Critical Review: Does access to thin water in individuals on thickened liquid diets in rehabilitation and acute care facilities lead to improved quality of life?

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This critical review examined the evidence for the improvement of quality of life following the implementation of a free water protocol in individuals on a thickened liquid diet in acute care and rehabilitation settings. A literature search yielded six articles that met selection criteria. Four articles employed a prospective randomized control trial study design, one article utilized a single group pre-test post-test study design, and one article conducted a systematic review. The findings of this review suggest that the implementation of water protocols improves patients' quality of life; however, protocols should only be implemented in patients with relatively good cognition and mobility and following proper oral care. Study limitations and recommendations for future research were discussed.

Introduction

It is well known that thin liquids are aspirated more frequently in patients experiencing swallowing difficulties, known as oropharyngeal dysphagia (Karagiannis et al, 2011). This is because these liquids flow more quickly, which requires a faster and more coordinated response from the swallowing mechanism (Kaneoka et al., 2016). A modified diet of thickened liquids is often prescribed by Speech Language Pathologists (SLPs) as thicker liquids have a slower rate of flow, allowing the swallowing mechanism more time to coordinate and respond (Kaneoka et al., 2016). While this viscosity alteration may decrease the risk of aspiration, it presents its own challenges. Low patient enjoyment and low compliance with thickened liquid diets has been widely reported (Langmore, 2011). These factors may potentially lead to a decrease in fluid intake and subsequent dehydration. Furthermore, thickened fluids are more harmful to the lungs if aspirated as compared to thin water, which contains less pathogenic bacteria and is therefore less likely to cause infection (Gillman et al., 2017).

For the above reasons, water protocols, such as the Frazier Free Water Protocol have been developed, allowing for the permittance of thin water to patients experiencing oropharyngeal dysphagia. Previous studies have found that the implementation of water protocols have been shown to reduce widely known complications of dysphagia such as dehydration and xerostomia, and to promote stronger observance of prescribed swallowing protocols (Gillman et al., 2017). Furthermore, it has been suggested that when risk factors of aspiration pneumonia such as mobility and oral hygiene are controlled for, the risk of developing pneumonia prior to the aspiration of thin fluids on water protocols is reduced (Panther, 2005).
Currently, there is literature to suggest that when individuals with oropharyngeal dysphagia are placed on thickened liquid diets, there is a decrease in their quality of life (Lazenby-Paterson, 2020). Therefore, there is reason to believe that individuals on thickened liquid diets may experience an improvement in their quality of life if they were permitted access to thin water. However, there is conflicting evidence regarding whether or not the ability to consume thin water actually leads to an improvement the quality of life of these individuals. There is a need to review the current literature and to evaluate this relation, as it may demonstrate the importance of implementing a water protocol to improve the quality of life. Additionally, it is important to review if certain patient characteristics influence the level of benefit experienced by an individual on a water protocol. Finally, it is worthwhile to investigate best practice in implementing a water protocol.

Objectives

The primary objective of this paper is to critically review the existing literature to discover if the implementation of a water protocol leads to improved quality of life in individuals on thickened liquid diets or in acute care and rehabilitation facilities.

Methods

Search Strategy
A literature search was completed using a variety of computerized databased including PubMed, Google Scholar, ScienceDirect and ASHAWire using the following search terms:

(free water) OR (water protocol) OR (free water protocol) AND (quality of life) AND (aspiration pneumonia) OR (dysphagia)

Selection Criteria

Studies selected for inclusion in this review were required to investigate effects that the implementation of a free water protocol had on quality of life. Participants must have had confirmed aspiration of thin liquids and be on thickened liquid diets. Studies must have also been conducted in either an acute care or rehabilitation facility.

Data Collection

Results of the literature search yielded six articles that matched the above selection criteria. Four articles employed a prospective randomized control trial study design, one article utilized a single group pre-test post-test study design, and one article conducted a systematic review.

Results

Garon, Engle, & Ormiston (1997) explored the effects of water ingestion in patients who were known to aspirate thin fluids. Newly admitted patients with recent cerebrovascular accidents (CVA) who were confirmed by Videofluoroscopic Swallow Studies (VFSS) to aspirate on thin fluids were recruited for this 1 year randomized, controlled, prospective study. 20 patients were randomly assigned to a control or study group. Each group consisted of 10 patients of a similar mean age. Those assigned to the control group remained on thickened fluids while the study group was provided access to thin water in between meals with an oral pre-rinse required prior to intake. The amount of fluid intake, both thickened and thin, was recorded on daily flowcharts for both groups.

