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An Ecological Model of Factors Contributing to Adult's Adherence to Dietary
Recommendations in Dysphagia Management

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Abstract

Purpose: The purpose of this study was to develop a preliminary ecological model of factors affecting adherence to dysphagia dietary recommendations grounded in the currently available dysphagia literature and guided by the general healthcare literature.

Methods: A rapid review of two electronic databases was conducted in April 2021. Searches were limited to English-language empirical studies published in peer-reviewed journals that explored adherence specifically to dysphagia dietary recommendations.

Results: The literature search resulted in 930 unique abstracts, of which 14 articles were accepted. Multiple factors were identified as having an influence on adherence. Based on the guiding framework of an ecological model, these factors were grouped into three levels: the individual, the caregiver, and the environment. The dysphagia-specific factors were then compared to those affecting adherence in the general healthcare literature. A visual model incorporating the dysphagia- and healthcare-related factors, or the “Ecological Model of Factors Affecting Adherence in Dysphagia and Healthcare”, was subsequently developed.

Conclusions: Improving adherence to dysphagia dietary recommendations is crucial for the improved outcomes. The ecological model can serve as a tool for speech-language pathologists in their clinical practice to identify those factors that contribute to adherence, including factors that may be modifiable. Targeting interventions at increasing the likelihood of adherence will maximize the effectiveness of these recommendations for individuals with dysphagia.

Keywords: dysphagia; swallowing; deglutition; compliance; adherence; ecological model

1 **Introduction**

2 Dysphagia is a prevalent and debilitating health condition, estimated to occur in
3 approximately 8% of the population worldwide (Cichero et al., 2017) and up to 91% of the
4 population aged 70 years of age or older (Ortega et al., 2017). The significant physical and
5 emotional consequences of the disease can markedly reduce quality of life and increase
6 mortality (Guyomard et al., 2009; Ekberg et al., 2002). Dysphagia can lead to dehydration,
7 malnutrition, failure to thrive, and aspiration pneumonia, all of which can lead to death
8 (Chadwick et al., 2002; Namasivayam-MacDonald et al., 2017). Eating and drinking during
9 mealtimes are also important components of daily social interaction and relationships (e.g.,
10 Mintz & Du Bois, 2002). Cultural rituals and celebrations, such as birthdays and holidays,
11 and other social gatherings often involve food and drink. Individuals diagnosed with
12 dysphagia may have difficulty participating in such social interactions or they might avoid, or
13 be excluded from, being part of these events completely (McQuestion et al., 2011; Patterson
14 et al., 2013). In addition, dysphagia can strip away the pleasure associated with mealtimes,
15 resulting in individuals eating as a matter of necessity and hunger only (Ullrich & Crichton,
16 2015).

17 In light of these negative consequences of dysphagia on the individual, speech-
18 language pathologists (SLPs) are challenged to provide the most effective interventions
19 possible. A variety of treatments are used in dysphagia management, including dietary
20 modifications, postural adjustments, and rehabilitative exercises (Groher & Crary, 2020;
21 Suiter & Gosa, 2019). Diet modification has become a fundamental aspect of treatment of
22 both acute and chronic dysphagia for many speech-language pathologists (Carnaby &
23 Harenberg, 2013; Garcia & Chambers, 2010; Ney et al., 2009; Sura et al., 2012). Diet
24 modification refers to the processes of changing food and liquid consistency (Garcia &
25 Chambers, 2010). Often the goal in using diet modification is to prevent the occurrence of
26 adverse events, such as aspiration pneumonia or choking, and to ensure adequate nutrition

27 (Sura et al., 2012). It has been reported that approximately 28 – 47% of residents living in
28 nursing homes receive modified diets (Castellanos, 2004; Vucea, 2019).

29 However, for such a compensatory dysphagia intervention to be effective, patient
30 compliance and/or adherence is needed (Low et al., 2001). While frequently used
31 interchangeably in the literature, compliance refers to the extent to which a patient
32 consistently follows healthcare advice and recommendations (Soares, 2009), whereas
33 adherence acknowledges and incorporates the effect of personal knowledge, motivation and
34 social context on the extent to which a patient follows agreed upon recommendations
35 (McKay & Verhagen, 2015). In other words, adherence is thought to be more patient-
36 centered than compliance as the healthcare plan is built upon a mutual agreement between the
37 clinician and patient. Thus, the concept of adherence will be the focus in this paper.

38 Ultimately, in order for dietary modifications to meet the intervention goals of increased oral
39 intake and the prevention of negative consequences, adherence is needed and patients must
40 actually be consuming the recommended modified textured food and drinks. Yet, not all
41 patients follow these recommendations. For example, one study reported that 21% of their
42 140-person sample did not follow the swallowing recommendations of the SLP (Low et al,
43 2001). Another study revealed a non-adherence rate of 43.5% to modified diets (Shim et al.,
44 2013). In addition, some individuals with dysphagia are dependent on their caregivers and
45 healthcare providers (e.g., nursing staff) for following these recommendations due to
46 cognitive and physical limitations (Krekeler et al., 2018). Yet still, adherence is not fully
47 achieved. For example, Chadwick et al. (2003) revealed that the average compliance rate of
48 caregivers was 76.9%.

49 Decreased adherence is not limited to dysphagia management alone. Even with the
50 availability of effective and efficacious therapies for many health conditions more generally,
51 complications and mortality still commonly occur, suggesting the likely important
52 contribution of adherence (Jan et al., 2011; Low et al., 2001). Research suggests that higher

53 patient adherence can result in up to 26% better treatment outcomes (Berry et al., 2008).
54 Better understanding the factors related to adherence, particularly modifiable factors that
55 target barriers to adherence, can ultimately improve intervention effectiveness and health
56 outcomes. Given the frequent use of diet modifications, in light of the challenges with
57 implementation, it is important to investigate what factors may increase adherence.

58 **Factors Influencing Adherence**

59 The combination of a variety of internal (e.g., motivation, buy-in) and external (e.g.,
60 staff and social support) factors ultimately contribute to adherence rates across dysphagia
61 treatment recommendations (Krekeler et al., 2018). However, few studies have investigated
62 adherence to dysphagia recommendations related to diet modifications and aspiration
63 precautions, and even fewer have focused on adherence as the primary outcome. Across the
64 available studies, though, a number of factors have been suggested to be related to adherence
65 that could serve as useful treatment targets or indicators of increased risk of nonadherence.
66 Patients' mental health status has been identified as a factor influencing the degree of patient
67 adherence (Colodny, 2005; Seshadri et al., 2018). Patients who are in denial of their
68 swallowing impairment or those who are feeling angry and demonstrate aggression toward
69 others might be less adherent to the recommendations made by the SLP (Colodny, 2005).
70 Other mental health factors, such as anxiety, fear, and social embarrassment have also been
71 found to have a negative influence on adherence levels (Seshadri et al., 2018). Additional
72 eating-related factors, such as dissatisfaction with modified diets and lack of supervision,
73 have also been suggested to hinder adherence (Colodny, 2005; Low et al., 2001; McCurtin et
74 al., 2018; Shim et al., 2013). Further, patients' degree of knowledge regarding the
75 recommendations influence adherence (Chadwick et al., 2003; Low et al., 2001; Rosenvinge
76 & Starke, 2005; Seshadri et al., 2018). Interestingly, many of these factors can yield both a
77 negative and positive effect on adherence, depending on how they are implemented. Finally,
78 the presence of other health factors that co-exist with dysphagia may decrease adherence

79 levels, such as multiple chronic conditions and sensory impairments (Leiter & Windsor,
80 1996).

81 Conversely, adherence to healthcare recommendations more broadly has been
82 frequently studied and therefore offers additional insight into what factors may play a role in
83 dysphagia management. In particular, the literature exploring adherence to dietary and
84 medication consumption recommendations may be most relevant to dysphagia. One of the
85 most significant factors that has been suggested to play a role is a patient's knowledge of the
86 benefit of the suggested recommendations (Herrema et al., 2018; Khambati et al., 2017),
87 similar to findings in the dysphagia-specific literature regarding knowledge of the
88 recommendations (Chadwick et al., 2003; Low et al., 2001; Rosenvinge & Starke, 2005;
89 Seshadri et al., 2018). For example, Lum et al. (2018) identified the main cause of medication
90 nonadherence to be a patient's perception of how important the medication recommendation
91 was as compared to others. Similarly, they found that caregiver perception of importance was
92 also a main contributor to medication nonadherence (Lum et al., 2018). Thus, both patient
93 and caregiver beliefs regarding which aspects of care are most important affects which
94 recommendations are most likely to be followed. Patient educational level also plays a role in
95 adherence; patients with higher educational levels tend to be more likely to follow healthcare
96 recommendations, which could be related to increased knowledge of health consequences
97 and increased trust in the healthcare system (Yilmaz & Colak, 2018). In addition, involving
98 the patient in the decision-making process has a significantly positive effect on improving
99 adherence (Herrema et al., 2018; Mikulka, 2016). For example, the more a recommendation
100 fits with a patient's everyday life routine, the more willing the patient is to make the
101 necessary changes (Herrema et al., 2018). Furthermore, patient adherence to recommended
102 foods, in particular, is affected by the patient's preferences regarding taste, texture, and smell
103 (Herrema et al., 2018; Mikulka, 2016), mapping onto the dissatisfaction patients with

104 dysphagia have reported regarding modified foods and liquids (Colodny, 2005; McCurtin et
105 al., 2018; Shim et al., 2013).

