ABSTRACT: Purpose: Neuromuscular electrical stimulation (NMES) is a relatively new yet controversial approach to the treatment of dysphagia that is gaining clinical popularity. The purpose of this study was to contribute to our understanding of the clinical viability of NMES, in light of empirical controversy, by describing current trends in the use/nonuse of NMES and clinician-perceived barriers to use among a sample of speech-language pathologists (SLPs) in the state of Iowa.

Method: Eighty SLPs employed in a variety of professional settings completed an online survey on practice patterns and perceptions related to general clinical practice, dysphagia management, and the use of NMES. Responses from 73 of these participants were included for quantitative and qualitative analyses.

Results: Despite high familiarity with NMES (70%) and the frequent provision of dysphagia services (74% of facilities and 62% of individuals), only 17% of facilities providing dysphagia services were reported to offer NMES as a treatment option, and only 3 respondents personally used this treatment modality. A variety of perceived benefits and disadvantages were reported by the nonusers; however, a majority indicated uncertainty related to the outcomes and whether the literature supports the use of NMES. Identified barriers to the adoption of NMES were related to both infrastructure (e.g., cost) and belief (e.g., misconceptions).

Conclusion: The focus of this study highlights the clinically relevant question of why clinicians may not adopt a new treatment modality, or specifically, why clinicians are not using NMES in their treatment of individuals with dysphagia, despite its presence as a viable treatment option. The perceptions and misconceptions related to NMES as reported by the nonusers indicate the necessity of not only continuing investigations into the use and outcomes of NMES but also targeting better dissemination of these results to best address evidence-based practice.

KEY WORDS: dysphagia, electrical stimulation, evidence-based practice, survey
management in order to provide the most effective and efficacious treatments.

A primary goal of swallowing intervention is to improve the client’s swallow function and reduce the risk of aspiration for efficient and safe oral consumption. Traditional nonsurgical treatment involves a number of compensatory interventions, including postural changes, swallowing maneuvers, and dietary restrictions and modifications, as well as rehabilitation treatments such as swallowing exercises (Logemann, 1998). Despite frequent use in clinical practice, the effectiveness and efficacy of these interventions remain questionable as previous research provided variable results and lacked research design homogeneity and rigor (see Ashford et al., 2009, for one review). Further, surveys conducted among clinicians in the area of dysphagia have indicated that variability exists in assessment and treatment practices, clinical decision making, and the utilization of standard treatment protocols (Crary, Carnaby-Mann, & Faunce, 2007; Martino, Pron, & Diamant, 2004; Mathers-Schmidt & Kurlinski, 2003).

Further impacting the clinical and research landscape regarding dysphagia management is the increasing popularity of novel approaches to dysphagia treatment. One such approach involves neuromuscular electrical stimulation (NMES). NMES is used frequently in physical medicine and rehabilitation facilities to support muscle strength development, including increasing muscle size, range of motion, and endurance; prevent or minimize muscle atrophy and fibrosis; and enhance muscle reeducation, including increasing sensory awareness and volitional muscle control (e.g., Alon, 1991; Campbell, n.d.; Carnaby-Mann & Crary, 2007). Although discrepancies in the reported effects of NMES exist, the literature and use of NMES in limb rehabilitation is extensive.

Much more limited data, with conflicting results, have been published regarding the effectiveness, benefits, and risks of using NMES in the management and treatment of individuals with dysphagia. On one hand, studies have reported various improvements in swallowing physiology and general swallowing performance following NMES (e.g., Shaw et al., 2007) as compared to traditional treatment or sham conditions (e.g., Blumenfeld, Han, LePage, Leonard, & Belafsky, 2006; Freed, Freed, Chatburn, & Christian, 2001; Ryu et al., 2009). Additionally, clinicians currently using NMES in dysphagia treatment have indicated positive clinical outcomes with no treatment-related complications and high patient and professional satisfaction (Crary et al., 2007), further suggesting a possible functional benefit of this treatment modality.

