusters were arranged into larger categories that emerged during model optimization. Ultimately, two models

were created: one that illustrates the interrelated factors of patient adherence and another that illustrates a subset of modifiable risk factors that a clinical speech-language pathologist may influence when developing a dysphagia treatment plan.
**Results:** Three general categories from 14 factors emerged based on relationships between factors and aspects of patient care: health factors, individual patient factors, and contextual factors. A second model consisting of modifiable risk factors included access, treatment type, patient perceptions, self-efficacy, health literacy, support factors, and provider bias.
**Conclusions:** This conceptual model allows clinicians and researchers to identify and explore the mechanisms driving adherence. Continual refinements of this model should be made as future studies uncover how the interconnectedness of factors affects adherence in dysphagia management. The models we have presented here are ready for clinical application and should also serve researchers as they generate hypotheses and design targeted research questions.

C onceptual models are used to visually represent or diagram relationships among variables in complex systems (Earp & Ennett, 1991; Paranjape & Sadanand, 2010; Rimer & Glanz, 2005). Health care is a

highly complicated system, involving coordination of care from stakeholders at multiple levels including patients, families, physicians, clinicians, technicians, insurance personnel, investors, and many more (Milani & Lavie, 2015; Omachonu & Einspruch, 2010). Providing a conceptual model to describe aspects of health care can be useful when the goal is to develop interventions that target areas of weakness in the system. Specific to patient care, modeling is a useful tool for identifying factors that contribute to accurate diagnosis and successful treatment of medical conditions. By visually depicting factors both known and perceived to affect patient care, clinical researchers are able to identify potential targets for improvement in patient safety and outcomes. While theoretical models have been used frequently in other areas of medicine to assess and target system-wide and individual-level changes, use of modeling in dysphagia research is limited (Rimer & Glanz, 2005).

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The purpose of this article is to (a) provide background on theoretical modeling and define terminology related to theory and model development; (b) explain how models are built and how they are used to address complex questions in clinical care; (c) introduce the utility of modeling as a tool in medical speech-language pathology, specifically within the area of swallowing and swallowing disorders; and (d) propose two visual models of factors involved in patient adherence to dysphagia recommendations.

## Use of Models in Health Care Settings

Models in health care can be constructed using various approaches. A common approach to model construction is to base the foundation of the model in theory. Models can be based on one or more theories, or may draw on specific aspects of theories from a variety of disciplines including psychology, epidemiology, behavioral science, and sociology, among others (Rimer & Glanz, 2005). The U.S. Department of Health and Human Services defines "theory" as "present[ing] a systematic way of understanding events or situations… a set of concepts, definitions, and propositions that explain or predict these events or situations by illustrating the relationships between variables" (p. 4; Rimer & Glanz, 2005). Theoretical constructs that have been well established and thoroughly studied suggest relationships between concepts and variables. Concepts are abstract ideas that are not based in a concrete measurement, whereas variables can be quantified or measured (Kumar, 2019). It can be helpful to use well-developed theories to assist in identifying concepts and variables for inclusion in a model related to a treatment, approach, or intervention. These theories may also explain or suggest relationships among variables within a model, generating possible intervention targets or narrowing concepts to provide a more focused approach. Ultimately, models of complex problems or situations can be influenced by any number of theories to better visualize, define, identify, or explain connections between the variables in question (Rimer & Glanz, 2005). By using models to visually map theoretical concepts, clinicians may better identify modifiable treatment variables, scientists may recognize critical gaps in the literature, and hospital administration personnel may make more informed decisions to improve patient-directed care.

There are several models that are used to target improvements in health care settings. These improvements can range from system-wide changes, such as implementing hand hygiene policies in a hospital or clinic, to improving patient and provider communication on an individual level. For example, Donabedian's structure–process–outcome (SPO) framework puts an emphasis on the individual providers to evaluate the quality of health care that is being provided in a particular space or setting. In the SPO, "structure" refers to settings and physical aspects of the space/environment where health care is provided, "process" indicates provider and patient participation in the actual giving and receiving of care, and "outcome" suggests broad effects of care on patient and population health (Donabedian, 1988). Other models used to target individual patient or provider performance include the Health Belief Model (HBM; Rosenstock, 1974) and Stages of Change (Transtheoretical Model; DiClemente et al., 1991). The HBM was one of the very first models developed from behavioral theories for health care use. It is still widely used to better understand "health-motivation," or why patients do or do not participate in certain health-related activities. (Rimer & Glanz, 2005; Rosenstock, 1974). Six main concepts have been identified to assess a patient's readiness and ability to implement recommendations: (a) perceived susceptibility (belief about chances of getting a condition), (b) perceived severity (belief about seriousness of a condition), (c) perceived benefit (belief about effectiveness of taking action), (d) perceived barriers (belief about costs of taking action), (e) cues to action (factors associated with readiness to take action, or change), and (f) self-efficacy (confidence in one's own ability to take action; Rimer & Glanz, 2005). The HBM has been used in countless areas of health care. Within the first 10 years of its introduction, this framework was used to identify methods to improve patient participation in a range of interventions including self-breast examinations, inoculations, initiatives to decrease drinking and driving, and exercise regimens (Janz & Becker, 1984). Similarly, the Transtheoretical Model has identified five "stages of change" that individuals progress through as they attempt to change a behavior. This model can be applied to a wide range of behaviors including smoking cessation, routine teeth flossing, and daily exercise (DiClemente et al., 1991). The five stages are precontemplation (no intention of taking action), contemplation (intending to take action), preparation (taking steps in the direction of intended behavior), action (changed behavior < 6 months), and maintenance (changed behavior for > 6 months; Rimer & Glanz, 2005).

While the models described above target change at the level of individuals (patients or providers), models can also be used to examine the workings of large systems involving many individuals or groups of individuals. One example of a model that may target system-wide changes would be the Systems Engineering Initiative for Patient Safety (SEIPS) model (Carayon et al., 2006; Holden et al., 2013). The SEIPS framework builds on the ideas of Donabedian's SPO framework. While Donabedian's SPO framework puts an emphasis on the individual performance of clinicians or providers, the SEIPS framework focuses on the structure of a work system as a whole and emphasizes "physical environment, organizational culture and climate, error reporting and analysis, and work design" (Carayon et al., 2006, p. i52). Since its development in 2006, this model has been broadly applied to many health care settings. The SEIPS framework has generated a great deal of research in hospital-based systems engineering, which has led to developments in electronic health records, workflow modeling, nursing process improvement, and patient safety improvement (Holden et al., 2013).