106 Another contributing factor for adherence identified in the healthcare literature is
107 cognitive abilities (Guimaraes et al., 2015). Higher levels of cognition are associated with
108 higher levels of adherence and vice versa. Mental health and specific cognitive factors also
109 appear to contribute to adherence, in line with previous findings in the dysphagia literature
110 (Colodny, 2005; Seshadri et al., 2018). For example, Stringham et al. (2018) identified that
111 anxiety and posttraumatic stress (PTSD) have a significant effect on decreased adherence for
112 medication use among veterans. Positive caregiver support has been found to increase patient
113 motivation, encouraging patients to follow clinical recommendations (Pereira et. al., 2015).
114 Conversely, negative support provided from the caregiver can significantly decrease
115 adherence. For example, if a caregiver is feeling depressed or stressed, it can negatively
116 influence the patient, decreasing the patient's motivation and willingness to follow
117 recommendations. Similarly, caregivers working outside the home is predictive of decreased
118 swallow-related QOL and is hypothesized to be related to a lack of ability to provide support
119 for meal needs as frequently (Guimaraes, et al., 2015).

120 Other factors external to the patient and caregiver also appear to influence adherence.
121 The physician-patient relationship is one such important factor (Berry et al., 2008; Endevelt,
122 & Gesser-Edelsburg, 2014). Physicians that spend more time getting to know their patients
123 are able to develop stronger rapport and trust with their patients (Berry et al., 2008). This
124 allows those physicians to develop a more individualized treatment approach while
125 considering their patients' cultural differences. Thus, a stronger relationship is often
126 associated with greater adherence with recommendations. Additional support can also be
127 beneficial. For example, health professionals providing counseling sessions to their patients
128 was associated with increased adherence (Zhao et al., 2018). Cost of treatment has also been
129 found to influence adherence, with increased cost being associated with decreased adherence

130 (Stringham et al., 2018). Finally, a team approach can be very effective in managing multiple
131 patient conditions, consequently improving overall adherence (Kapoor et al., 2016).

132 **Creating a Model-Based Framework to Understand Adherence**

133 Adherence is ultimately a complex human behavior that is influenced by a number of
134 internal and external variables, particularly in dysphagia management (Krekeler et al., 2018;
135 2020). Given this complexity, the use of model-driven intervention approaches that can
136 support a better understanding of patient adherence in dysphagia management has been
137 previously suggested (Krekeler et al., 2020). While more commonly used in other
138 subdisciplines, model development in dysphagia is still relatively new. Krekeler and
139 colleagues (2020) developed a conceptual model for adherence to dysphagia treatment
140 recommendations. Based on their review of the literature, the authors identified 14 factors
141 affecting adherence to dysphagia treatment recommendations, grouped across three broad
142 categories (health factors, patient factors, contextual factors). Based on these findings, the
143 authors were able to generate two related models – a main model that described the various
144 factors influencing adherence across these three categories and a clinician-centered submodel
145 that identified modifiable risk factors for decreased adherence that could be addressed in
146 clinical practice.

147 Significantly, these recent models were primarily centered around adherence to
148 exercise and behavioral recommendations. Given the more limited research on dietary
149 recommendation adherence in dysphagia, this topic has been underrepresented in the
150 previous conversations (Krekeler et al., 2018, 2020). Yet, developing a model grounded in
151 theory and literature findings for adherence to dietary recommendations is equally as
152 beneficial as it can contribute to increased swallow safety. Thus, the purpose of the current
153 study was to address this gap in the literature and develop a model specifically targeting diet
154 modifications, framing the more limited extant dysphagia literature within the larger
155 healthcare literature. Further, based on the previous findings from the dysphagia-specific

156 literature, the ecological and health belief models were selected as guiding frameworks, as
157 described further below.

158 **Ecological Model.** It is apparent that there is not one singular factor contributing to
159 behavioral adherence, particularly as related to diet modification recommendations. The
160 factors described across the previous literature appear to span various levels of influence,
161 such as those related to the individual patient, caregiver, and the environment. Thus, rather
162 than a focus on identifying one key factor, a more appropriate model for increasing adherence
163 must incorporate the various levels of factors that influence the behavior. The notion that
164 multiple levels of factors influence a behavior is at the core of ecological models (Sallis et al.,
165 2008). The ecological model was first developed by Bronfenbrenner (1977) to study the
166 interaction of children with their mothers by studying the individual, the environment, and
167 the interaction between the individual and the environment. Developing from that initial
168 purpose, ecological models frame human behavior in context, recognizing the influence of
169 multiple variables on behavior, ranging from the environment to the individual themselves
170 (Sallis et al., 2008). In addition, this model also accounts for the possibility of these different
171 levels interacting together, which further impacts behavior. By taking a more wholistic view
172 of human behavior and the contributors to behavior, multiple targets become the focus of
173 intervention, facilitating treatment success and improved outcomes (Cohen et al., 2000; Sallis
174 et al., 2008). Ecological models have been previously used to develop effective and
175 meaningful interventions targeting behavioral changes such as healthy eating habits and
176 smoking cessation (Sallis et al., 2008; Sogari, 2018). Thus, such a model holds similar
177 promise for facilitating similarly positive change as related to adherence to dysphagia dietary
178 recommendations.

179 **Health Belief Model.** Notably, some of the factors identified in the dysphagia
180 literature as having an effect on adherence to dysphagia diet recommendations are also
181 related to the individual's inner feelings and mental status (Colodny, 2005; Seshadri et al.,

2018). Thus, even while focusing on the multiple levels of influence as suggested by the ecological model, it is equally as important to draw from the tenets of the health belief model for the innermost, or individual, level of the ecological model. The health belief model was initially developed with the primary intention to understand why some individuals do not follow disease prevention strategies and do not participate in disease screening tools (Champion & Skinner, 2008). The model consists of six components: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy. Perceived susceptibility and perceived severity refer to an individual's beliefs of the risk of getting an illness and how serious that illness and its associated consequences are. Perceived benefits refers to the individual's beliefs about the effectiveness of the intervention for resolving the illness, while perceived barriers refers to the individual's beliefs about possible obstacles to recovery or for performing the health-related behavior. Cue to action refers to internal and external cues that alert and motivate the individual for possible change. Self-efficacy refers to the individual's self-perceived ability to change the behavior, or their self confidence in being able to change the behavior. The health belief model has been previously used to motivate individuals to be involved in the assessment and intervention of their health, such as self-breast examination and smoking cessation (DiClemente et al., 1991). Combinations of these six components have also been suggested to play a role in dysphagia management (Krekeler et al., 2018). Thus, such a model holds similar promise for facilitating similarly positive change as related to adherence to dysphagia dietary recommendations.

Given the more-narrow focus of the health belief model (i.e., targeted at only the individual themselves), the health belief model is serving as a support for the development of a more primary ecological model of dysphagia management.

Ecological Model of Dysphagia Management. Using theoretical models in assessing and treating dysphagia is relatively new (Krekeler et al., 2020). However, due to the

208 complexities involved in managing dysphagia, the use of such models in all aspects of
209 dysphagia therapy can help ensure positive outcomes. Adherence to dysphagia dietary
210 recommendations is essential for improving patient's health and for preventing negative
211 consequences. It is clear that the factors influencing this adherence are widespread,
212 encompassing the individual, the caregiver, and the broader environment. Thus, developing
213 an ecological model of factors affecting adherence to dietary recommendations, that is
214 grounded in the previous literature base and that integrates important components of health
215 beliefs, could facilitate improved adherence to these recommendations.

216 **Current Study**

217 The purpose of the current study was to construct an ecological model of dysphagia
218 management, targeting factors suggested to influence adherence to dysphagia dietary
219 recommendations. In order to develop the model, a rapid review of behavioral adherence in
220 the dysphagia-specific literature was conducted; these results were then integrated with the
221 suggestions previously provided across the general healthcare literature. Throughout the
222 model development process, the methods and analyses were grounded in the principles of
223 both the ecological model and health belief model. The resulting ecological model of
224 dysphagia management can provide a more comprehensive and systematic framework for
225 considering the factors influencing adherence to dysphagia diet recommendations, ultimately
226 improving behavioral outcomes.

227 **Methods**

228 **Search Process**

229 To construct a preliminary ecological model of factors affecting adherence in
230 dysphagia, a rapid review was conducted to capture as wide a range of potential factors as
231 possible. Rapid reviews are often used to meet specific healthcare needs and to help
232 healthcare professionals engage in a more timely decision-making process (Khangura, et al.,
233 2012). They utilize similar principles as systematic reviews but require a shorter time to

234 complete (Polisena et al., 2015). The main purpose and advantage of a rapid review is that it
235 aids health care professionals in providing evidence-based clinical health decisions in a
236 timelier matter. There currently is no standard methodology on how rapid reviews are
237 conducted (Haby, et al., 2016; Polisena et al., 2015). For the purposes of developing a
238 preliminary model that would broadly capture all potential influencing factors in the current
239 study, we followed the primary procedures of a systematic review, although not all eligible
240 databases were searched and risk of bias was not assessed.

241 A comprehensive literature search was conducted in April 2021 to identify articles
242 related to adherence to dysphagia-related dietary recommendations in the adult population.
243 The electronic databases that were searched for relevant articles included Medline and
244 PubMed. All searches used two-word combinations, with one relating to adherence
245 (compliance OR adherence OR noncompliance) and the second to the field of dysphagia
246 (dysphagia OR deglutition OR swallowing). Given that compliance and adherence are often
247 used interchangeably in the literature, they were treated as such within the literature search.
248 Searches were limited to English-language papers. A librarian assisted with the search
249 process and removal of duplicate articles. Reference lists of pertinent articles were cross-
250 checked to ensure that all relevant articles were reviewed.

251 **Study Selection**

252 Only studies with published abstracts were considered for this review. Studies were
253 considered for inclusion based on the following: (a) if they were empirical articles and/or
254 articles that presented original intervention research (i.e., review articles, position papers,
255 practice guidelines, and other non-empirical papers were not included); (b) data from the
256 adult population could be extracted; (c) adherence was measured as part of the methods and
257 discussed in the results; and (d) adherence related to dietary and/or aspiration precaution
258 recommendations (i.e., adherence related to swallowing exercises or other compensatory
259 strategies was not included). The first and second authors examined all identified articles

260 using the inclusion criteria. The first step included eliminating articles based on title and
261 abstract. The remaining articles were then reviewed in depth using the same inclusion criteria
262 and rated by the same reviewers. Disagreements between raters were resolved via discussion
263 until a consensus was reached.