On the other hand, various studies have demonstrated no functional improvements in swallow function following NMES as compared to traditional treatment or any additional benefit of adding NMES to traditional treatment protocols (e.g., Bulow, Speyer, Bajens, Woisard, & Ekberg, 2008; Kiger, Brown, & Watkins, 2006). Further, the potential for decreased airway protection as a result of hyolaryngeal depression during electrical stimulation has been reported (Humbert et al., 2006; Ludlow et al., 2007). Differing outcomes might be attributable to study design limitations and methodological variation between studies, with those that used nonblinded, subjective outcome measures reporting more favorable outcomes than those involving blinded and more objective measures (Huckabee & Doelgen, 2007), as well as differences in patient characteristics, with more severely impaired individuals demonstrating smaller, less functional gains (Shaw et al., 2007). Systematic literature reviews have highlighted both these promising findings and findings of limited to no benefit of NMES over traditional treatment, with these reviews concluding that such findings are often overshadowed by the need for more controlled trials to assess efficacy (Carnaby-Mann & Crary, 2007; Clark, Lazarus, Arvedson, Schooling, & Frymark, 2009; Ludlow, 2010).

Despite limited efficacy data, or perhaps in light of reported positive benefits, NMES is currently being used in clinical practice (Crary et al., 2007). This disparity, or inconsistency, between empirical research and clinical practice is not unique to this particular modality of dysphagia treatment. Traditional dysphagia management techniques such as postural interventions and swallowing maneuvers are frequently used despite limited and/or conflicting effectiveness and efficacy data (Ashford et al., 2009). Surveys researching currently employed treatments and evaluation techniques have highlighted the concern that research-based evidence and clinical practice behaviors do not always agree. This is indicated not only by the utilization of clinical management techniques that are not supported by empirical evidence, but also by the failure to use such techniques that have been proven accurate (Garcia, Chambers, & Molander, 2005; Martino et al., 2004). As applied to the use of NMES in the limbs, and equally as applicable to its use in dysphagia treatment, it is of concern that current controversy and clinical tendency to accept potentially non-scientific, subjective, and commercially motivated claims may threaten the actual potential of electrical stimulation as a viable clinical modality (Alon, 1991). In other words, it is not only the utilization of techniques that are not fully supported by empirical research that needs to be addressed, but also the decision not to use a particular technique despite potential or actual benefit.

The question is, then, “Why does such a disparity exist?” More specifically, “What factors contribute to clinicians selecting a specific treatment protocol and what barriers prevent clinicians from selecting others?” Although certainly necessary and concluded by many systematic reviews of the current literature, it is not enough to study only the effectiveness and efficacy of a treatment modality, as has been the focus of previous literature; it is also important to understand what contributes to the adoption (or lack thereof) of that modality.

Converging evidence within the larger field of health care has pointed to particular barriers to the adoption of new technology and treatment protocols (e.g., health information technology infrastructures, Garrett et al., 2006; medications for substance abuse treatment, Rieckmann, Kovas, & Rutkowski, 2010). These barriers may be related to infrastructure concerns (e.g., costs of start-up, maintenance, and reimbursement; time needed to acquire training and equipment, implement a new system, and test efficacy and efficiency) or personal beliefs/attitudes (e.g., fear of...
change, negative public and professional attitudes about the new methodology, lack of buy-in from providers, stigma, and lack of feedback or knowledge regarding impact on patient care). The National Institute for Health and Clinical Excellence (NICE, 2007) developed a guide aimed at improving patient care that contained practical advice on how to encourage health care providers to change practices in line with the latest research/trends in clinical practice. Barriers discussed in this guide mirror those of previous research and include awareness and knowledge (e.g., health care professionals may be unaware of or lack familiarity with the latest evidence-based research), acceptance and beliefs (e.g., health care professionals’ personal beliefs and attitudes can significantly impact how they behave, yielding difficulty accepting new research/treatments that are in conflict with previous knowledge and believing that they will achieve better patient outcomes), and practicalities (e.g., a facility may lack the necessary resources or personnel).