## Modeling in Medical Speech-Language Pathology

Within the field of speech-language pathology, theoretical frameworks have often been used to describe and explain complex processes and pathologies. In speech and language development, theories have been used to explain how infants and young children acquire language knowledge and develop grammatical structure and literacy skills (Catts et al., 2008; Norbury et al., 2019; Paul & Norbury, 2012). However, the use of theoretical frameworks to address complex problems in voice and swallowing treatment is relatively new. Over the last 10 years, the Transtheoretical Model has been applied to the treatment of voice disorders to better understand the challenges surrounding patient adherence in voice therapy implementation (van Leer & Connor, 2012, 2015; van Leer et al., 2008). In the first of these papers (van Leer et al., 2008), the authors use the Transtheoretical Approach to construct a visual model illustrating concepts that may determine patient readiness for participation in voice therapy. Other works in the area of voice have explored specific variables that researchers suspect may influence voice therapy participation or completion. These studies examined whether factors such as self-efficacy, therapeutic alliance, demographics, sex, age, education level, and employment status were related to adherence to a voice therapy regimen (Hapner et al., 2009; Portone et al., 2008; van Leer & Connor, 2012). These studies demonstrate the utility of modeling in identification of factors related to adherence in voice and provide an example of how these methods can be used and extended to other areas of speech-language pathology.

## A Model of Adherence to Dysphagia-Related Recommendations

While theory and modeling have been applied to voice therapy with a focus on patient adherence, these approaches have yet to be applied to dysphagia therapy, specifically. Management of dysphagia is increasingly complex and may require a combination of any number of treatment approaches including diet modification, exercise-based interventions, head and neck posturing and maneuvers, and rate or mealtime routine alterations (Kraaijenga et al., 2014; Lancaster, 2015; Logemann, 1998; McKenna et al., 2017; Sura et al., 2012). Considering the complex and often multifaceted treatment approaches for this disorder, it is not surprising that poor patient adherence has been identified as a prevalent problem in dysphagia management (Krekeler et al., 2017). While this is a known issue, factors that may influence patient adherence have yet to be identified or systematically studied (Wall et al., 2016). Given that treatment efficacy depends on patient follow-through and adherence to recommendations, this is a critical topic to address and target using evidence-based approaches (DiMatteo et al., 2002).

To create a basis for understanding patient adherence to dysphagia-related recommendations, a visual model was developed, illustrating factors identified through literature review and clinical experience. The purpose of this model

is to promote empirical testing of variables that may influence adherence. Building on this broader model, a second, more clinically-focused model was created to aid clinicians in devising an individualized treatment plan for patients who may be at risk for poor adherence. By using data-driven and well-designed studies to empirically test the relationships among the factors presented in these conceptual models and patient adherence, these models can be further refined to allow clinicians to identify significant barriers and facilitators that can be addressed at the onset of therapy to maximize patient success.

## Method

This model of adherence to dysphagia-related recommendations was formed following the guidelines outlined in the U.S. Department of Health and Human Services guide, "Theory at a Glance – A Guide for Health Promotion Practice"(Rimer & Glanz, 2005), and Earp and Ennett's 1991 book chapter titled "Conceptual Models for Health Education Research and Practice" (pp. 163–171).

During model construction, we followed these four steps outlined in the sources above:

1. Identify a desired outcome related to the health condition in question

2. Identify potential modifying factors related to the desired health care outcome

3. Identify relationships between these factors and concepts using the model-building set of rules for use of arrows and boxes that aid in the visualization of connections between these concepts

4. Narrow down concepts and factors to include only relevant concepts

Factors to be considered for inclusion in the model were identified through an extensive and thorough review of English-language literature, where factors were evaluated and incorporated into the model if they were relevant to adherence with treatments in dysphagia or voice, or if they were related to behavioral interventions, exercise interventions, or health care utilization. The literature search was conducted on MEDLINE, PubMed, and Google Scholar using combinations of general search terms that included the following: "adherence", "voice", "swallowing", "dysphagia", "device", "therapy", "treatment", "compliance", "rehabilitation", "recommendations", "bias", "technology", "exercise", "behavior", and "behavior change." All factors related to adherence to exercise-based or behavioral treatments were evaluated for relevance to dysphagia-related treatment adherence (see Table 1 for a summary of literature review). Patient populations were heterogeneous. Studies that were included focused on dysphagia-specific treatment (noted in Table 1), voice treatment, diabetes management programs, physical exercise programs, and treatments for management of chronic illness. Quality of papers included in the literature review were assessed using an adapted quality rating scale (see Table 2; Forrest & Miller,

**Table 1.** Literature review to identify factors related to patient adherence with exercise or behavioral based interventions.

| Factor name | Author(s) (year) | Quality rating | Brief summary of findings |
|---|---|---|---|
| | | **Health factors** | |
| Overall health condition | [a]Cnossen et al. (2014) | 4 | Patient's overall health condition likely contributes to whether patients at risk for dysphagia after head and neck cancer complete a treatment task. |
| | Ducat et al. (2014) | 4 | Individuals with diabetes are at an increased risk for mental health comorbidities which has been shown to compromise adherence to treatment. |
| | Kavookjian et al. (2018) | 3 | Patients with fewer deficits were less likely to participate in voice therapy |
| | [a]Leiter & Windsor (1996) | 4 | Patients with less severe swallowing impairments may not be motivated to participate in therapy. |
| | [a]Duarte et al. (2013) | 4 | Patients with less severe swallowing impairments may be more likely to be lost to follow up. |
| Care setting | [a]Low et al. (2001) | 3 | Patients living at home tend to have lower adherence to swallowing recommendations and care setting (e.g., outpatient vs. inpatient) may affect adherence to treatment. |
| | [a]Shim et al. (2013) | 3 | Admission status (i.e., inpatient, outpatient) was significantly correlated with compliance to a viscosity-modified diet for patients with dysphagia. |
| Access to care | Paez et al. (2009) | 4 | Out-of-pocket spending may affect access to services that are used to treat chronic health conditions, ultimately affecting patient adherence. |
| | Gago et al. (2019) | 3 | Loss to follow-up in women with human papillomavirus may be linked with reduced access to health care services resulting from socio-economic or geographic barriers. |
| | Mashima & Brown (2011) | 4 | Rurality can be a barrier to receiving proper care, telehealth could provide a solution in voice-related treatment. |
| | Edmonds & McGuire (2007) | 4 | Patients who face transportation barriers or live far from the treatment facility are at an increased risk of nonadherence to chemoradiation therapy for head and neck cancer. |
| | Anthony et al. (2009) | 4 | Insurance status, access to regular source of care, socioeconomic status, and social network characteristics contribute to care-seeking tendencies in a large group of Medicare patients. |
| | Smith et al. (2018) | 4 | Many people with various health conditions avoid or delay seeking health care due to potential cost factors, even with insurance. |
| Treatment type, mode of delivery, and technology | [a]Shinn et al. (2013) | 3 | Adherence to swallowing exercises is low and difficult for patients with head and neck cancer to achieve due in part to the amount of effort required to complete them, among other factors. |
| | [a]Krisciunas et al. (2012) | 4 | Dose or intensity of a dysphagia treatment program affects adherence. |
| | Sabaté (2003) | 1 | The dose-response curve illustrates a continuum; therefore, dosage and timing variables are difficult to construct but necessary when defining operational definitions of adherence in a variety of health conditions. |
| | [a]Wall et al. (2016) | 1 | Adherence with exercise treatment programs (prophylactic swallow-related exercises in head and neck cancer) is low but may be influenced by service delivery model. |
| | [a]Cnossen et al. (2014) | 2 | Technology used in dysphagia treatment can be a barrier or a facilitator, depending on the individual patient. |
| | | **Individual patient factors** | |
| Demographics | [a]Cnossen et al. (2017) | 2 | Age does not affect adherence to a prophylactic exercise program to treat dysphagia during treatment for head and neck cancer. |