264 **Data Extraction**

265 Data extracted from the accepted articles included: participants' demographic
266 information (e.g., age, dysphagia-associated diagnosis); the primary aim of the study,
267 including whether adherence was the primary aim; factors identified in the study that affected
268 adherence; and whether the effect on adherence was positive or negative.

269 **Model Generation**

270 The model generation process, including the data extraction methods, was grounded
271 in the principles of both the ecological model and the health belief model. Building on that
272 theoretical framework, the following guidelines were implemented to develop the model
273 itself: identify the desired outcome related to the health condition in question (i.e., adherence
274 to dietary recommendations), identify potential modifying factors related to the desired health
275 care outcome (e.g., individual-, caregiver-, and environmental-level factors as suggested by
276 the ecological and health belief models), identify relationships between these factors, and
277 narrow down factors to include only those most relevant concepts (Earp & Ennett, 1991;
278 Krekeler et al., 2020; Rimer & Glanz, 2005).

279 To start the preliminary model development process, we first examined all data
280 extracted from the studies to identify those factors that served as facilitators or barriers to
281 adherence. Next, we engaged in a more wholistic review of all the factors extracted,
282 attempting to identify patterns of classification across the factors. Based on the guiding
283 theoretical frameworks and the empirical data, the classifications were based on three levels,
284 including individual, caregiver, and environmental factors. Individual factors include those
285 influencers that are within the patient themselves (e.g., personality, cognition, self-efficacy),

286 which either increase or decrease a behavior. Caregiver factors relate to those factors
287 associated with other individuals who provide support, especially individuals who provide
288 support to those who are not independent, such as family and healthcare staff. Finally, factors
289 related to the environment are those factors related to policies, procedures, costs, and training
290 requirements, such as within a healthcare organization. We also documented any factors that
291 were identified across multiple levels (e.g., knowledge), which can have a unique effect on
292 adherence.

293 The factors identified and extracted as part of the rapid review process were then
294 compared to the findings from the more general healthcare literature described above.
295 Specifically, results from studies exploring adherence to dietary and medication consumption
296 recommendations were primarily considered given that they are the most relevant to
297 dysphagia. Close attention was directed to those unique factors that did not appear across the
298 limited dysphagia literature base. These factors were then classified across the same three
299 theoretical levels confirmed in the dysphagia literature, including individual, caregiver, and
300 environmental factors.

301 A preliminary list of factors that may contribute to adherence to dysphagia diet
302 recommendations based on the dysphagia-specific and general healthcare literature was then
303 generated. This list was reviewed by the research team for clarity and redundancy. The final
304 list of factors was then visually represented, grouped together based on their common levels
305 of influence. This figure formed the developed ecological model.

306 **Results**

307 **Literature Retrieval**

308 The results of the literature search are summarized in Figure 1. The initial search
309 yielded 2967 articles, 851 articles in Medline and 2116 articles in PubMed. This was then
310 reduced to 930 unique articles after duplicates were removed. All articles were reviewed by
311 both raters to ensure that they were written in English, published in a peer-reviewed journal,

312 and met the inclusion criteria. Following title and abstract review, 38 articles remained for
313 further analysis. Agreement between the two raters before reconciliation on rejecting or
314 accepting abstracts based on title/abstract review was 96.9%. The remaining articles
315 underwent full-text review by both raters. Systematic review articles, articles investigating
316 dysphagia only in the pediatric population, articles related to adherence to swallowing
317 exercises (rather than dietary recommendations), and articles where adherence was not
318 measured/discussed as part of the results and discussion sections were excluded. Agreement
319 between the two raters before reconciliation on rejecting or accepting articles based on full
320 review was 92%. The article set for the rapid review was narrowed down to a final list of 14
321 articles. The reference lists of these articles were reviewed for any additional relevant titles
322 that may have been missed in the original search. One additional article was reviewed, but
323 was determined not to meet the inclusion criteria.

324 <<Insert Figure 1 around here>>

325 **Study Characteristics**

326 The characteristics of the 14 included studies are summarized in Table 1. Adherence
327 was the main target of the study in 11 of the articles and was a secondary finding reported for
328 the remaining articles. All of the articles included adult participants, with participants being
329 the care recipients or patients in nine studies, the caregivers (formal or informal) in four
330 studies, and both care recipients/patients and caregivers in one study. Eight studies reported
331 participant ages; among those studies, the mean age of care recipients/patients ranged from
332 40.1 to 80.5 years and only one study reported the mean age of caregivers at 48.2 years. The
333 number of participants varied across the studies, from 8 to 184 participants, which could be
334 attributed, in part, to differing study designs, settings, and targeted populations. Dysphagia-
335 associated diagnoses among the care recipients/patients also varied and included brain
336 lesions, cancer, cardiovascular accidents, cerebral palsy, intellectual impairments,
337 neurodegenerative disease, and respiratory disease. Finally, the studies utilized different

338 quantitative (e.g., cross sectional) and qualitative (e.g., interviews) study designs, with some
339 using a mixed method approach.

340 <<Insert Table 1 around here>>

341 **Main Findings in the Dysphagia Literature**

342 The 14 articles were closely examined and the factors influencing adherence were
343 extracted. These factors were then grouped into the levels suggested by the ecological model,
344 including individual, caregiver, and environmental. The factors will be described below
345 according to these groupings. The majority of factors reported across the 14 studies were at
346 the individual level followed by caregiver factors, with few environmental level factors
347 discussed or studied.

348 Various individual factors were identified across nine articles, encompassing
349 emotional, psychological, and cognitive factors that influence adherence to dysphagia dietary
350 recommendations. One of the major factors identified was patients' dissatisfaction with
351 modified diets (Colodny, 2005; McCurtin et al., 2018; Robbertse & Beer, 2020; Shim et al.,
352 2013). Patients were either dissatisfied with the texture of the modified food and liquids
353 (Colodny, 2005; McCurtin et al., 2018; Shim et al., 2013), or with the taste of the modified
354 food and liquids (Colodny, 2005; McCurtin et al., 2018; Shim et al., 2013). Another study
355 reported that the inconvenience of preparing the modified diet was a major reason for their
356 dissatisfaction (Shim et al., 2013) as well as the unappealing nature of the modified texture
357 foods (McCurtin et al., 2018). Dissatisfaction with the modified diet was reported by the
358 patients themselves (Colodny, 2005; McCurtin et al., 2018; Shim et al., 2013) and also
359 observed and reported by nurses caring for patients with dysphagia (Robbertse & Beer,
360 2020). When patients were not satisfied with their modified diet, it negatively affected their
361 adherence. Another commonly occurring factor was the individual's level of knowledge
362 about the recommended diet (Chadwick et al., 2003; Low et al., 2001; McCurtin et al., 2018;
363 Rosenvinge & Starke, 2005; Seshadri et al., 2018). This included knowledge regarding why

364 they were placed on a modified diet, what modified diet they were on, how to use thickeners
365 and prepare their modified diet, and what the consequences were of not following the
366 recommended diet. The more knowledgeable the individual with dysphagia was about the
367 benefit and the rationale behind the recommended diet, the more likely they were to adhere to
368 the recommendations. For example, post-stroke patients reported nonadherence to the
369 recommended modified diet as related to their lack of knowledge regarding the reason they
370 were placed on the modified diet (McCurtin et al., 2018). Given this lack of knowledge, they
371 reported that they felt that they did not need to be on a modified diet.

372 Moreover, a patient's emotional and mental status also affected their level of
373 adherence (Colodny, 2005; Seshadri et al., 2018). Feelings of denial, anger, aggression,
374 dishonesty, blaming, and stress all led to decreased adherence to dysphagia dietary
375 recommendations (Colodny, 2005). Relatedly, loss of control in choosing what they want to
376 eat, the need to be dependent on others, and the loss of enjoyment in eating and drinking also
377 resulted in increased nonadherence to the recommended modified diet (Balandin et al., 2009;
378 Colodny, 2005). This behavior of nonadherence could be appropriately framed as a volitional
379 choice to not follow the diet recommendations, as a way for the individual to regain control
380 over their body and what to eat and drink. Other psychoemotional factors that influenced
381 adherence included depression, embarrassment, the burden of the modified diet on social
382 interactions, and a fear of choking and the consequences of aspiration (Balandin et al., 2009;
383 Seshadri et al., 2018). Lastly, age appeared to also have an effect on adherence, with younger
384 adults being less likely to follow their dysphagia dietary recommendations (Low et al., 2001).

385 A variety of factors related to the individuals caring for the patient with dysphagia,
386 such as nurses, spouses, or other caregivers, were also found to influence adherence to
387 dysphagia dietary recommendations. Caregiver factors were identified in 7 of the 14 articles
388 included in the rapid review. Perception of importance was one factor identified as having an
389 influence on adherence (Crawford et al., 2007; Smith-Tamaray et al., 2011). Those caregivers

390 who perceived high importance of following the SLP recommendations for safe eating and
391 drinking experiences were more motivated to implement and make sure the dysphagia
392 recommendations were met. Disagreement with the SLP recommendations was another factor
393 identified across multiple studies (Colodny, 2001; Robbertse & Beer, 2020). Caregivers who
394 did not agree with the recommended diet, often did not put the needed effort in to follow
395 those recommendations. For example, in the study conducted by Robbertse and Beer (2020),
396 45% of nurses reported that they did not agree with the SLP dietary recommendations.
397 Knowledge and experience were also identified as important contributors to adherence.
398 Informal caregivers' level of knowledge and formal caregivers' (e.g., healthcare staff) level
399 of experience, which is also related to knowledge, were identified to have a significant effect
400 on adherence to dietary recommendations across multiple studies (Chadwick et al., 2002;
401 Colodny, 2001; Robbertse & Beer, 2020; Rosenvinge & Starke, 2005; Smith-Tamaray et al.,
402 2011). Thus, the more experienced and/or knowledgeable the caregiver was, the higher the
403 adherence to dysphagia recommendations. Finally, for individuals who were dependent on
404 others for feeding and/or following the SLP recommendations, the presence of supervision
405 throughout the meal played a factor in increasing or decreasing adherence (Low et al., 2001;
406 Rosenvinge & Starke, 2005). For example, 73% nonadherence to SLP dietary
407 recommendations was noted in inpatients due to a lack of supervision (Rosenvinge & Starke,
408 2005).