These barriers may be equally applicable to the widespread adoption of new techniques for treating dysphagia. This is evident in the results of Crary et al.’s (2007) secondary survey of SLPs who declared a special professional interest in swallowing but did not use NMES in their treatment of dysphagia: The majority of respondents indicated that they wanted more published information on outcomes, effectiveness, and safety before adopting the approach. Although Crary and colleagues’ study sought to describe the perceptions of NMES among individuals who were not currently using the treatment, the identification of potential barriers to adopting such a modality was not a focus. This could explain why elicited responses related more to personal beliefs/attitudes and awareness/knowledge-related barriers (i.e., those most associated with individual perceptions) rather than encompassing all of the identified barriers described earlier. Further, this survey only targeted clinicians who were actively using NMES and clinicians with an expressive interest in dysphagia as evidenced by voluntary participation in a special interest group. However, as previously described, the widespread nature of dysphagia (i.e., in terms of population and prevalence) requires SLPs in all settings to be knowledgeable regarding current and new clinical practice. For example, there is an increase in dysphagia services being provided outside of medical settings, such as in schools where clinicians report decreased familiarity with, and lower levels of confidence in, providing these services (Hutchins, Gerety, & Mulligan, 2011). Additionally, given the rapid growth in popularity of NMES, including an increase in commercial marketing and positive patient stories, it is possible that more physicians and patients across multiple settings are requesting such treatment. It is unclear how this combination of increased dysphagia caseload, potentially increased pressure to use NMES, and decreased knowledge about dysphagia management and current research may be changing the face of NMES usage. Unfortunately, the perceived barriers of adopting and using this modality across settings are unknown. Regardless of what benefits may be revealed through further clinical and controlled empirical trials related to the use of NMES in dysphagia management, there will be no benefits to patients if clinicians do not or cannot incorporate the treatment into their clinical practice. Thus, it is of clear importance to examine clinicians’ perceptions and perceived barriers in an effort to further promote the appropriate practical adoption of new dysphagia treatments across all settings.

Although unable to provide substantive evidence regarding clinical effectiveness or efficacy, surveys can be used to gather information regarding treatment use/nonuse, practice patterns, and current perceptions from large samples in an efficient manner. Surveys have been employed effectively to gather information regarding a variety of approaches to dysphagia treatment (e.g., Crary et al., 2007; Hutchins et al., 2011; Martino et al., 2004). Previous surveys of dysphagia management and the use of NMES have targeted specific subsets of the population of SLPs. Our survey focused on describing current trends in the use and nonuse of NMES and perceived barriers to such use among SLPs across all settings, particularly those involved in the treatment of swallowing disorders. With the ultimate goal of evidence-based practice and bridging the gap between clinical practice and research in light of the more recent introduction of NMES as a treatment technique, it is important to understand this clinical trend better. Such an understanding must involve current clinician opinion regarding its use and barriers to its use not only to focus on the design of more clinically relevant research studies specifically targeting effectiveness and efficacy but also to encourage appropriate change in health care practice that will ultimately promote improved patient outcomes. Therefore, the purpose of the current study was to describe the current trends in and perceptions regarding the use of NMES in the clinical management of dysphagia and to identify clinicians’ perceived barriers to the adoption of its use.

METHOD

Survey Development and Protocol

The structure of this survey was adapted and modified from that reported by Crary et al. (2007). The survey contained a total of 43 questions and consisted of four sections (see the Appendix for a complete list of questions, including notation of which participants completed each section).