The results of the study indicated that no patients in either group developed aspiration pneumonia during the study or in a 30-day follow up period. There was a significant difference ($p=0.03$) found between the study and control groups on the average daily intake of thickened fluids with the control group consuming an average of 1210 cc/day and the study group consuming a total of 855 cc/day. This difference is due to the study group's additional consumption of thin fluids of 462 cc/day, bringing the study group's overall mean fluid intake to 1318 cc/day. It should be noted that recording of fluids was completed by a variety of different healthcare workers which may have led to variability in recording.

In a follow-up unstandardized satisfaction survey, the authors found that all study participants reported satisfaction with access to water as it related to quenching thirst and relieving oral dryness. These participants reported that small sips of thin water throughout the day made a large impact on their overall satisfaction, thirst levels and oral cavity dryness. In contrast, 90% of control subject were dissatisfied with thickened liquids and reported desiring access to sips of water or ice chips to quench their thirst. The questions included in this survey were not recorded in this paper and therefore this survey could not be replicated.

The exclusion criteria of the study were well stated and extensive, taking into account factors such as medical comorbidities, reflux or other esophageal issues, poor cognition and impulsive tendencies, and the inclusion criteria was quite broad (including various races, ages, ethnicities, and genders), which together increases the generalizability of the study. However, the small sample size and the potential variability in recording, as well as the informal use of an evaluation of patient satisfaction which provided only anecdotal evidence leads to an overall equivocal level of evidence presented for the improvement of swallow related quality of life.

Karagiannis et al. (2011) completed a randomized-control group prospective study investigating the effects of oral intake of thin fluids in people with dysphagia with previously identified aspiration. 76 participants with dysphagia, on thickened diet, as prescribed by an SLP, were randomly assigned to a control group (34 patients) who would remain on thickened liquids or a treatment group (42 patients) who would be allowed access to thin water in between meals.

Participants included in this study had been previously confirmed to have aspirated on thin liquids in two independent assessments by two SLPs. Assessments included bedside evaluations, Fiberoptic Endoscopic Evaluation of Swallowing (FEES) and VFSS. The two independent assessments of swallowing ability increase the interrater reliability of this study.

This study consisted of two phases. The first phase consisted of extensive oral hygiene education provided to all healthcare professionals who would be involved in the care of participants. The second phase was broken into three parts: 1) monitoring of both groups for 72 hours while consuming thickened liquids, 2) providing access to thin water to the treatment group in between meals for 72 hours, 3) monitoring of both groups for 5 days for the development of aspiration pneumonia (the authors determined this was most likely to occur in the 24-48 hours post consumption of thin fluids). Participants' body core temperature was recorded three times daily and their total fluid intake was recorded. They were also

examined daily, via chest x-ray, by physicians who were blind to the assignment of participants.

An informal quality of life survey was administered pre- and post-intervention. Eighteen participants in total completed these surveys (5 control, 13 treatment). The survey consisted of the following questions: 1. How have you been feeling? 2. Are you happy with the drinks? 3. Have you been feeling thirsty? 4. How clean does your mouth feel? The Wong and Baker Pain Rating Scale (1997) was adapted and used to assess participants' answers regarding quality of life.

The authors noted that a limitation of this study was the limited overall participation in quality of life surveys (24% of participants) and the informal nature of the quality of life survey questions. Furthermore, the exclusion criteria, while comprehensive, could have presented a greater effort to eliminate potential confounds such as limited mobility or immobility, which is another limitation noted by the authors. A particular strength of this study was the blinding of the physicians completing the chest x-ray.

While the assessment of quality of life has its limitations, overall the authors presented a strong study design and presented valid and reliable research methods which suggest that the results may be interpreted with a suggestive level of evidence.

Carlaw et al. (2012) conducted a pilot study to determine the effect of implementation of a free water protocol in individuals with thin liquid aspiration on adverse health outcomes, fluid intake, and quality of life. This study was a randomized control trial with one of the two groups having a control phase before crossover to the treatment phase. Sixteen participants (ages 19-62 years) with thin liquid dysphagia were randomly assigned to either the treatment group or the control group with crossover. The GF Strong Water Protocol (GFSWP) was employed and consisted of three phases: 1) preparation to determine best practices for implementation and assigning of roles to multidisciplinary team members, 2) implementation of GFSWP for 14 days using care plans for water intake and oral care, and 3) outcome evaluation using the SWAL-QOL to determine quality of life. Baseline and post-intervention measures using the SWAL-QOL were taken.

Results of this study were determined by measuring the key subscales of the SWAL-QOL that would be impacted by the GFSWP (symptom, burden, mental health, fear, and fatigue). Results indicated that there was a significant difference in key subscale composite scores with a greater improvement in the control phase measures. Therefore, there was a significant improvement overall from baseline to post-intervention in quality of life for both groups.

The selection and exclusion criteria for this study were both reported in great detail. Due to controlling for factors that may have skewed the results of the study such as an absent pharyngeal swallow or oral dental bacteria, this study's results will be more valid then if these variables were not controlled for.