**Table 1.** *(Continued).*

| Factor name | Author(s) (year) | Quality rating | Brief summary of findings |
|---|---|---|---|
| | McNeely et al. (2012) | 1 | Age, gender, and marital status did not predict shoulder exercise adherence in patients with head and neck cancer. Older patients, women, and unmarried survivors adhered equally well to exercise. |
| | [a]Low et al. (2001) | 3 | Younger patients are more likely to adhere. Marital status, dependents, occupation, residence, gender identification, socioeconomic status, level of education all may affect adherence with dysphagia management. |
| | Pasternak & Thibeault (2019) | 3 | Middle-aged patients (30–39 years) are more likely to initiate treatment for paradoxical vocal fold motion. |
| | Sabaté (2003) | 1 | Marital status, dependents, occupation, residence, gender identification, socioeconomic status, level of education all may affect adherence in a variety of health conditions. |
| Patient personality traits | [a]Constantinescu et al. (2017) | 4 | Pre-illness grit (personality trait describing ability to set and achieve goals despite obstacles) may predict level of patient adherence with swallowing therapy. |
| | Ciechanowski et al. (2001) | 4 | Individuals with type 1 and type 2 diabetes with a dismissing attachment style demonstrated significantly poorer adherence to glucose monitoring. |
| | DiMatteo et al. (2000) | 1 | Patients with depression are less likely to adhere with medical treatment regimens. |
| | Kaplan & Simon (1990) | 4 | Personality traits are poor predictors of adherence, but patients themselves can accurately predict their own level of adherence in a review of various health conditions. |
| Patient perceptions | [a]Shinn et al. (2013) | 3 | Patients with poor insight into swallowing deficits (e.g., silent aspiration) may be less likely to buy into therapy. |
| | Janz & Becker (1984) | 1 | Perceived susceptibility (perception of risk of contracting a condition), perceived severity (patient's understanding of consequences of differing levels of illness severity), and perceived benefit (how much the patient believes a therapy will benefit them) may affect adherence in a variety of health conditions. |
| | Abbott et al. (1996) | 4 | A patient's level of concern or worry about their condition was related to level of adherence, but perceived susceptibility was not in patients with cystic fibrosis. |
| | Kirscht & Rosenstock (1977) | 4 | Perceived susceptibility, perceived severity, perceived benefit were found to be associated with adherence to a hypertension management regimen. |
| | Sabaté (2003) | 1 | Patient must be able to perceive benefit from intervention for adherence to be maintained in various health conditions. |
| | [a]Colodny (2005) | 4 | Prolonged denial of a disease/condition can prevent a patient from seeking and participating in dysphagia treatment. |
| | Alsan et al. (2019) | 1 | Black men were more likely to seek preventative treatment from a Black physician for cardiovascular screenings and flu vaccines. |
| | Cajigal & Scudder (2017) | 4 | Patients of various health conditions reported avoiding a provider because of the provider's personality characteristics. |
| Self-efficacy | Bandura (1982) | 4 | Self-efficacy may predict adherence more so than belief about whether the treatment is beneficial (perceived benefit). |
| | Graffigna et al. (2017) | 4 | Patient activation (combination of knowledge, skill and confidence to manage health actions) is a predictor of medication and physical therapy adherence. |
| | Skolasky et al. (2008) | 2 | Patient Activation Measure scores were positively correlated with attendance and engagement in physical therapy after lumbar spine surgery. |
| Readiness for change | Prochaska & Velicer (1997) | 4 | Transtheoretical model of health behavior change includes moving through six stages: precontemplation, contemplation, preparation, action, maintenance, and termination. Matching intervention with stage of behavior change may promote participation in health-related treatments. |
| Motivation | Husebø et al. (2013) | 1 | The theory of planned behavior and transtheoretical model of behavior change are important contributors to understanding patient motivation as it relates to adherence with exercise in patients with cancer. |
| | Chan et al. (2009) | 4 | |

*(table continues)*

**Table 1.** *(Continued).*

| Factor name | Author(s) (year) | Quality rating | Brief summary of findings |
|---|---|---|---|
| | | | In patients undergoing rehabilitation after reconstructive anterior cruciate ligament surgery, autonomous motivation (intrinsic) was positively related to good adherence, as was receiving autonomy support from the therapist. |
| | Williams et al. (1998) | 2 | Patients with diabetes were more motivated to regulate their glucose levels when health care providers promoted patient autonomy. |
| Level of health literacy | Parker (2000) | 4 | People with poor health literacy have lower self-care skills, as studied in populations of individuals with diabetes. |
| Technological knowledge and competence | Gell et al. (2015) | 4 | Use of technology in older adults varies based on health and sociodemographic status. Although access to the internet is improving for older adults, a large percentage (> 50%) are still not accessing the internet. |
| | Constantinescu et al. (2017) | 4 | Knowledge of technology can contribute to whether or not someone will enroll in a technology-based program involving use of gaming. |
| | Mackert et al. (2016) | 4 | People with low health literacy are less likely to use health information technology tools. |
| | | | **Contextual factors** |
| Provider traits | Ciechanowski et al. (2001) | 4 | Dismissing attachment in individuals with diabetes who experience poor patient–provider communication is associated with poorer adherence to treatment. |
| | DiMatteo (1994) | 4 | Collaboration between patient and health care provider during treatment planning and implementation fosters treatment adherence in various health conditions. |
| | Graffigna et al. (2017) | 4 | Quality of the patient/doctor relationship affects the level of patient activation in individuals with chronic health conditions. |
| | Sabaté (2003) | 1 | Patient–provider relationship is an important factor in helping the patient overcome barriers to good adherence with recommendations for various health conditions. |
| | Vermeire et al. (2001) | 4 | The multifactorial relationship between doctor and patient is difficult to assess and measure, but appears to be an important variable in adherence to treatment for chronic illnesses. |
| | Lutfey & Ketcham (2005) | 4 | Providers make inferences regarding a patient's level of adherence based on observable characteristics, particularly age and race. There is evidence to suggest providers are more uncertain regarding the adherence of black patients with diabetes. |
| | Greer et al. (2014) | 4 | The interaction between systemic racism and perceived provider racial biases affect treatment adherence for African American patients enrolled in hypertension management programs. |
| Community and social support | [a]Cnossen et al. (2014) | 2 | Patients who were employed had trouble finding a socially acceptable time or place to complete their dysphagia treatment exercise. |
| | Jack et al. (2010) | 1 | Poor social or family support is a barrier to adherence with physical exercise interventions. |
| | [a]Ekberg et al. (2002) | 4 | People with dysphagia avoid eating around others socially, which might impact their willingness to use recommendations for safe swallowing. |
| Caregiver support | [a]Crawford et al. (2007) | 4 | A higher level of adherence with dysphagia recommendations was observed in individuals with intellectual disabilities who had more experienced care workers. |
| | [a]Chadwick et al. (2003) | 2 | Individuals with intellectual disabilities who were able to feed themselves had lower adherence with dysphagia recommendations as compared to individuals who were fed by a caregiver. |
| | Feil et al. (2009) | 4 | Presence of cognitive impairment is related to low adherence but caregiver support did not help improve adherence with a diabetes management program including diet, exercise, blood glucose, and medication management. |