409 Two studies described specific environmental factors that played a role in adherence,
410 particularly as related to dysphagia diet recommendations in institutionalized settings.
411 Patients and hospital wards that received pre-thickened liquids showed better rates of
412 adherence (Rosenvinge & Starke, 2005). In addition, the development of new facility-wide
413 measures and policies aimed at increasing education about dysphagia management had a
414 positive influence on increasing adherence (Rosenvinge & Starke, 2005). Finally, there was
415 increased adherence in settings where SLPs were core and respected members of the health

416 team and settings where there were enough and stable staffing of SLPs (Smith-Tamara et al.,
417 2011). When the SLPs are recognized as an important member of the team providing health
418 services to the patient, their dietary recommendations are acknowledged and more likely to
419 be followed. In addition, with proper staffing, SLPs working in the setting can have more
420 reasonable caseload and workload requirements, allowing them time to provide appropriate
421 education and additional services.

422 **The Ecological Model**

423 The review of the 14 articles identified in the rapid review, in combination with the
424 results previously identified from the general healthcare literature, revealed the presence of
425 various factors that contribute or may contribute to adherence to dysphagia dietary
426 recommendations. Drawing on the guiding frameworks from the ecological and health belief
427 models, these factors were mapped onto the individual, caregiver and environmental levels of
428 influence. The resulting visual representation of this model, “The Ecological Model of
429 Factors Affecting Adherence in Dysphagia and Healthcare”, is presented in Figure 2.

430 <<Insert Figure 2 around here>>

431 **Discussion**

432 While adherence is not a new concept in the general healthcare literature, a more
433 systematic focus on adherence in the dysphagia literature is relatively new. Given the crucial
434 role that adherence to dysphagia dietary recommendations plays in realizing the benefits of
435 these recommendations, a better understanding of the factors that contribute to adherence is
436 needed. Therefore, the goal of this research study was to develop a preliminary model of
437 these contributing factors that can be used as a framework for addressing adherence to
438 dysphagia dietary recommendations. To build the model, a rapid review was conducted to
439 identify relevant articles in the dysphagia literature; the factors extracted from the dysphagia
440 literature were then mapped onto factors previously described in the more general healthcare
441 literature. As guided by the tenets of the ecological and health belief models and as based on

442 the results of the rapid review, we then developed a visual representation of the model, “The
443 Ecological Model of Factors Affecting Adherence in Dysphagia and Healthcare” (Figure 2).

444 **Factors in the Dysphagia Literature**

445 Across the dysphagia literature, adherence to dysphagia dietary recommendations
446 emerged as a complex activity, influenced by factors across multiple levels. Thus, in order to
447 effectively increase adherence, a more comprehensive approach is needed, which relies on
448 better understanding the different levels of influence on the behavior.

449 Within the model, individual level factors were varied and included dissatisfaction
450 with modified diets, level of knowledge, negative emotions related to the dysphagia (e.g.,
451 denial, anger, aggression, dishonesty, blaming, stress, loss of control, depression,
452 embarrassment, fear of choking), the burden of the modified diet on social interactions, and
453 age. Patient’s level of knowledge was revealed to be an influencing individual factor on
454 adherence across multiple studies, with the more knowledgeable the individual being, the
455 higher the adherence (Chadwick et al., 2003; Low et al., 2001; McCurtin et al., 2018;
456 Rosenvinge & Starke, 2005; Seshadri et al., 2018). This finding emphasizes the necessity for
457 educating patients on the risks associated with dysphagia, the components of the treatment
458 plan, and the potential benefits of and rationale for the selected treatment plan. Not
459 surprisingly, brief, but focused education on dysphagia has been found to lead to significant
460 improvements in patient knowledge that is retained over time (e.g., McKinstry et al., 2010).
461 Individuals with dysphagia have previously reported the value of dedicated time to reviewing
462 instrumental assessment results, with the opportunity to ask questions in the moment, as well
463 as individualized conversations about the impact of dysphagia, such as tailoring
464 conversations to be about a specific meal the patient will be eating (Howells et al., 2020).
465 Unfortunately, other individuals have noted that they do not even understand the role of the
466 SLP (Howells et al., 2020), further emphasizing the importance of focused education,
467 provided at the level the patient is currently at. Furthermore, increasing the patient knowledge

468 level has the potential to reduce depression and increase quality of life (Chen et al., 2018),
469 emphasizing the importance of providing patient education. For example, Chen and
470 colleagues (2018) found that a swallowing exercise educational program resulted in improved
471 emotional status and improved quality of life. The value of targeted enhancements of
472 knowledge are well-aligned with the components of the health belief model. For example,
473 such education can directly influence patients' perceptions of the severity of dysphagia-
474 related consequences, the effectiveness of treatment, the reduction of barriers, and their
475 ability for change (self-efficacy), which would all be predicted to have a positive impact on
476 behavior (adherence).

477 Dissatisfaction with the modified diet has also been associated with decreased
478 adherence (Colodny, 2005; McCurtin et al., 2018; Robbertse & Beer, 2020; Shim et al.,
479 2013). Across settings, modified textures have been found to be less desirable – for example,
480 consumers of pureed foods find that they lack sensory appeal and variety, they may be
481 indistinguishable from one another, and they lack natural flavor (Keller & Duizer, 2014;
482 Keller et al., 2012). This relationship between dissatisfaction and decreased adherence is
483 observed not only in relation to the food and liquid textures, but also with restrictions
484 associated with other health diagnoses, such as diabetes (Ghimire, 2017). Relatedly, drinking
485 and eating are generally happy and pleasurable acts and form a fundamental component of
486 social engagement with others. Thus, placing a patient with dysphagia on a modified diet can
487 strip enjoyment from eating and drinking and lead to negative psychosocial consequences
488 such as increased isolation. Consequently, feelings of denial, anger, aggression, blaming,
489 stress, loss of control, depression, and embarrassment can all arise. These feelings have been
490 associated with decreased adherence in dysphagia management (Balandin et al., 2009;
491 Colodny, 2005; Seshadri et al., 2018) and across other health domains (Sumlin et al., 2014).
492 Certainly, the decision to modify a patient's diet should not be taken lightly, and is often
493 considered a last resort for increasing swallowing safety as there may be negative

494 consequences to these recommendations that must be considered during the management
495 process. It is clearly important to consider the role that dissatisfaction plays in adherence,
496 combined with the value of individualized education.

497 A number of interrelated caregiver factors, across both formal and informal care
498 providers, also emerged as relating to adherence and included perception of importance,
499 disagreement with the SLP recommendations, knowledge, level of experience, and
500 supervision. Notably, knowledge appeared as an influencing factor at both the individual and
501 caregiver levels. The influence of caregiver level of knowledge on intervention
502 implementation, patient support, and treatment outcomes has been established across
503 dysphagia and other healthcare domains. For example, when educational programs about
504 dysphagia were provided to nurses, the number of patients who were identified as having or
505 being at risk for dysphagia increased (Hansell & Heinemann, 1996). Informal care providers,
506 such as family members, have previously reported not being prepared for the severity and
507 chronicity of their loved ones' dysphagia and feeling as though they did not receive enough
508 support during the recovery process, with a particular lack of practical, personalized
509 information free from medical jargon (Nund et al., 2014). Similar to findings among patients,
510 many informal care providers have indicated not understanding the role of the SLP in
511 dysphagia management (Nund et al., 2014). Thus, it is not surprising that improved
512 education, particularly individualized education, can lead to increased adherence. Caregiver
513 experience, another contributor to adherence, likely also interacts with education and overall
514 knowledge base as caregivers with greater experience likely also present with an increased
515 degree of knowledge related to dysphagia management. These more experienced caregivers
516 who may be more knowledgeable about dysphagia overall, may similarly be more aware of
517 the importance of dysphagia management and adherence to treatment recommendations.
518 These findings are similar to results revealed across the more general healthcare literature; for
519 example, nurses' pain management for cancer patients has been found to be highly correlated

520 with their knowledge base (Jang et al., 2016). Further, the success of health interventions
521 more broadly is highly influenced by the level of experience of the health professional
522 involved (Laffel et al., 1992); the more familiar they are with the diagnosis, procedure, and
523 medication, the better the outcome. Finally, agreement with the health recommendations by
524 caregivers was also found to be associated to increased adherence in dysphagia as well as
525 across other health domains (Bogardus et al., 2004; Colodny, 2001; Robbertse & Beer, 2020).
526 This factor is likely also related to the previously described caregiver factors as increased
527 knowledge about dysphagia and dysphagia management, increased experience, and greater
528 awareness of the importance of recommendations may result in increased agreement with the
529 health recommendations – and increased likelihood of implementation.

530 Pre-thickened liquids, and improvements in the facility-wide practices and policies
531 (e.g., increasing education, reducing caseload size, utilizing a team approach) were the
532 factors identified at the environmental level. There are multiple studies available that have
533 investigated the use of pre-thickened liquids (Huppertz et al., 2020; Kotecki & Schmidt,
534 2010; McCormick et al., 2008). Positive outcomes were not only observed in increasing
535 adherence, but also in terms of cost effectiveness; pre-thickened liquids were also found to be
536 less time consuming for SLPs and nurses (Kotecki & Schmidt, 2010). In addition, setting
537 policies and procedures were also identified as influencing factors. These settings and
538 policies can either have a positive or negative effect on adherence. For example, in settings
539 where SLPs have an appropriate caseload, they can allocate more time to each of their
540 patients. This can help SLPs provide a more tailored education and treatment plan, and thus
541 improve education.