The authors also employed a strong study design with random assignment to treatment or control groups. The crossover of the control group to the water protocol phase allowed for measurement of quality of life without access to water over an extended period of time before receiving water. Additionally, the study design and methods were extensively reported with explicit instructions as to what roles each team member played and steps for implementing the protocol. These details would allow of easy study replication. Each participant in the study also received consistent care that matched their level of assistance needed, allowing for equal access to oral care and water across all participants.

The decision to use the SWAL-QOL in this study was a strong choice as it is a common test used to measure swallow-related quality of life in individuals with dysphagia. The SWAL-QOL is high reliability with high internal consistency in addition to high specificity and sensitivity (Rinkel et al., 2009). Furthermore, creating a key subscale for the SWAL-QOL allowed for specific measurement of the variables that would be most likely to be affected by the implementation of the water protocol.

With regards to limitations of this study, the authors reported that a lack of blinding for those in the control phase likely effected the results. The control group had perceived worsening of their dysphagia symptoms and swallowing from baseline to the end of the control phase. This is likely because the participants knew they would have access to water eventually, but having to wait to receive it made them more aware of their swallowing difficulties and made receiving only thickened liquids or being NPO appear much worse. Other reported limitations included the short study period which was due to the short-stay nature of the rehabilitation facility, and a small sample size. Carlaw et al. (2012) also chose to include individuals with a wide range of medical diagnoses and severity [cardiovascular accident (CVA), spinal cord injury, traumatic brain injury (TBI)] which may make

generalizing the results more difficult. It is not clear what characteristics or diagnoses would lead to more improvement in quality of life across individuals.

Although there were some inherent limitations to this study, the level of evidence is high to support the use of a water protocol in a rehab facility to improve quality of life. The level of evidence is highly suggestive due to the appropriateness of the study design, the methodology, and the measures used to assess quality of life.

Pooyania et al. (2015) conducted a prospective, randomized, controlled pilot study to determine the effects of a free water protocol on thickened and total fluid intake, swallowing related care, and swallowing related quality of life. This study included 17 participants, ages 16 to 74 years, with acquired brain injury or stroke and confirmed aspiration of thin liquids. Participants were randomly assigned using a random number table to a control group, receiving only thickened beverages, or a treatment group receiving thickened beverages and thin water. SWAL-CARE and SWAL-QOL were administered at baseline, and were attempted to be administered again prior to discharge. Unfortunately, not all participants were able to complete all subsections of the SWAL-QOL. Some family members attempted to complete the surveys for the participants, but a high number were left unfinished. Therefore, results of the SWAL-QOL were unable to be reported and a composite score could not be determined.

Eligibility for this study was determined based on diagnosis of an acquired brain injury, confirmed aspiration, and restriction of thin fluids, ensuring all participants were of similar severity and on the same diet. The exclusion criteria were extensive, ensuring that there were no individuals involved in the study who had additional diagnoses or issues that would skew the results (e.g. pulmonary complications, immune system deficiency, etc.). Additionally, the methodology was clearly stated, allowing for possible replication of the study. Documentation procedures and communication of the multidisciplinary team members was excellent, ensuring all participants received the assistance and care needed to properly implement the free water protocol.

Pooyania et al. (2015) reported that a limitation that caused an inability to report the quality of life composite score was the nature of the study population. Many individuals in the study had cognitive impairments or aphasia that made completing the SWAL-QOL on their own difficult. If this study was replicated, it would be crucial to have individuals trained on administering the SWAL-QOL to assist those participants who cannot complete it on their own. Doing this would ensure reliable reporting and would allow for a composite score to be developed for quality of life. This study also had a small sample size, and there was a lack of females ($n = 1$) included in the study, making it difficult to generalize findings.

Although there was an appropriate study design and methodology, the limitations of this study lead to an equivocal level of evidence. Due to lack of reliability in having SWAL-QOL questionnaires completed, no quality of life results could be reported, and therefore it is not possible to draw a conclusion as to whether or not quality of life was improved when the free water protocol was implemented.

Karagiannis and Karagiannis (2014) conducted a follow up study to their previous study on provision of water to individuals with dysphagia (Karagiannis et al., 2011). Results of the of the previous study were used to determine who would be best suited to be placed on a free water protocol in order to assess quality of life. This study was a single group pre-test post-test design that aimed to examine the implications of a free water protocol on quality of life. 16 participants (ages 70 to 92 years) with a wide range of conditions including CVA, dementia, cancer, Parkinson's Disease (PD), heart disease, and TBI were included in this study. All participants had a diagnosis of oropharyngeal dysphagia and were on a modified diet of thickened liquids. This study included two phases: 1) education related to oral care provided to all members of the multi-disciplinary team, and 2) implementation of the free water protocol and pre-/post-intervention monitoring. A simple 4-question quality of life survey was administered pre- and post-intervention.