[a]Indicates primary study where voice or swallowing was the focus.

**Table 2.** Quality assessment of research designs.

| Levels of evidence | Description |
|---|---|
| 1 | Clinical Practice Guidelines, Meta-analyses & Systematic-Reviews, Randomized Controlled Trials |
| 2 | Cohort Studies |
| 3 | Case Control Studies, Retrospective Cohort Studies |
| 4 | Case Report or Case Series, Cross-Sectional Studies, Surveys, Qualitative Interview Studies, Narrative Review, Expert Opinion, Editorials |
| 5 | Animal and Laboratory Studies |

*Note.* Adapted from JAMA Quality Rating Scale for Studies and Other Evidence (www.jamanetwork.com) and Forrest & Miller (2016).

2016). Two of the authors (B. N. K. and K. V.) independently rated articles included in the literature review using the adapted rating scale; if discrepancies were found between ratings, a unanimous consensus was reached to determine the final rating.

Clinical experience and theories were used to supplement identification of factors through literature review, as discussed above, and included use of the HBM, Transtheoretical Model (Stages of Change), and Andersen's concept of mutability (Andersen, 1995; DiClemente et al., 1991; Rosenstock, 1974). Then, factors identified through these sources were organized using a thematic approach. First, groups of interrelated factors were arranged into clusters, which were then organized into larger categories that emerged based on how the factors were related to each other (within a cluster and between clusters). Larger categories were adjusted and refined by evaluating individual factors across clusters and categories to ensure proper fit. The final conceptual model framework was arranged once categories were optimized and consensus between three of the authors (B. N. K., K. V., and N. R.-P.) was reached. Factors were excluded only if there was unanimous agreement among all three reviewers (B. N. K., K. V., and N. R.-P.).

Ultimately, two models were created. The first model provides a comprehensive overview of all the factors identified during the development and consensus meetings; the second was designed to illustrate a subset of factors that a clinical speech-language pathologist may be able to modify or influence when developing a dysphagia management plan. This second model was created to encourage clinicians and providers to consider which factors are "modifiable" and which factors are considered more "fixed," or not modifiable, for each patient.

## Results

### Main Model of Adherence

Factors related to adherence are represented in Figure 1. Factors identified in consensus meetings were grouped into three overall categories: health factors, individual patient factors, and contextual factors. As indicated in Figure 1, all of the factors listed in these three categories are likely interrelated. It is impossible to consider a factor within one category in isolation without considering the cumulative effects from other factors.

### Health Factors

Health factors involve aspects of a patient's medical condition. Some of these factors are fixed (unchanging) while other factors are modifiable. Factors within this category include overall health condition, care setting, access to care, treatment type, and mode of delivery and technology.

**Overall Health Condition**

*Primary diagnosis or etiology of dysphagia.* A patient's overall physical condition is likely a contributing factor to completion of treatment tasks (Cnossen et al., 2014). For example, if stroke is the primary cause of dysphagia, subsequent language deficits and barriers related to this primary diagnosis may affect the patient's ability to participate in therapy.

*Comorbidities.* Depending upon the primary diagnosis, a host of comorbid conditions could be present that potentially impact a patient's ability or desire to participate in a therapy program, including cognitive deficits (Ducat et al., 2014). Furthermore, treatment adherence to one health condition may vary from that of another health condition. That is, just because a patient has high adherence to therapy for one specific primary or secondary diagnosis does not guarantee that adherence will be the same for a different comorbidity and/or treatment intervention.

*Severity of deficits.* Studies in voice and swallowing therapy have shown that severity of deficit does affect adherence (Kavookjian et al., 2018; Leiter & Windsor, 1996). For example, patients who have mild dysphagia may be at a greater risk for drop out because they are less motivated to follow recommendations if they are not experiencing swallowing issues (Duarte et al., 2013). That is, a patient with more severe dysphagia experiencing significant symptom burden may be more likely to adhere to a treatment protocol because they are motivated by the potential treatment benefits (Sabaté, 2003). This is supported in the voice literature in that patients with less severe deficits were less likely to attend voice therapy (Kavookjian et al., 2018). Actual severity of deficits may be perceived by each individual patient differently. For example, perception may vary based on previous personal experience with other health-related conditions (see below further discussion of factors related to patient perceptions).

Figure 1. Main model of adherence. Factors identified related to adherence were grouped into categories related to patient health, individual patient characteristics, and contextual factors. These factors related to adherence and categories emerged through the iterative process of literature review and conceptual model construction. The continuum arrow across the bottom of each factor group represents the influence factors can have across and between categories. That is, factors in each of these three categories do not stand in isolation but more than likely cross over and influence, or are influenced, by factors in other categories. Any factor listed in this model can likely serve as a barrier or as a facilitator to adherence, depending on each individual patient's situation within the context of these factors.
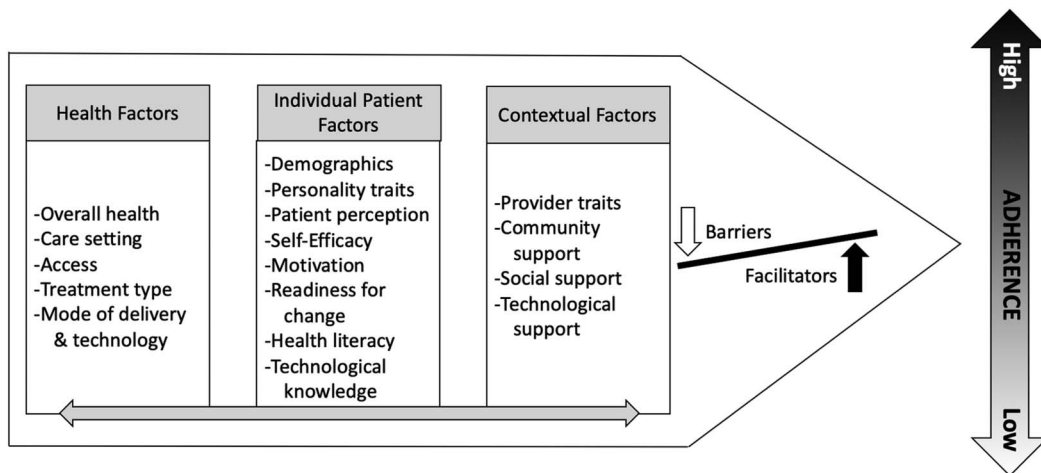