The first section sought general demographic and employment information. It included questions related to current employment setting, current employment role, and length of time working. Participants were also asked whether they were familiar with the use of electrical stimulation for the treatment of dysphagia and whether they were introduced to this technique during their graduate education. The second section addressed practice patterns related to general clinical practice, dysphagia treatment, and, when applicable, the use of electrical stimulation—all important clinician characteristics when considering perceptions regarding the use of NMES in general. Information gathered in this section sought general caseload information, information on the provision of dysphagia services at the facility and by the participant, and information regarding the use of electrical stimulation in the facility and by the participant.
For those participants reporting utilization of electrical stimulation, specific questions were asked regarding the populations receiving this treatment, criteria for the selection of electrical stimulation, the electrical stimulation protocol, use of concurrent treatment techniques, and follow-up visits. These questions specifically addressed the first goal of our study: to describe current trends in the use of NMES. The third section of the survey was only presented to those participants who reported using electrical stimulation. This section consisted of questions addressing patient outcomes and clinician satisfaction, including assessment of progress, percentage of patients experiencing improvements in outcome measures, degree of improvement, complications, and general satisfaction. The final section targeted participants’ perceptions regarding the effectiveness, potential benefits and disadvantages, barriers to use, and support of electrical stimulation. It additionally addressed external requests for treatment with electrical stimulation by physicians and/or patients. These last two sections addressed the second goal of our study: to describe perceptions related to NMES and potential barriers to its use. The survey contained a combination of binary, multiple-choice, and open-ended questions.

Participants

Invitations to participate were mailed to 705 SLPs in Iowa. The names and corresponding mailing addresses were purchased from the American Speech-Language-Hearing Association (ASHA). The list included all licensed and certified SLPs (including clinical fellows) in Iowa. Those individuals involved in the design of the survey and individuals identified as having moved out of the state were excluded from the mailing.

RESULTS

A total of 80 surveys were completed, resulting in an 11.3% response rate. Of the surveys that were completed, five were >50% incomplete and two indicated that the individuals were not currently employed or were not seeking employment in the state of Iowa. These seven surveys were excluded from further analysis, resulting in responses from 73 participants (91.3% of completed surveys).

Demographic and Employment Information

The majority of the respondents were female (93.2%; n = 68), master’s-level (94.5%, n = 69) clinicians. The majority indicated that they primarily provided clinical services in their respective work settings (82.2%, n = 60), with the remainder partially providing clinical services in addition to other responsibilities (e.g., administrator/supervisor, college/university faculty member, consultant, researcher). Although a few respondents were practicing as clinical fellows (6.8%, n = 5), most were working with their certificates of clinical competence and had been in the field for >1 year (93.2%, n = 68; see Table 1). Additionally, the respondents worked in a number of settings, including health care (52.1%, n = 38) and schools (23.3%, n = 17). Equal numbers of respondents maintained primarily adult or pediatric caseloads (45.2%, n = 33 each); the caseloads were approximately

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<td>&lt;1 year</td>
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<td>6–10 years</td>
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<td>&gt;20 years</td>
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<td>Employment setting</td>
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<td>Health care/medical setting</td>
<td>38</td>
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<td>School</td>
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<td>Clinic</td>
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<td>Private/group practice</td>
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<td>University</td>
<td>4</td>
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<td>State government/resource center</td>
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Note. SLP = speech-language pathologist.

The facilities in this group included general medical/university hospital (13), skilled nursing facility—adult or pediatric (10), rehabilitation hospital (5), outpatient clinic/office (3), home health (2), independent/long-term care facility (2), split acute/clinic/home (2), and pediatric hospital (1).
equal (containing both adults and children) for the remaining individuals (9.6%, \( n = 7 \)).

Of the 73 respondents, 69.9% (\( n = 51 \)) indicated that they were familiar with and had been introduced to the use of electrical stimulation for the treatment of dysphagia. A total of 27.4% (\( n = 20 \)) of these individuals received information about this treatment as part of their graduate education; all of these respondents had been practicing for \( \leq 6 \) years.

**Treatment Practice Patterns**

A total of 74% (\( n = 54 \)) of all respondents indicated that dysphagia services were provided in their facilities, with 18.5% of these respondents (13.7% of total respondents, \( n = 10 \)) indicating that other professionals were involved in providing dysphagia services. Occupational therapists were most commonly reported to be involved, either as the primary therapy providing services or in conjunction with speech services. A majority of the individuals reporting that dysphagia services were provided in their facilities, 83.3% (61.6% of total respondents, \( n = 45 \)), stated that they personally provided dysphagia services as part of their clinical duties, having been providing dysphagia services for a mean of 8.6 years (range 0–26 years; \( SD \) 7.2 years). All settings previously reported were represented in this group.