542 The majority of factors identified as influencing adherence within the dysphagia
543 literature were at the individual and caregiver levels. It is plausible that there are more
544 individual and caregiver level factors that influence this behavior as compared to
545 environmental level factors. Perhaps, more likely, it is also possible that previous research

546 has been primarily focused on person-level factors, such as those related to the patient and
547 those related to the caregiver. This can be attributed to the fact that impairment-based
548 approaches are more widely used in dysphagia management and that environmental, or
549 system-wide, changes are more difficult to achieve. These findings support the need for more
550 research in the area of adherence, especially looking into influencing factors at the
551 environmental level and how those may interact with the previously revealed person-level
552 factors.

553 **Integrating the Healthcare Literature**

554 Factors affecting compliance in the general healthcare literature were also integrated
555 into the current model, given the paucity of dysphagia-specific research. While some of these
556 factors were similar to the factors identified in the dysphagia literature, a number of unique,
557 but seemingly relevant, factors emerged. These factors could also be grouped into the three
558 levels of the ecological model: individual, caregiver, and environment.

559 A patient's knowledge level was a factor identified at the individual level in both the
560 dysphagia and healthcare literature, supporting its strong influence on adherence and well-
561 aligned with the health belief model (Chadwick et al., 2003; Herrema et al., 2018; Khambati
562 et al., 2017; Low et al., 2001; McCurtin et al., 2018; Rosenvinge & Starke, 2005; Seshadri et
563 al., 2018). Patient preference was also identified as an influencing factor on adherence in the
564 healthcare literature (Herrema et al., 2018; Mikulka, 2016). This factor is closely related to
565 the dissatisfaction with the recommended diet observed in the dysphagia literature given that
566 modified diets are generally not what patients would prefer (Colodny, 2005; McCurtin et al.,
567 2018; Robbertse & Beer, 2020; Shim et al., 2013). Relatedly, patient's involvement in the
568 healthcare decision making process was identified as an influencing factor in the general
569 healthcare literature (Herrema et al., 2018; Mikulka, 2016). This is likely extremely relevant
570 in dysphagia, as patients are more motivated to follow the recommendations when they have
571 been involved in the decision making, particularly in light of the common dissatisfaction

572 associated with many aspects of modified diets. Importantly, this shared decision-making
573 process is a fundamental component of defining adherence as compared to compliance,
574 further emphasizing its importance to consider in clinical practice. Other unique factors
575 identified in the healthcare literature were anxiety, cognitive abilities, and post-traumatic
576 stress disorders (PTSD) (Guimaraes et al., 2015; Stringham et al., 2018). These factors were
577 deemed to be additionally relevant to dysphagia adherence as they are related to the
578 individual's emotional and mental status, which have been previously shown to impact
579 adherence to dysphagia diet recommendations (Colodny, 2005; Seshadri et al., 2018).

580 At the caregiver level, knowledge and perception of importance were common factors
581 in both the healthcare and dysphagia literature (Chadwick et al., 2002; Colodny, 2001;
582 Crawford et al., 2007; Lum et al., 2018; Robbertse & Beer, 2020; Rosenvinge & Starke,
583 2005; Smith-Tamaray et al., 2011). Together, this suggests that both patient and caregiver
584 “buy in”, which draws heavily on their understanding of the medical condition and treatment
585 options, are needed to maximize adherence. Other factors emerging from the healthcare
586 literature included lack of a caregiver, the strength of the physician-patient relationship, and
587 the presence of positive or negative support (Berry et al., 2008; Endevelt, & Gesser-
588 Edelsburg, 2014; Guimaraes, et al., 2015). The negative impact of a lack of a caregiver can
589 likely extend to dysphagia adherence. Patients who are unable to be independent are often
590 unable to, for example, thicken their liquids appropriately or prepare their modified diet
591 without caregiver help and support. Thus, without the presence of a caregiver, they will be
592 less likely to adhere to dysphagia dietary recommendations given logistical barriers. In
593 addition, the more positive the caregiver support is, the more adherent the patient often is to
594 the recommendations. Lastly, the observed relationship between the physician-patient
595 relationship and adherence in the healthcare literature is likely also present in the case of
596 dysphagia. When the relationship between an SLP and patient is stronger, there is generally
597 an increase in trust in the SLP and what they recommend, thus increasing adherence. In fact,

598 medical mistrust – including a lack of trust in the individual healthcare providers as well as
599 the overall healthcare system – has been observed to be one of the most prominent barriers to
600 medication adherence (Hall & Heath, 2021; Kelly et al., 2020). Thus, it is crucial for
601 healthcare providers to prioritize the therapeutic alliance between themselves and their
602 patients.

603 At the environmental level, there were no overlapping factors between the healthcare
604 and the dysphagia literature. This can be attributed to the fact that there were only two
605 articles that investigated environmental factors in dysphagia. The unique factors identified in
606 healthcare included counselling sessions, the use of a team approach, cost of treatment,
607 cultural considerations, and individualized treatment (Kapoor et al., 2016; Stringham et al.,
608 2018; Zhao et al., 2018). All of these factors are likely equally as valuable in improving
609 adherence to dysphagia dietary recommendations. Implementing aspects of counselling into
610 SLP therapy sessions through psychoeducation can increase patient and caregiver knowledge,
611 which has been shown to increase adherence (Zhao et al., 2018). It is also important to refer
612 patients and informal caregivers to a mental health provider as appropriate. More formal
613 counselling can help address some of the negative emotions associated with dysphagia that
614 may negatively impact adherence. Cost of medical services and medication has been noted in
615 healthcare literature to also have a strong influence on adherence (Law et al., 2012; Soumerai
616 et al., 2006; Stringham et al., 2018). Studies in medication adherence reported poor
617 adherence levels with high out of pocket medication costs (Soumerai et al., 2006). Skipping
618 doses, taking smaller doses to delay refill, choosing which medication to get, and using
619 generic brands are some of the nonadherence methods used by patients. Providing more
620 affordable medical services and medication, can increase patient’s willingness to visit health
621 care professionals, and to adhere to their recommendations. As applied to dysphagia therapy,
622 when patients are able to pay for the costs associated with assessment and therapy sessions as
623 well as needed supplies (e.g., thickeners), adherence may be maximized. Another

624 contributing factor to adherence in healthcare is cultural considerations (Jin & Acharya,
625 2015; McQuaid, 2018). It is crucial to respect and acknowledge cultural differences that may
626 impact beliefs related to the disease itself and its trajectory and the acceptance of different
627 treatments. SLPs must develop individualized treatment plans that integrate each patient's
628 unique background and needs. Such individualization and respect can lead to better patient
629 satisfaction, increased adherence, and ultimately better treatment outcomes.

630 **Clinical Implications**

631 Certainly not all influencing factors identified in the current review are modifiable.
632 However, a number of immediately implementable strategies to improve service delivery,
633 treatment outcomes, and patient adherence are suggested. First, both patient and caregiver
634 knowledge were identified as a factor influencing adherence across the dysphagia and
635 healthcare literature. SLPs need to allocate sufficient time for education, which must include
636 a clear and easily understandable description of the current impairments, the treatment
637 recommendations, and the rationale for the recommendations. It is crucial that this education
638 includes a discussion of what is important to the patients themselves. This conversation
639 should be tailored specifically to what the patient needs, what they know, and what they are
640 feeling, at a level that is appropriate for their current cognitive and emotional status. This
641 time can also be used for the patients to express concerns and for the SLP to work with the
642 patient to problem solve what may work best for them (e.g., types of modified foods that are
643 more acceptable such as transitional foods). Unfortunately, a reality of clinical practice is that
644 SLPs may face challenges to providing this individualized education, such as time constraints
645 and productivity requirements. Clinicians may need to be creative in determining the best
646 way to integrate patient and informal caregiver training into therapy sessions. For example,
647 working with the dietitian or occupational therapist may allow for tailored discussions of
648 dietary needs and meal preparation in a more functional format or activity. Considering
649 formal strategies such as the teach-back method may also allow the clinician to target both

650 cognition and dysphagia education in a functionally relevant clinical activity. Use of multiple
651 modalities of instruction, such as verbal discussion and visual handouts to take home, can
652 further help maximize understanding and carryover despite in-therapy time constraints.

653 Dissatisfaction with the modified diet was another factor identified as negatively
654 impacting adherence, which can be further targeted through education. Allocating dedicated
655 time to providing education to patients and their informal caregivers can allow SLPs to
656 discuss the reasons behind the current diet and ideas to help the patient adjust to the modified
657 diet (e.g., recipes). These sessions can also provide time for sufficient training of the
658 caregiver who will be taking care of the patient at home. This may increase patient's
659 acceptance of the modified diet and caregiver understanding of the importance of the current
660 diet. For formal caregiver education/training, healthcare facilities can build in required
661 educational lectures by the SLPs to all health employees involved in taking care of patients
662 with dysphagia. Ultimately, engaging in these crucial conversations about the importance of,
663 strategies for, and barriers related to dysphagia dietary recommendations will facilitate more
664 active participation by patients and their caregivers in the therapy plan.

665 Building trust is also important to promote patient and caregiver engagement in the
666 therapy process and the patient-provider relationship. Taking the time to listen to patients and
667 their caregivers, asking questions, and using ethnographic interviewing techniques will help
668 ensure that they feel valued. Patients and caregivers must experience agency, or control, over
669 their healthcare plan. This is particularly relevant for dysphagia dietary recommendations as
670 patients' preferences may not align with what the medical team may deem to be "most safe".
671 Ensuring a strong therapeutic alliance based on trust will facilitate these conversations and
672 allow patients and caregivers to realize their important role in the development of the plan.