## Care Setting

*Care setting.* Adherence to treatment may be affected by care setting (outpatient, inpatient, rehabilitation center, skilled nursing facility, etc.) as the patient may be receiving care on a short-term versus long-term basis (Low et al., 2001; Shim et al., 2013). Care setting also relates to the environment in terms of level of support, supervision, assistance, and access to therapy. Patients living at home have been shown to have lower adherence rates to the recommended swallowing management program (Low et al., 2001).

## Access to Care

*Insurance.* Financial and insured access to care can be a challenge in today's ever-evolving public health system. Certain specialty clinics may only be covered for a limited number of sessions, after which the patient must pay out of pocket (Paez et al., 2009). If the allowed amount of therapy sessions is insufficient for the time needed to initiate and follow up with a therapy program, the likelihood of program completion may be affected.

*Proximity.* For some individuals living in rural areas, physical distance from care can be a significant barrier to receiving quality care (Mashima & Brown, 2011). Patients who live farther from clinics or in rural settings may be less likely to keep appointments; therefore, they may be at a greater risk of poor adherence to treatment recommendations (Edmonds & McGuire, 2007).

*Utilization.* Even if patients are insured, have financial means, and proximal access to care, some individuals still may not utilize care that is available to them (Anthony et al., 2009; Smith et al., 2018). Low utilization of care could result in lower adherence if patients are not seeking or following through with treatment, despite having full access. This is a prime example that, even if one factor (access to care) is serving as a facilitator, another factor in a different category may be an even greater barrier to treatment adherence.

## Treatment Type

*Type of treatment.* Type of treatment (i.e., exercise, diet modification, posturing, change in mealtime routines, tactile cues, or any combination of these treatment modalities) has been shown to impact level of patient adherence (Shinn et al., 2013; Wall et al., 2016). Some individuals may be more inclined to complete exercise maneuvers over implementing diet changes, or vice versa, depending on individual patient factors described below (patient personality traits, perceptions, etc.). Dose or intensity of the treatment program has also been shown to affect adherence levels in dysphagia treatment (Krisciunas et al., 2012; Sabaté, 2003).

## Mode of Treatment Delivery and Technology

*Treatment delivery mode.* Treatment delivery mode is likely to have an impact on general adherence. Therapy sessions may involve one-on-one coaching, or they may be performed at home. For example, an exercise program could be accessed at home via the web, or via an exercise-facilitating device. One study in prophylactic treatment of head and neck cancer found that, during the first few weeks of chemoradiation treatment, in-person sessions promoted better patient adherence than at-home therapy (Wall et al., 2016). An area that has yet to be fully explored is group-based dysphagia treatment, which may be a facilitator for some individuals seeking more social or community support.

*Use of technology.* The provider may also consider the use of technology in a treatment program. Interestingly, the use of technology to support dysphagia treatment has been cited by some studies as both a barrier and a facilitator (Cnossen et al., 2014; Krekeler et al., 2017). Technology may facilitate regular communication and follow-up with the provider through telephone contact and webcam teletherapy. Additionally, an exercise device capable of automatically tracking and displaying patient progress may be motivating for the patient and would allow the clinician to objectively measure adherence. Some device-facilitated programs also use biofeedback as a tool to ensure accurate completion of each exercise (surface electromyography, Iowa Oral Performance Instrument, etc.). However, use of technology as a treatment modality can also serve as a barrier if the patient has limited technological knowledge or experience.

### Individual Patient Factors

Individual patient factors are characteristics or traits that are intrinsic to the patient themselves. These factors include traits that can be dynamic (changing throughout a person's life) and traits that are more static (unchanging). Many, if not all, of these factors tend to influence one another. Therefore, it is difficult to consider one individual trait independently without considering its relationship with other traits in this category.

#### Demographics

*Stable factors.* These are factors that are determined at birth and include factors such as age, sex at birth, ethnicity, and race. These characteristics are commonly thought to influence a variety of a patient's life experiences and perceptions. However, the current literature base reports mixed findings with respect to the influence of these factors on adherence to treatment. Some studies report that age does not affect adherence (Cnossen et al., 2017; McNeely et al., 2012); however, another suggests younger patients are less likely to adhere to treatment (Low et al., 2001). Yet another recent study in voice suggests that patients aged 30–39 years are the least likely to initiate voice treatment for paradoxical vocal fold motion (Pasternak & Thibeault, 2019).

*Dynamic factors.* These are factors that can change throughout life, such as marital status, dependents, occupation, residence, gender identification, socioeconomic status, level of education, and place of residence. Similarly, to stable factors, there are mixed results reporting the effects of dynamic factors on patient adherence medical recommendations (Low et al., 2001; McNeely et al., 2012; Sabaté, 2003).

#### Patient Personality Traits

*Personality traits.* There are many personality traits that likely influence adherence. One study describes the effect *pre-illness grit* may have on patient adherence to a treatment protocol (Constantinescu et al., 2017). Grit has been defined as the "perseverance and passion for long term goals" (Duckworth et al., 2007, p. 1087). Patients with higher levels of pre-illness grit may have already learned that perseverance to a task, despite instances of failure or plateau, results in positive change (Constantinescu et al., 2017). Other traits such as *dismissing attachment* (self-reliant, positive view of self but discomfort connecting with or trusting others) and depression were associated with significantly worse adherence (Ciechanowski et al., 2001; DiMatteo et al., 2000). However, not all researchers agree that personality influences adherence. One review article (Kaplan & Simon, 1990) claims that, while personality traits are not good predictors of adherence, patients themselves are accurate in predicting their own level of adherence prior to the onset of therapy.

#### Patient Perceptions

These include factors that relate to how well the patient is able to understand or perceive information about themselves or about their health condition such as:

*Insight into deficits.* If patients do not have insight into their swallowing problem, they are unlikely to adhere to a treatment program. This has been reported as the most common reason for nonadherence to the prescribed swallowing exercise program (Shinn et al., 2013). For example, a patient who is silently aspirating may be less likely to believe they have a swallowing problem as they are not regularly experiencing common symptoms of dysphagia (i.e., coughing with oral intake).