Although a large portion of respondents reported that dysphagia services were provided in their facilities, only 16.7% of these facilities (12.4% among all respondents, \( n = 9 \)) offered electrical stimulation as a treatment option. Seven of these facilities used electrical stimulation primarily with adult patients and two primarily with pediatric patients. Of all respondents, only three reported that they personally used electrical stimulation in the treatment of patients with dysphagia. All three of these individuals had been practicing for >10 years (11, 19, and 20 years), two with adults and one with children, and all three reported currently working in an inpatient setting. Additionally, all three reported using electrical stimulation concurrently with other dysphagia treatments, providing 5–6 sessions/week with no scheduled follow-up at the conclusion of treatment. However, responses to questions addressing specific practice patterns in using electrical stimulation varied greatly between these three respondents. The percentage of caseloads treated with electrical stimulation ranged from a minority to a majority of patients (i.e., 3%, 25%, and 67%). Further, although all three reported using electrical stimulation with patients following stroke and other cerebrovascular accidents, their use of electrical stimulation with other populations varied and included traumatic head injury (\( n = 2 \)), meningitis and brain tumors (\( n = 1 \)), cerebral palsy (\( n = 1 \)), and premature infants (\( n = 1 \)). All three clinicians indicated that they used aspiration on instrumental evaluation and severity of dysphagia as criteria for use of this modality. Two of the three clinicians, although not the same two for each response, also indicated that they used clinical signs of aspiration, feeding tube dependence, and lack of progress with other treatment approaches as criteria for use.

**Patient Outcomes and Clinician Satisfaction Following Electrical Stimulation**

All three respondents using electrical stimulation reported patient improvements following treatment, indicating that 50%–80% of their patients demonstrated some level of improvement. However, improvements on specific outcome measures and the degree of improvements varied greatly. Two of the clinicians (one primarily working with adults and one with children), for example, reported that in those patients demonstrating improvements, the improvements ranged from extensive to complete (recovery). These respondents both indicated that following electrical stimulation treatment, >75% of their patients demonstrated improvements in the quantity of aspiration and advancement of oral diet, and at least 50% of their patients demonstrated decreased use of compensatory strategies and increased pharyngeal strength and range of motion. Conversely, the third clinician reported that her patients, at best, demonstrated moderate levels of improvement but frequently demonstrated minimal to no improvements. She indicated that <50% of her patients demonstrated improvements in quantity of aspiration, advancement of oral diet, and pharyngeal strength and range of motion, and <25% of her patients demonstrated decreased use of compensatory strategies during meals. Of interest, only two respondents reported “complications” associated with treatment, which were minimal and included occasional pain or discomfort (\( n = 1 \)) and lack of change in swallow function (\( n = 1 \)). Further, although reporting both clinician and patient satisfaction with the use of electrical stimulation for the treatment of dysphagia, all three respondents indicated equal or higher levels of satisfaction among their patients (very to extremely satisfied) compared to their own levels of satisfaction (somewhat to extremely satisfied).

**Perceptions of Electrical Stimulation**

In order to explore respondents’ attitudes and perceptions related to the use of electrical stimulation in dysphagia management and to identify potential barriers to adopting such a treatment modality, the survey included a series of open-ended questions related to perceived benefits and disadvantages associated with its use for only the subset of nonusers (\( n = 70 \)). All data were analyzed for common themes across responses. Excluding missing responses, six general themes were identified for describing both the potential benefits and disadvantages associated with the use of electrical stimulation. Tables 2 and 3 display these overarching themes and specific subtopics reported by nonusers.

Respondents indicated a variety of perceived benefits related to (a) improved swallow function/safety, (b) the method involved in electrical stimulation treatment, and (c) overall general positive outcomes. Benefits associated with improved swallow function/safety were most commonly indicated, with 37.1% of nonusers (\( n = 26 \)) describing general improvements in swallow function/safety, sensory and muscle function or coordination, and diet as possible outcomes. A few respondents additionally noted that electrical stimulation may yield these outcomes sooner as
compared to more traditional treatments, which is an additional benefit of this modality. Relating to the treatment approach itself, 10.0% of nonusers \((n = 7)\) indicated that electrical stimulation is a beneficial option when more traditional treatment is not appropriate or fails, and that given the combination of the structured protocol with the use of a device (i.e., visible equipment), electrical stimulation provides increased feedback, patient perception of achievable outcomes, and patient motivation. Improvements in quality of life and general improvements that were not able to be classified were mentioned by 5.7% of the nonusers \((n = 4)\).