673 There are a number of additional considerations for clinical practice. First, important
674 to any approach implemented is the need to acknowledge the multiple levels of influence
675 impacting adherence, as suggested by the ecological model. Therefore, it is necessary to not

676 only include the patient in our treatment plans. Caregivers should be a part of the patient's
677 assessment and treatment sessions, which will also provide an opportunity to hear their
678 concerns and answer their questions about the recommendations. Clinicians must also
679 recognize and work to minimize potential environmental barriers that exist, that may limit
680 successful adherence, particularly among individuals who do want to implement dietary
681 modifications. Furthermore, some of the factors identified as influencing adherence are not
682 able to be modified (e.g., personality characteristics). While it is important to focus on those
683 factors that are modifiable when creating the treatment plan, it may be valuable to attend to
684 the non-modifiable factors to identify who is at increased risk of non-adherence – and who
685 may not be appropriate for recommendations of dietary modifications. Finally, it is important
686 to ultimately acknowledge a patient's right to choose or refuse any given treatment
687 recommendation. The SLP can make sure that the patient and caregiver were provided with
688 ample education to facilitate their understanding of why these recommendations were chosen
689 and to help structure their environment for success should they want to (e.g., considering the
690 factors of the ecological model presented above); however, patient autonomy and agency
691 must be recognized.

692 **Limitations**

693 The current study presents with some limitations. The specific inclusion criteria and
694 keywords used might have resulted in missed studies, particularly studies not published in
695 English. In addition, only two databases (Medline and PubMed) were used in the current
696 study. The model also incorporated data from the general healthcare literature based on a
697 descriptive review of the literature, so other non-dysphagia-specific factors may be relevant,
698 but were not identified. Further, all of the factors extracted from the 14 dysphagia-specific
699 articles were included in the model regardless of the number of times they appeared in the
700 literature and no information about relative importance as compared to other factors or
701 strength of influence could be ascertained. However, given the goal of this study to develop

702 an initial ecological model of factors affecting dysphagia dietary adherence, it was important
703 to broadly explore and consider all factors. Therefore, additional research is needed to
704 strengthen the model and future research should focus on not only identifying which factors
705 affect adherence, particularly those healthcare-related factors not yet explored in the
706 dysphagia literature, but also on investigating which combinations of factors across the levels
707 of influence have the greatest impact. It will also be important for research to address how
708 manipulations of these combinations of factors ultimately help improve adherence.

709 **Conclusion**

710 Adherence to dysphagia dietary recommendations is necessary for the success of this
711 management approach. Yet, adherence is a complex human behavior. The goal of this study
712 was to identify what network of factors may influence adherence to dietary recommendations
713 across the individual, the caregiver, and the environment, leading to the development of an
714 ecological model. This preliminary visual model can serve as a functional tool for SLPs to
715 use in their clinical practices in order to improve treatment outcomes and patient satisfaction
716 related to dietary modifications. Ultimately, to enhance treatment effectiveness, clinicians
717 must engage their patients in the therapy process and explore opportunities to enhance patient
718 and caregiver education related to the impairments, consequences, and treatment options
719 related to dysphagia.

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References

- Balandin, S., Hemsley, B., Hanley, L., & Sheppard, J. (2009). Understanding mealtime changes for adults with cerebral palsy and the implications for support services. *Journal of Intellectual and Developmental Disability, 34*(3), 197-206. <https://doi.org/10.1080/13668250903074489>
- Berry, L. L., Parish, J. T., & Rayburn, W. L. (2008). Patients' commitment to their primary physician and why it matters. *Annals Of Family Medicine, 6*–13. <https://doi.org/10.1370/afm.757.2>
- Bogardus, S.T., Jr., Bradley, E.H., Williams, C.S., Maciejewski, P.K., Gallo, W.T. & Inouye, S.K. (2004), Achieving Goals in Geriatric Assessment: Role of Caregiver Agreement and Adherence to Recommendations. *Journal of the American Geriatrics Society, 52*, 99-105. <https://doi.org/10.1111/j.1532-5415.2004.52017.x>
- Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*, 513 – 531.
- Carnaby, G. D., & Harenberg, L. (2013). What is “usual care” in dysphagia rehabilitation: A survey of USA dysphagia practice patterns. *Dysphagia, 28*(4), 567-574.
- Castellanos, VH., Butler, E., Gluch, L., & Burke, B. (2004). Use of thickened liquids in skilled nursing facilities. *Journal of The American Dietetic Association, 104*(8), 1222-1226. <https://doi.org/10.1016/j.jada.2004.05.203>
- Chadwick, D. D., Jolliffe, J., & Goldbart, J. (2002). Carer knowledge of dysphagia management strategies. *International Journal of Language & Communication Disorders, 37*(3), 345–357. <https://doi.org/10.1080/13682820210137196>
- Chadwick, D., Jolliffe, J., & Goldbart, J. (2003). Adherence to eating and drinking guidelines for adults with intellectual disabilities and dysphagia. *American Journal on Mental Retardation, 108*(3), 202-211. [https://doi.org/10.1352/0895-8017\(2003\)108%3C0202:ATEADG%3E2.0.CO;2](https://doi.org/10.1352/0895-8017(2003)108%3C0202:ATEADG%3E2.0.CO;2)

- 750 Champion, V., & Skinner, C. (2008). The health belief model. In J. F. Sallis, N. Owen, E. B.
751 Fisher (Eds.), *Health Behavior and Health Education: Theory, Research, and*
752 *Practice* (4th ed., pp. 45-62).
- 753 Chen, SC., Huang, BS., Chung, CY., Lin, CY, Fan, KH., Chang, JT., & Wu, SC.
754 (2018). Effects of a swallowing exercise education program on dysphagia-specific
755 health-related quality of life in oral cavity cancer patients post-treatment: A
756 randomized controlled trial. *Support Care Cancer*, 26(8), 2919–2928.
757 <https://doi.org/10.1007/s00520-018-4148-7>
- 758 Cichero, J., Lam, P., Steele, C., Hanson, B., Chen, J., Dantas, R., Duivesteyn, J., Kayashita, J.,
759 Lecko, C., Murray, J., Pillay, M., Riquelme, L., & Stanschus, S. (2017). Development
760 of International Terminology and Definitions for Texture-Modified Foods and
761 Thickened Fluids Used in Dysphagia Management: The IDDSI Framework.
762 *Dysphagia*, 32(2), 293–314. <https://doi.org/10.1007/s00455-016-9758-y>
- 763 Cohen, D., Scribner, R., & Farley, T. (2000). A structural model of health behavior: A
764 pragmatic approach to explain and influence health behaviors at the population level.
765 *Preventive Medicine*, 30(2), 146-154. <https://doi.org/10.1006/pmed.1999.0609>
- 766 Colodny, N. (2001). Construction and validations of the mealtime and dysphagia
767 questionnaire: An instrument designed to assess nursing staff reasons for
768 noncompliance with SLP dysphagia and feeding recommendations. *Dysphagia*, 16,
769 263-271. <https://doi.org/10.1007/s00455-001-0085-5>
- 770 Colodny, N. (2005). Dysphagic independent feeders' justifications for noncompliance with
771 recommendations by a speech-language pathologist. *American Journal of Speech-*
772 *Language Pathology*, 14(1), 61–70. [https://doi.org/10.1044/1058-0360\(2005/008\)](https://doi.org/10.1044/1058-0360(2005/008))
- 773 Crawford, H., Leslie, P., & Drinnan, M. J. (2007). Compliance with dysphagia
774 recommendations by carers of adults with intellectual impairment. *Dysphagia*, 22(4),
775 326–334. <https://doi.org/10.1007/s00455-007-9108-1>

- 776 DiClemente, C. C., Prochaska, J. O., Fairhurst, S. K., Velicer, W. F., Velasquez, M. M., &
777 Rossi, J. S. (1991). The process of smoking cessation: An analysis of
778 precontemplation, contemplation, and preparation stages of change. *Journal of*
779 *Consulting and Clinical Psychology*, 59(2), 295–304. [https://doi.org/10.1037/0022-](https://doi.org/10.1037/0022-006X.59.2.295)
780 [006X.59.2.295](https://doi.org/10.1037/0022-006X.59.2.295)
- 781 Earp, J. A., & Ennett, S. T. (1991). Conceptual models for health education research and
782 practice. *Health Education Research*, 6(2), 163–171.
783 <https://doi.org/10.1093/her/6.2.163>
- 784 Ekberg, O., Hamdy, S., Woisard, V., Wuttge-Hannig, A., & Ortega, P. (2002). Social and
785 psychological burden of dysphagia: Its impact on diagnosis and treatment. *Dysphagia*,
786 17(2), 139–146. <https://doi.org/10.1007/s00455-001-0113-5>
- 787 Endevelt, R., & Gesser-Edelsburge, A. (2014). A qualitative study of adherence to nutritional
788 treatment: Perspective of patients and dietitians. *Patient Preference and Adherence*, 8,
789 147-154. <https://doi.org/10.2147/PPA.S54799>
- 790 Garcia, J. M., & Chambers E., IV. (2010). Managing dysphagia through diet
791 modifications. *The American Journal of Nursing*, 110(11), 26-33. [https://doi.org/](https://doi.org/10.1097/01.NAJ.0000390519.83887.02)
792 [10.1097/01.NAJ.0000390519.83887.02](https://doi.org/10.1097/01.NAJ.0000390519.83887.02).
- 793 Ghimire, S. (2017). Barriers to diet and exercise among Nepalese Type 2 diabetic patients.
794 *International Scholarly Research Notices*, 2017, 1-9.
795 <https://doi.org/10.1155/2017/1273084>
- 796 Groher, M. E., & Crary, M. A. (2020). *Dysphagia: Clinical Management in Adults and*
797 *Children* (3rd ed.). Maryland Heights, MS: Mosby, Inc.
- 798 Guimaraes, F. C., Amorim, P. R. dos S., Reis, F. F. dos, Bonoto, R. T., Oliveira, W. C. de,
799 Moura, T. A. d. S., De Assis, C.L., Palotas, A., & Lima, L. M. (2015). Physical
800 activity and better medication compliance improve mini-mental state examination