*Perceived susceptibility.* The HBM describes perceived susceptibility as perception of risk of contracting a condition. Perception of susceptibility has been identified as a potential factor that may affect adherence (Janz & Becker, 1984). Level of adherence may depend on the patient's belief in their own susceptibility, or ability to be subjected to, the consequences of dysphagia (aspiration pneumonia, choking, etc.). However, this may be dependent on the condition and is multifactorial. For example, one study examining adherence to recommendations for cystic fibrosis management found no relationship between perceived susceptibility and adherence, but did find that patients who were more "worried" about their condition had better adherence (Abbott et al., 1996).

*Perceived severity.* Another component of the HBM, perceived severity, is related to where the patient believes their illness lies on the spectrum of severity in relation to others with the same condition. This differs from actual severity of the illness because it represents the patient's understanding of how variations in severity may change likelihood of consequences of their illness/condition and what may happen if it goes untreated (Janz & Becker, 1984; Jones et al., 2014). For example, one study of adherence to recommendations for hypertension management found a relationship between perceived severity and adherence (Kirscht & Rosenstock, 1977). The way an individual perceives the severity of their illness may be either a barrier or facilitator of adherence, but likely depends on the specific medical condition and treatment in question. This has yet to be systematically studied in dysphagia, but should be considered as a potential influential factor in future research.

*Perceived benefit.* This is a factor described in the HBM that represents how feasible and effective the patient believes the treatment protocol is in reducing or preventing the condition (Janz & Becker, 1984). Furthermore, it has also been postulated that benefit from an intervention must be perceptible by the patient for adherence to continue (Sabaté, 2003).

*Stage of grief.* The social-cognitive transition model can be used to describe a patient's response to a diagnosis (Colodny, 2005). Since dysphagia is typically a secondary diagnosis caused by an underlying etiology, these patients are often coping with two or more serious and often life-altering diagnoses. Patients with dysphagia may experience denial, often subconsciously elicited to combat depression and changes in mood. While denial can initially serve a protective role, prolonged denial can prevent the patient from seeking and retaining information and recommendations regarding treatment (Colodny, 2005). Conversely, a patient who has entered the acceptance stage may be more open to participating in discussion, education, and treatment options related to dysphagia.

*Patient biases about providers.* Patients may exhibit racial, gender, ethnic, or religious bias that may affect their desire to participate in therapy or follow recommendations. One study found that black men in Oakland, California, were more likely to opt for certain preventive services when they met with a Black physician than with a non-Black physician (Alsan et al., 2019). A recent WebMD survey of 934 consumers and 822 physicians revealed that 59% of physicians who responded reported hearing an offensive remark about their personal characteristics or background from a patient within the past 5 years (Cajigal & Scudder, 2017). In that study, one third of patients reported that, within the past 5 years, they had avoided a provider based on one of the provider's personal characteristics, or that they would have avoided a provider if the situation arose.

## Self-Efficacy

Self-efficacy has been defined as "the belief that one can successfully perform desired behaviors" (Desharnais et al., 1986, p. 1156). Self-efficacy may determine whether one attempts a task, the conviction and determination behind the task, and task success (Desharnais et al., 1986). It may be a greater determinant of adherence than expected outcome or benefits (Bandura, 1982). Differing from, but related to, self-efficacy is *patient activation*, defined as "having the knowledge, skills, and confidence to manage one's health" (Greene & Hibbard, 2012, p. 520). Self-efficacy is related to patient self-perceptions regarding a specific condition; patient activation relates to knowledge, skill sets, and self-assurance about an individual's ability to manage or maintain their health, but is not specific to any disease state or condition (McCusker et al., 2016). Activation has been measured through administration of the Patient Activation Measure, a valid and reliable measure with good psychometric properties (Hibbard et al., 2004). Literature demonstrates the significant effect patient activation has

with adherence to physical therapy (Graffigna et al., 2017; Skolasky et al., 2008).

## Readiness for Change

The five "stages of change" of the Transtheoretical Model suggest that behavior modification occurs through a series of five stages (Prochaska & Velicer, 1997):

1. Precontemplation - Not ready to make change and do not intend to take action in the next 6 months

2. Contemplation - Ready to make change within the next 6 months

3. Preparation - Ready to make change in the next month

4. Action - Made specific changes within the past 6 months

5. Maintenance - Made specific changes and are working to prevent relapse

Authors of the Transtheoretical Model suggest that it may take a considerable amount of time for a person to progress to the Preparation and Action stages. Multiple unsuccessful attempts at the Precontemplation stage can lead to resistance, demoralization, and lack of motivation to change (Prochaska & Velicer, 1997). Additionally, many people can become "stuck" in the Contemplation stage if they consider the benefits and drawbacks of change to be equal. To transition to the Preparation or Action stage, the person needs to perceive greater benefits than drawbacks to change (Prochaska & Velicer, 1997). If a patient is not at this stage, adherence to the treatment protocol may be significantly lower. On the contrary, if the patient perceives greater benefits to participation in therapy, adherence to the treatment program may be more likely.

## Motivation

Different from self-efficacy, motivation is also a factor that has been explored in rehabilitation literature as it relates to patient adherence. Linked to readiness for change, motivation is considered to be near the later stages of behavior change (Husebø et al., 2013). Motivation can be either intrinsic or extrinsic. Intrinsic motivation, also called "autonomous motivation," is defined as participating in an activity, for example, therapy, for the enjoyment that comes from performing that action or being genuinely interested in the activity (Ryan & Deci, 2000). Extrinsic motivation is less well defined, but generally equates to performing an action in order to achieve some specific benefit or outcome (Chan et al., 2009; Ryan & Deci, 2000). Depending on the patient population and type of treatment being considered, either intrinsic or extrinsic motivation is likely to be involved in level of patient adherence. Conclusions from one meta-analysis studying factors that predict adherence to an exercise program in patients with cancer indicate that external motivational factors might be more important than intrinsic motivation in this patient population (Husebø et al., 2013). However, other studies suggest that, when internal or autonomous motivation is encouraged

and supported, patient adherence will increase (Chan et al., 2009; Williams et al., 1998). This suggests that patient motivation could be a fluid factor that can be bolstered through clinical or family support.

## Level of Health Literacy

Low health literacy has been associated with poorer self-care skills and knowledge of condition in patients who have asthma, hypertension, or diabetes (Parker, 2000). Providers should use simple verbal explanations of essential information when providing information to the patient (Parker, 2000). Ultimately, health literacy affects many of the patient perceptions that can influence adherence such as insight into deficits, perceived benefit, and perceived severity.