Overall, 69% of participants completed both pre- and post-intervention quality of life surveys. Appropriate statistical tests (t-tests) were used to determine that there was not a statistically significant difference between pre and post measures of general well-being. However, measures of quality of drinks, hydration, and oral mouth care showed a highly significant difference from pre to post test ($p<0.001$), indicating greater satisfaction in all three measures.

Karagiannis and Karagiannis' (2014) use of a single group pre-test post-test design limits the internal validity of the study results as participants may have a preconceived notion regarding how having access to water will affect their quality of life. This study design was also weak due to there being no randomization,

counterbalancing, or control group. Additionally, there was limited information provided regarding implementation of the treatment. Therefore, it would be difficult to replicate this study since the treatment proceedings are not clearly described.

The authors included individuals with a wide range of medical diagnoses, however there was a lack of information regarding other personal characteristics of the study population that may have impacted the results such as time post-onset and severity of their ailments. Due to this, it is difficult to be certain that other factors did not impact the responses given for the surveys. Furthermore, it would be difficult to generalize these results to a wider population as it cannot be clearly stated what characteristics would make an individual more likely to have improvements in quality of life when on a free water protocol.

Although it is not possible to identify the exact cause for improvements from pre- to post-intervention, it is appropriate to say that there was a marked increase in quality of life overall for these participants, post-intervention. However, due to the limitations of study design, this study provided an equivocal level of evidence. It is difficult to conclude with a high degree of certainty that the implementation of a free water protocol is the reason for improvement in quality of drinks, hydration, and oral care from pre-test to post-test.

Gillman, Winkler, & Taylor (2017) conducted a systematic review of 8 research papers published in peer-reviewed journals. 5 randomized control trials, 2 cohort studies and 1 single group pre and post intervention prospective studies were analyzed with the intention of assisting clinicians working in the area of dysphagia. A meta-analysis of the studies found low quality evidence that there was a correlation between implementation of water protocols and subsequent lung complications as well as low quality evidence of increased hydration and fluid intake following access to thin water. This systematic review found that there was a perceptual increase of patient' quality of life when implementing water protocols.

A key finding of this systematic review of the literature revealed that of the 8 papers analyzed, the majority were deemed to be of good quality and reported more favourable outcomes (i.e., adherence to swallowing diet protocols, decreased thirst levels and increased oral comfort) upon implementation of water protocols, suggesting that provided protocol is managed well and patients are deemed appropriate candidates (i.e., cognitively intact, mobile) thin fluids may be offered to adult rehabilitation inpatients.

The meta-analysis was well stated in its inclusion and exclusion criteria and used various tools (i.e., Downs and Black quality assessment) to assess the quality of studies, which were completed by 2 independent reviewers, increasing the interrater reliability of this risk assessment. Overall, this meta-analysis is judged to have a highly suggestive level of evidence.

Discussion

Overall, current research suggests that there is an inconsistent improvement in quality of life and no indication that there will be a decline in quality of life when on a free water protocol. Three of the six articles reviewed had equivocal levels of evidence due to inherent limitations including broad diagnoses among study participants, weak methodology, and poor completion of quality of life measures. However, studies reviewed with higher levels of evidence showed consistent reports of improvement in quality of life, specifically in relation to swallowing.

Future Research Considerations:
It is recommended that future research be conducted to confirm consistent improvements in quality of life among patients who are on thickened liquid diets when placed on a free water protocol. In order to improve the level of evidence provided by the literature, it is recommended that future studies of swallowing related quality of life take the following into consideration:

a) Future research studies should attempt to employ study designs that offer a stronger level of evidence, in addition to larger sample sizes to allow for more application to clinical practice.

b) Studies should strive to use a formal, validated tool to measure quality of life among participants such as the SWAL-QOL to ensure the results are reliable and valid.

c) Trained individuals should administer the quality of life measures, thereby eliminating any barriers to completion such as poor mobility or cognition. This will allow for better completion rates as well as higher validity of responses.

d) Future research should focus on a more specific study population in terms of diagnoses in order to determine who may

have the most improvement in quality of life when on a free water protocol.

e) Use of blinding participants and researchers to the reason for completing quality of life measures should be implemented when possible.

Clinical Implications

Results of this critical review suggest that clinicians should feel comfortable implementing a free water protocol with patients who are relatively mobile and cognitively intact and when known predictors of aspiration pneumonia such as poor oral hygiene are controlled for. There is no present data to indicate that quality of life decreases in patients who meet water protocol criteria when they are provided access to thin water, and patients consistently reported that access to water made a positive impact in their day to day lives. Therefore, the controlled implementation of a water protocol by speech language pathologists will enhance the satisfaction and comfort of their patients.

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