- 801 scores in the elderly. *Dementia and Geriatric Cognitive Disorders*, 39(1-2), 25-31.
802 <https://doi.org/10.1159/000366413>
- 803 Guyomard, V., Fulcher, R.A., Redmayne, O., Metcalf, A.K., Potter, J.F. & Myint, P.K.
804 (2009). Effect of dysphasia and dysphagia on inpatient mortality and hospital length
805 of stay: A Database study. *Journal of the American Geriatrics Society*, 57, 2101-
806 2106. <https://doi.org/10.1111/j.1532-5415.2009.02526.x>
- 807 Haby, M., Chapman, E., Clark, R., Barreto, J., Reveiz, L., & Lavis, J., (2016). What are the
808 best methodologies for rapid reviews of the research evidence for evidence-informed
809 decision making in health policy and practice: a rapid review. *Health Research Policy
810 and Systems*, 83(14), 1-12. <https://doi.org/10.1186/s12961-016-0155-7>
- 811 Hall, G. L., & Heath, M. (2021). Poor medication adherence in African Americans is a matter
812 of trust. *Journal of Racial & Ethnic Health Disparities*, 8(4), 927-942.
813 <https://doi.org/10.1007/40615-020-00850-3>
- 814 Hansell, D., & Heinemann, D. (1996). Improving nursing practice with staff education.
815 *Gastroenterology Nursing*, 19(6), 201-206. [https://doi.org/10.1097/00001610-](https://doi.org/10.1097/00001610-199611000-00003)
816 199611000-00003
- 817 Jang, Kyoung Hee, & Jung (2016). Converged study on the nurses' knowledge and
818 performance of cancer pain management in one city. *Journal of the Korea
819 Convergence Society*, 7(6), 115-124. <https://doi.org/10.15207/JKCS.2016.7.6.115>
- 820 Herrema, A. L., Wesrerman, M. J., Van Dongen, E. J. I., Kudle, U., & Veltkamp, M. (2018).
821 Combined protein-rich diet with resistance exercise intervention to counteract
822 sarcopenia: A qualitative study on drivers and barriers of compliance. *Journal of
823 Aging and Physical Activity*, 26(1), 106-113. <https://doi.org/10.1123/japa.2017-0126>
- 824 Howells, S., Cornwell, P., Ward, E., & Kuipers, P. (2020). Client perspectives on living with
825 dysphagia in the community. *International Journal of Speech-Language Pathology*,
826 23(2), 201-212. <https://doi.org/10.1080/17549507.2020.1765020>

- 827 Huppertz, V., Wijk, N., Baijens, L., Groot, L., Halfens, R., Schols, J., & Helvoort, A. (2020).
828 Design of the DYNAMO study: A multi-center randomized control trial to investigate
829 the effect of pre-thickened oral nutritional supplements in nursing home residents
830 with dysphagia and malnutrition (Risk). *BMC Geriatrics*, 20, 537.
831 <https://doi.org/10.1186/s12877-020-01947-4>
- 832 Jan, S., Usherwood, T., Brien, J. A., Peiris, D., Rose, J., Hayman, N., Howard, K., Redfern,
833 J., Laba, T., Cass, A., & Patel, A. (2011). What determines adherence to treatment in
834 cardiovascular disease prevention? Protocol for a mixed methods preference study.
835 *BMJ Open*, 1(2), 1–8. <https://doi.org/10.1136/bmjopen-2011-000372>
- 836 Jin, L. & Acharya, L. (2015). Cultural beliefs underlying medication adherence in people of
837 Chinese descent in the United States. *Health Communication*, 31(5), 513-521.
838 <https://doi.org/10.1080/10410236.2014.974121>
- 839 Kapoor, R., Bansal, A., Kumar, S., & Miriyals, R. T. (2016). Factors influencing compliance
840 to radical treatment of middle thoracic esophageal cancer: An audit from a regional
841 cancer center. *Indian Journal of Palliative Care*, 22(3), 288-294.
842 <https://doi.org/10.4103/0973-1075.185037>
- 843 Keller, H., Chambers, L., Niezgoda, H., & Duizer, L. (2012). Issues associated with the use
844 of modified texture foods. *The Journal of Nutrition, Health & Aging*, 16(3), 195-200.
- 845 Keller, H., & Duizer, L. (2014). What do consumers think of pureed food? Making the most
846 of the indistinguishable food. *Journal of Nutrition in Gerontology & Geriatrics*,
847 33(3), 139-159. <https://doi.org/10.1080/21551197.2014.927302>
- 848 Kelly, A., Tymms, K., De Wit, M., Bartlett, S., Cross, M, Dawson, T., De Vera, M., Evans,
849 V., Gill, M., Hassett, G., Lim, I., Manera, K., Major, G., March, L., O'Neill, S.,
850 Scholte-Voshaar, M., Sinnathurai, P., Sumpton, D., TeiXeira-Pinto, A., Tugwell, P.,
851 Bemt, B., & Tong, A. (2019). Patient and caregiver priorities for medication
852 adherence in Gout, Osteoporosis, and Rheumatoid Arthritis: Nominal group

- 853 technique. *Arthritis Care & Research*, 72(10), 1410-1419.
854 <https://doi.org/10.1002/acr.24032>
- 855 Khambati, A., Matulewicz, R. S., Perry, K. T., & Nadler, R. B. (2017). Factors associated
856 with compliance to increased fluid intake and urine volume following dietary
857 counseling in first-time Kidney stone patients. *Journal of Endourology*, 31(6), 605-
858 610. <https://doi.org/10.1089/end.2016.0836>
- 859 Khangura, S., Konnyu, K., Cushman, R., Grimshaw, J., & Moher, D. (2012). Evidence
860 summaries: The evolution of a rapid review approach. *Systematic Review*, 10(1), 1-9.
861 <https://doi.org/10.1186/2046-4053-1-10>
- 862 Kotecki, S., & Schmidt, R. (2010). Cost and effectiveness analysis using nurses staff-
863 prepared thickened liquids vs commercially thickened liquids in stroke patients with
864 dysphagia. *Nursing Economics*, 28(2), 106-113.
- 865 Krekeler, B., Broadfoot, C., Johnson, S., Connor, N., & Rogus-Pulia, N. (2018). Patient
866 adherence to dysphagia recommendations: A systematic review. *Dysphagia*, 33, 173-
867 184. <https://doi.org/10.1007/s00455-017-9852-9>
- 868 Krekeler, B., Vitale, K., Yee, J., Powell, R., & Rogus-Pulia, N. (2020). Adherence to
869 dysphagia treatment recommendations: A conceptual model. *Journal of Speech,*
870 *Language and Hearing Research*, 63(6), 1- 17. [http://doi.org/10.1044/2020_JSLHR-](http://doi.org/10.1044/2020_JSLHR-19-00270)
871 [19-00270](http://doi.org/10.1044/2020_JSLHR-19-00270)
- 872 Laffel, G. L., Barnett, A. I., Finkelstein, S., & Kaye, M. P. (1992). The Relation between
873 Experience and Outcome in Heart Transplantation. *New England Journal of*
874 *Medicine*, 327(17), 1220–1225. <https://doi.org/10.1056/NEJM199210223271707>
- 875 Law, M., Cheng, L., Dhalla, I., Heard, D., & Morgan, S. (2012). The effect of cost on
876 adherence to prescription medications in Canada. *Canadian Medical Association*
877 *Journal*, 184(3), 297-302. <https://doi.org/10.1503/cmaj.111270>

- 878 Leiter, A.E., & Windsor, J. (1996). Compliance of geriatric dysphagic patients with safe-
879 swallowing instructions. *Journal of Medical Speech-Language Pathology*, 4, 289-300.
- 880 Low, J., Wyles, C., Wilkinson, T., & Sainsbury, R. (2001). The effect of compliance on
881 clinical outcomes for patients with dysphagia on videofluoroscopy. *Dysphagia*, 16(2),
882 123–127. <https://doi.org/10.1007/s004550011002>
- 883 Lum, Z. K., Suministrado, M. S. P., Venketasubramanian, N, Ikram, M. K., & Chen, C.
884 (2018). Medication compliance in Singaporean patients with Alzheimer’s disease.
885 *Singapore Medical Journal*, 60(3), 154-160.[https://doi-](https://doi-org.libproxy.uoregon.edu/10.11622/smedj.2018076)
886 [org.libproxy.uoregon.edu/10.11622/smedj.2018076](https://doi-org.libproxy.uoregon.edu/10.11622/smedj.2018076)
- 887 McCormick, S., Stafford, K., Saqib, G., Chronin, D., & Power, D. (2008). The efficacy of
888 pre-thickened fluids on total fluid and nutrient consumption among extended care
889 resident requiring thickened fluids due to risk of aspiration. *Age & Aging*, 37(6), 714-
890 715. <https://doi.org/10.1093/ageing/afn204>
- 891 McCurtin, A., Healy, C., Kelly, L., Murphy, F., Ryan, J., & Walsh, J. (2018). Plugging the
892 patient evidence gap: What patients with swallowing disorders post-stroke say about
893 thickened liquids. *International Journal of Language & Communication Disorders*,
894 53(1), 30-39. <https://doi.org/10.1111/1460-6984.12324>
- 895 McKay, C. D., & Verhagen, E. (2015). ‘Compliance’ versus ‘adherence’ in sport
896 injury prevention: why definition matters. *British Journal of Sports Medicine*, 50(7),
897 382–383. <https://doi.org/10.1136/bjsports-2015-095192>
- 898 McKinstry, A., Tranter, M., & Sweeney, J. (2010). Outcomes of dysphagia intervention in a
899 pulmonary rehabilitation program. *Dysphagia*, 25(2), 104-111.
- 900 McQuaid, E. (2018). Barriers to medication adherence in asthma: The importance of culture
901 and context. *Annals of Allergy, Asthma & Immunology*, 121(1), 37-42.
902 <https://doi.org/10.1016/j.anai.2018.03.024>