## Technological Knowledge and Competence

Depending on the patient's age, exposure to, and prior experience with technology, technology may serve as a facilitator or barrier to adherence to a treatment protocol. A study examining older adults in the United States found that technology use varied significantly by health and sociodemographic status (Gell et al., 2015). Though the percentage of older adults accessing the Internet in 2011 (42.7%) is greater than the percentage of adults accessing the Internet in 2003 (an estimated 37%; Wright & Hill, 2009), the majority of older adults are still not using the internet (Gell et al., 2015).

Technological knowledge may contribute to consideration of enrollment in a device-facilitated dysphagia treatment program or even participation in an app-based treatment program with gaming elements (Constantinescu et al., 2017). Ease in navigating technology can also affect a patient's ability to schedule and reschedule appointments through online health portals (e.g., MyChart). Technological knowledge and access may also contribute to a patient's level of health literacy. Health information technology uses electronic tools such as mobile applications and patient portals to make health information available to patients. One study showed that the patients less likely to use health information technology tools were patients with low health literacy (Mackert et al., 2016).

## Contextual Factors

Contextual factors refer to other environmental traits that surround and influence the individual patient factors and contribute to the health-related factors. These include provider traits and characteristics, community and social support, and caregiver-specific support.

## Provider Traits

*Personality.* A provider's intrinsic personality traits may impact the nature of the relationship between provider and patient. This relationship has been shown to impact adherence, either positively or negatively (Ciechanowski et al., 2001; DiMatteo, 1994; Graffigna et al., 2017; Sabaté, 2003; Vermeire et al., 2001).

*Bias.* Provider bias has been shown to impact patient care. Providers may be likely to make inferences about a patient's level of adherence based on that individual's age and race (Lutfey & Ketcham, 2005). Relatedly, patients are less likely to adhere if they feel discriminated against in a health care setting (Greer et al., 2014).

*Clinical expertise.* Clinical expertise and experience also may impact patient adherence. It is possible that, the more patients a provider has encountered, the more experience the clinician has with varied patient personalities, different approaches to fostering patient success, and general clinical experience to enhance patient performance. Independent of clinical experience is also clinical approach, that is, how the clinician interacts with patients on a personal and/or professional level. For example, some clinicians may take a more direct approach giving personal opinions, providing education, or giving feedback on performance, whereas other clinicians may use others approaches. Thus, the provider's individual approach to treatment administration is likely to impact patient success in treatment. These areas of provider expertise and approach have not been well studied in both dysphagia treatment and other health care regimens, but may be important contributing factors. However, researchers have offered recommendations to guide clinical approaches encourage patient adherence (see DiMatteo et al., 2012).

## Community and Social Support

Social support, especially in dysphagia treatment, is likely to play a role in patient success in carrying out recommendations. One study showed that patients who were employed had trouble finding time in the workday to complete their exercises or had trouble completing the exercises at home due to social barriers (Cnossen et al., 2014). In that same study, social support served as a facilitator if partners or family members are encouraged or even participated in the exercise with the patient. Poor social or family support has been shown to be a strong barrier to adherence in physical exercise interventions (Jack et al., 2010). It is no surprise that individuals with dysphagia have reported avoiding eating around others socially (Ekberg et al., 2002), which may impact a patient's willingness to follow through with recommendations regarding solid or liquid texture modification, posturing, or supplemental tube feeding. Family members and friends who are openly supportive of these changes in mealtime and exercise routines may improve an individual's adherence to these recommendations outside of the hospital setting.

## Caregiver Support and Technological Support

For some patients, caregiver support is paramount in their treatment success, particularly for individuals with cognitive impairments or physical challenges that may prevent them from following recommendations on their own. Furthermore, if the patient has difficulty independently using the equipment or technology required for their treatment, the caregiver must take on a supportive role for technology use as well. However, many caregivers are older

adults themselves and may have their own challenges in filling this supportive role. The role of caregiver support is complex and multifactorial, and research findings are mixed regarding role of caregiver in various contexts. Within dysphagia-specific treatment, one study found that patients with intellectual impairments who had more skilled caregivers had higher adherence, but not statistically significantly higher (Crawford et al., 2007). Another study of adherence to dysphagia recommendations in people with intellectual disabilities demonstrated that care setting and being self-fed versus caregiver fed were significantly related to adherence (Chadwick et al., 2003). This suggests the interrelationship between caregiver support and other potential factors of adherence (i.e., "Care Setting"). A study of adherence to a diabetes management program (diet, exercise, blood glucose, medication) also revealed that presence of a cognitive impairment was predictive of low adherence (Feil et al., 2009). However, this study also found that support from a caregiver did not improve adherence (Feil et al., 2009). These findings may suggest that the level of caregiver training may be more important than the presence or absence of a caregiver alone. Ultimately, more research in these areas is needed to better understand these relationships.

## Sub-model of Adherence-Fixed and Modifiable Factors

In addition to developing the broad model of adherence (see Figure 1), we also identified factors from this broader model that clinicians can identify, consider, and potentially influence when providing patient care. This model was specially developed to help clinicians identify factors they may be able to impact and facilitate during treatment planning and execution. This model (see Figure 2) depicts "fixed factors" and "modifiable factors" that can and should be considered during treatment planning.

Fixed factors include those from the broader model that the clinicians themselves cannot affect or change. These include features such as overall health condition, care setting, patient demographics, and patient personality traits. However, there are many factors that the clinician does have the capability or potential to modify (modifiable factors):

*Access to care.* While some aspects of care access are not within the clinician's control (e.g., care setting, as this is ultimately determined by the physician), speech-language pathologists are able to advocate for their patients and encourage care utilization by offering different treatment modalities as warranted. For example, offering telehealth treatment sessions or follow-up telephone calls may improve access to care for patients who are not proximal to the provider's location.

*Treatment type.* The speech-language pathologist has complete authority over the type of treatment selected to address the patient's swallowing impairment. Treatments may be compensatory in nature, rehabilitative, or both. Some clinicians frequently recommend thickeners or modified textures to reduce instances of aspiration without also considering rehabilitative interventions that address long-term changes in swallowing physiology. These rehabilitative interventions can be used in conjunction with compensatory approaches (e.g., dietary modification). For some patients, working toward a goal of improved swallowing biomechanics may be more motivating than the thought of prolonged use of thickened liquids. To improve adherence, the provider should actively work to identify the patient's wishes and discuss appropriate treatment options before generating an individualized treatment plan that both addresses the impairment and aligns with patient preferences and goals of care.

*Patient perceptions, health literacy, and self-efficacy.* Patient perceptions of health conditions are often tied to level of health literacy (Parker, 2000) or how well the patient understands or comprehends their diagnos(e)s. The HBM is built largely on this idea that a patient's perception or understating of the "threat" posed by their diagnosis, as well as the benefits of preventing or avoiding the threat, has a direct effect on their decision to act or carry out a treatment plan (Rimer & Glanz, 2005). Patient perception also plays deeply into the concept of self-efficacy. If a patient does not believe they will be capable of following through with a recommendation, they are less likely to attempt the treatment. The patient's perception of the impairment is directly related to how well they understand the information they receive from the provider. As a provider, the speech-language pathologist can consider the patient's level of health literacy and be sure to communicate at an appropriate level conducive to understanding (Chew et al., 2004). There is a large body of research outlining strategies to improve patient–provider interactions when challenged by low health literacy (Parker, 2000). In addition to appropriate communication with the patient, use of strategies to discuss and promote goal-directed and goal-oriented behaviors (i.e., motivational interviewing) could improve understanding and adherence (Rubak et al., 2005).

*Motivation.* In addition to motivational interviewing and conveying information in a clear, concise, and understandable manner, providers can support patient intrinsic motivation, or autonomy, by creating a patient-centered environment (Williams et al., 1998). In doing this, clinicians should acknowledge that the patient's choice matters, recognize and validate the patient's emotions, and remove pressure to perform therapy actions in order to promote a more intrinsically motivating environment (Williams et al., 1998).

*Community and support factors.* While the clinician is unable to harness complete control of community and family support, speech-language pathologists can provide recommendations and resources such as local support groups (web- or community-based), ways to incorporate recommendations into social settings, and even encourage family members or friends to attend therapy sessions to improve understanding of the swallowing impairments and corresponding treatment.

*Provider bias.* It is well known that implicit biases of the provider can negatively affect decisions regarding patient care and overall patient adherence (Hall et al., 2015). Given that these biases are largely implicit subconscious

**Figure 2.** Clinician-centered submodel of adherence. This model breaks down individual factors identified in the main model to help clinicians identify which factors may be under their locus of control during therapy planning. These include "fixed" and "modifiable" factors, where fixed factors refer to specific items out of clinician control (e.g., care setting is usually ordered by a medical doctor) and modifiable factors include items that the clinicians themselves may be able to identify and use to support patient adherence during implementation of a therapy plan. Fixed factors should be considered prior to deciding which modifiable factors the clinician may target to support adherence.
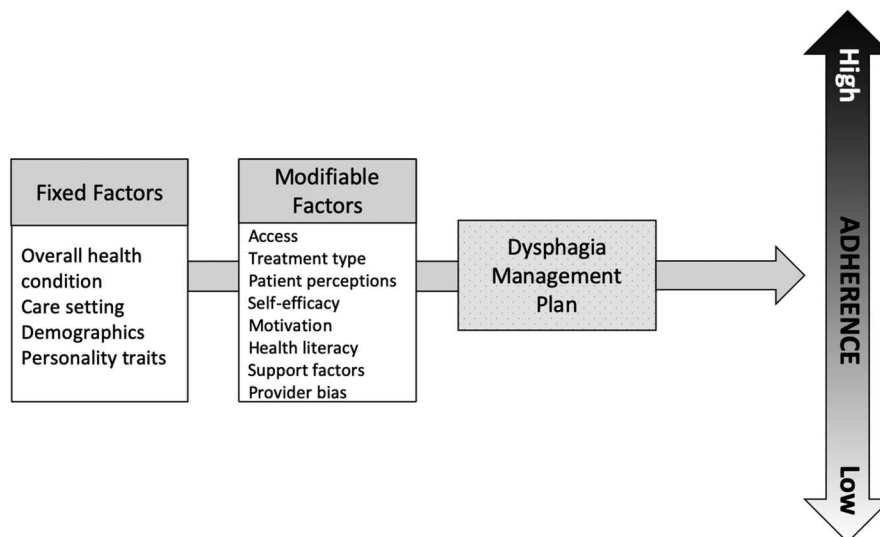


habits of mind, it may seem that they cannot be changed. However, providers are able to work on recognizing these biases and improve interactions with patients once these biases are addressed (Forscher et al., 2017). Recommendations based on social cognitive theory have aided providers in dealing with these biases to improve relationships and communication with patients (Burgess et al., 2007).

## Discussion

In this article, we have proposed two visual models mapping factors that have been shown to either influence or potentially influence patient adherence to dysphagia-related treatment recommendations. These models are grounded in theory, informed by the literature surrounding adherence in dysphagia and other related areas (exercise, behavioral-based treatments, health care utilization), and are supplemented by clinical expertise. However, these models are not concrete; they are meant to serve as a platform on which future research endeavors can build. Adherence research in dysphagia management is relatively new compared to the 50-year history of adherence in health care more broadly (DiMatteo et al., 2002; Krekeler et al., 2017). Thus, many of these factors have yet to be empirically tested to determine whether they influence patient adherence to dysphagia-related recommendations. The benefit of using a visual model to represent these complex factors is that it can illustrate a dynamic, ongoing process. These models are meant to be plastic and easily reshaped as they are informed by new empirical evidence and changing standards of patient care. Factors may be added, altered, deleted, or supported as research in this area continues to grow.

Given the novelty of this area, the future directions for use of this model are extensive. First, elements within the model must be empirically tested. This can be approached in many ways, but it will be necessary to produce high-quality studies that examine factors that serve as barriers or facilitators to patient adherence. More than likely, qualitative or mixed-methods studies will be necessary to fully appreciate the relationships between factors and their effects on adherence. Other methods might involve large clinical trials that track patient adherence to recommendations. These large trials collect patient demographic information, which would be useful in testing whether intrinsic patient factors are associated with level of patient adherence.

Consideration of model factors to drive change in clinical practice is another aspect to consider in future investigation. Even after the model is further developed, implementation of this knowledge will still be a challenge. The first step in applying or integrating a model into a health system is to identify specific patient- or provider-based behaviors to target for change (Fishbein & Yzer, 2003). This can occur at an individual or system level of care. It may begin with individual clinicians identifying their own biases and habits related to patient communication and interaction. At a systems level, it may be necessary to analyze the way an entire clinic or group of staff relays and carries out recommendations. Regardless of the level, behaviors can be targeted, and interventions can be trialed to see if encouraging facilitating factors and reducing barriers improves patient adherence. Through the use of this clinically applicable model (see Figure 2), we are hopeful that speech-language pathologists can identify potential modifiable factors when creating a therapy plan.

## Conclusions

This conceptual model of adherence can serve as a framework to help organize, define, and categorize the drivers that may be affecting adherence to a dysphagia-related treatment program. This model is rooted in theory, informed by clinical expertise and consensus, and will ultimately need to be scientifically tested and refined over time as new evidence emerges. The ultimate purpose of the submodel is to serve as a clinically useful tool when devising treatment plans for patients at an increased risk of low adherence. Although preliminary, the purpose of these models are to serve as a starting point in recognizing the areas we can influence as dysphagia therapists to provide the highest level of care with our patients.

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