- 903 McQuestion, M., Fitch, M., & Howell, D. (2011). The changed meaning of food: Physical,
904 social and emotional loss for patients having received radiation treatment for head and
905 neck cancer. *European Journal of Oncology Nursing*, *15*(2), 145-151.
906 <https://doi.org/10.1016/j.ejon.2010.07.006>
- 907 Mikulka, I. (2016). Importance of compliance in nutritional management. *Orvosi Hetilap*,
908 *157*(15), 596-598. <https://doi-org.libproxy.uoregon.edu/10.1556/650.2016.30413>
- 909 Mintz, S.W., & Du Bois, C.M. (2002). The anthropology of food and eating. *Annual Review*
910 *of Anthropology*, *31*(1), 99–119.
911 <https://doi.org/10.1146/annurev.anthro.32.032702.131011>
- 912 Namasivayam-MacDonald, A., Morrison, J., Steele, C., & Keller, H. (2017). How
913 swallowing pressures and dysphagia affect malnutrition and mealtime outcomes in
914 long term care. *Dysphagia*, *32*(6), 785-796. [https://doi.org/10.1007/s00455-017-9825-](https://doi.org/10.1007/s00455-017-9825-z)
915 [z](https://doi.org/10.1007/s00455-017-9825-z)
- 916 Ney, D. M., Weiss, J. M., Kind, A. J., & Robbins, J. (2009). Senescent swallowing: Impact,
917 strategies, and interventions. *Nutrition in Clinical Practice*, *24*(3), 395–413.
918 <https://doi.org/10.1177/0884533609332005>
- 919 Nund, R., Ward, E., Scarinci, N., Cartmill, B., Kuipers, P., & Porceddu, S. (2014). Carers’
920 experiences of dysphagia in people treated for head and neck cancer: A qualitative
921 study. *Dysphagia*, *29*, 450-458. <https://doi.org/10.1007/s00455-014-9527-8>
- 922 Ortega, O., Martin, A., & Clavé, P. (2017). Diagnosis and management of oropharyngeal
923 dysphagia among older persons, State of the art. *Journal of the American Medical*
924 *Directors Association*, *18*(7), 576–582. <https://doi.org/10.1016/j.limno.2013.04.005>
- 925 Patterson, J., Rapley, T., Carding, P., Wilson, J., & McColl, E. (2013). Head and neck cancer
926 and dysphagia: Caring for carers. *Psycho-Oncology*, *22*(8), 1815-1820.
927 <https://doi.org/10.1002/pon.3226>

- 928 Pereira, M. G., Costa, V., Oliveira, D., Ferreira, G., Pedras, S., Sousa, M. R., & Machado, J.
929 C. (2015). Patients' and spouses' contribution toward adherence to self-care behaviors
930 in type 2 diabetes. *Research and Theory for Nursing Practice*, 29(4), 276-296.
931 <https://doi.org/10.1891/1541-6577.29.4.276>
- 932 Polisen, J., Garrity, C., Kamel, C., Stevens, A., Abou-Setta, A. (2015). Rapid review
933 programs to support health care and policy decision making: A descriptive analysis of
934 processes and methods. *Systematic Reviews* 26 (4), 1-7.
935 <https://doi.org/10.1186/s13643-015-0022-6>
- 936 Rimer, B. K., & Glanz, K. (2005). *Theory at a glance: A guide for health promotion*
937 *practices*. U.S. Department of Health and Human Services, National Institutes of
938 Health, National Cancer Institutes.
- 939 Robbertse, A., & Beer, A. (2020). Perceived barriers to compliance with speech-language
940 therapist dysphagia recommendations of South African nurses. *South African Journal*
941 *of Communication Disorders*, 67(1), 686-692.
942 <https://doi.org/10.4102/sajcd.v67i1.686>
- 943 Rosenvinge, S. K., & Starke, I. D. (2005). Improving care for patients with dysphagia. *Age*
944 *and Ageing*, 34(6), 587-593. <https://doi.org/10.1093/ageing/afi187>
- 945 Sallis, J. F., Owen, N., & Fisher, E. B. (2008). *Ecological models of health behavior. Health*
946 *Behavior and Health Education: Theory, Research, and Practice*.
947 https://doi.org/10.7326/0003-4819-116-4-350_1
- 948 Seshadri, S., Sellers, C., Kearney, M. (2018). Balancing Eating with Breathing: Community-
949 Dwelling Older Adults' Experiences of Dysphagia and Texture-Modified Diets.
950 *Gerrontologist*, 58(4), 749-758. <https://doi:10.1093/geront/gnw203>
- 951 Shim, J. S., Oh, B. M., & Han, T. R. (2013). Factors associated with compliance with
952 viscosity-modified diet among dysphagic patients. *Annals of Rehabilitation Medicine*,
953 37(5), 628-632. <https://doi.org/10.5535/arm.2013.37.5.628>

- 954 Smith-Tamaray, M., Wilson, L., McAllister, L. (2011). Factors affecting dysphagia
955 management and compliance with recommendations in non-metropolitan healthcare
956 settings. *International Journal of Speech-Language Pathology*, 13(3), 268-279.
957 <https://doi.org/10.3109/17549507.2011.573575>
- 958 Soares, R. (2009). Life expectancy and welfare in Latin America and the Caribbean. *Health*
959 *Economics*, 18(1), 37–54. <https://doi.org/10.1002/hec.1460>
- 960 Sogari, G., Velez-Argumedo, C., Gómez, M., & Mora, C. (2018). College students and eating
961 habits: A study using an ecological model for healthy behavior. *Nutrients*, 10(12),
962 1823. <http://doi.org/10.3390/nu10121823>
- 963 Soumerai, S., Pierre-Jacques, M., Zhang, F., Ross-Degnan, D., Adams, A., Gurwitz, J., Adler,
964 G., & Safran, D. (2006). Cost-related medication nonadherence among elderly and
965 disabled Medicare beneficiaries: A national survey 1 year before the Medicare drug
966 benefit. *Archives of Internal Medicine*, 166(17), 1829-1835.
967 <https://doi.org/10.1001/archinte.166.17.1829>
- 968 Stringham, J., Ashkenazy, N., Galor, A., & Wellik, S. R. (2018). Barriers to Glaucoma
969 Medication Compliance Among Veterans: Dry Eye Symptoms and Anxiety
970 Disorders. *Eye & contact lens*, 44(1), 50–54.
971 <https://doi.org/10.1097/ICL.0000000000000301>
- 972 Suiter, D. M. & Gosa, M. M. (2019). *Assessing and Treating Dysphagia: A Lifespan*
973 *Perspective*. Thieme.
- 974 Sumlin, L., Garcia, T., Brown, S., Winter, M., Garcia, A., Brown, A., & Cuevas, H. (2014).
975 Depression and adherence to lifestyles changes in type 2 diabetes: A systematic
976 review. *The Diabetes Educator*, 40(6), 731-744.
977 <https://doi.org/10.1177/0145721714538925>

- 978 Sura, L., Madhavan, A., Carnaby, G., & Crary, M. A. (2012). Dysphagia in the elderly:
979 Management and nutritional considerations. *Clinical Interventions in Aging*, 7, 287–
980 298. [https://doi.org/ 10.2147/CIA.S23404](https://doi.org/10.2147/CIA.S23404)
- 981 Trinidad, A., Martinelli, K., Andreou, Z., & Kothari, P. (2011). Soft, fortified ice-cream for
982 head and neck cancer patients: a useful first step in nutritional and swallowing
983 difficulties associated with multi-modal management. *Otorhinolaryngol*, 269, 1257-
984 1260. [https://doi.org/ 10.1007/s00405-011-1769-6](https://doi.org/10.1007/s00405-011-1769-6)
- 985 Ullrich, S., & Crichton, J. (2015). Older people with dysphagia: Transitioning to texture-
986 modified food. *British Journal of Nursing*, 24(13), 286-692. [https://doi.org/
987 10.12968/bjon.2015.24.13.686](https://doi.org/10.12968/bjon.2015.24.13.686)
- 988 Vucea, V., Keller, H., Morrison, J., Duizer, L., Duncan, A., & Steele, C. (2019). Prevalence
989 and characteristics associated with modified textured food use in long term care: An
990 analysis of making the most of mealtimes (M3) project. *Canadian Journal of Dietetic
991 Practice & Research*, 80(3), 104-110. [https://doi.org/ 10.3148/cjdpr-2018-045](https://doi.org/10.3148/cjdpr-2018-045)
- 992 Yilmaz, F & Colak, M. (2018). Evaluation of inappropriate medication use and compliance in
993 elderly people. *Current Drug Safety*, 13(2), 122-127. [https://doi.org/
994 10.2174/1574886313666180321120036](https://doi.org/10.2174/1574886313666180321120036)
- 995 Zhao, M., Chiriboga, D., Olendzki, B., Xie, B., Li, Y., McGonigal, L. J., Maldonado-
996 Contreras, A., & Ma, Y. (2018). Substantial increase in compliance with saturated
997 fatty acid intake recommendations after one year following the American heart
998 association diet. *Nutrients*, 10(10). <https://doi-org.libproxy.edu/10.3390/nu10101486>

999

Figure and Table Legends/Captions

1000 **Figure 1.** Flow diagram of the rapid review search process, including the number of articles
1001 identified, included, and excluded at each step

1002 **Figure 2.** The “The Ecological Model of Factors Affecting Adherence in Dysphagia and
1003 Healthcare” as guided by the dysphagia-specific (left) and general healthcare (right)
1004 literature, highlighting factors influencing adherence across three different levels (individual,
1005 caregiver, environment)

1006

1007 **Table 1.** Characteristics of all studies meeting the criteria for inclusion in the rapid review

1008