Although many of the respondents described a variety of potential benefits associated with the use of electrical stimulation, nearly half \((47.1\%, n = 33)\) indicated that they were uncertain or unsure of the potential benefits. These responses included general comments (e.g., “I am unsure”) as well as specific remarks stating the cause of the uncertainty (e.g., “I don’t know enough about it to answer”; “Uncertain due to the limited research in this area”). Many clinicians, even those familiar with the treatment modality, stated that they did not feel as though they have adequate information regarding electrical stimulation and how it may relate to positive outcomes. An additional 2.9% of the nonusers \((n = 2)\) reported no perceived benefits associated with the use of electrical stimulation in improving swallow function and safety.

Perceived drawbacks of electrical stimulation commonly cited by the nonusers included disadvantages associated with the method itself and negative outcomes, or complications, associated with the treatment. More than ¼ of nonusers \((28.6\%, n = 20)\) indicated that there were disadvantages associated with the treatment approach. These comments included the necessity for specialized training and equipment (including costs), difficulty in billing insurance companies and patients, difficulty with electrode placement, and the time-consuming nature of the recommended treatment intensity. Respondents further raised concerns over whether electrical stimulation can actually reach the targeted muscles and whether it is beneficial or more beneficial as compared to current standard treatments. Additionally, nearly ¼ of the nonusers \((24.3\%, n = 17)\) described potential negative outcomes and complications that may be associated with electrical stimulation. These ranged from mild complications, such as little to no improvement in swallow function and discomfort during treatment, to more severe complications, such as declining swallow or muscle function and pain during treatment. Nonusers also expressed concerns over the high risks that may be associated with inaccurate use of electrical stimulation and use in patients with contraindications resulting in severe harm to patients, stating that these risks outweigh any potential benefits. Professional risks, including loss of professional credibility and providing false hope to patients, especially if electrical stimulation were to be used without appropriate evaluative measures or simply due to a lack of alternatives, were also described \((2.9\%, n = 2)\).

Uncertainty regarding potential disadvantages was again frequently cited \((35.7\%, n = 25)\) by the nonusers. This commonly included both general responses and specific comments suggesting uncertainty due to limited knowledge regarding electrical stimulation. Whereas many nonusers reported uncertainty over benefits as related to limited research, many of those individuals later stated that the lack of adequate research is actually a disadvantage
Specifically, nonusers were concerned over limited research indicating whether the treatment was effective and the presence of research indicating that patients demonstrated no improvements following treatment with electrical stimulation. An additional 2.9% of these respondents (n = 2) conversely stated that they saw no potential disadvantages associated with the use of electrical stimulation.

Similar to the trend of uncertainty previously described, when specifically asked whether electrical stimulation is an effective treatment for patients with dysphagia, the majority of all respondents (users and nonusers) indicated that they were unsure at the present time (72.6%, n = 53), with the remaining individuals indicating that they either did (21.9%, n = 16) or did not (5.5%, n = 4) consider it an effective treatment. Additionally, many respondents indicated that they did not know whether the current literature supports the use of electrical stimulation for the treatment of patients with dysphagia: 64.4% don’t know, 21.9% no, and 13.7% yes (n = 47, 16, and 10, respectively). Of interest, 15.0% (n = 11) and 17.8% (n = 13) of respondents noted that they had physicians and patients specifically request the use of electrical stimulation, respectively, even though not all of these individuals indicated certainty over the effectiveness of and research support for the treatment.

All respondents were further asked whether electrical stimulation was within the scope of practice for SLPs and was supported by ASHA. Regarding scope of practice, many individuals (60.3%, n = 44) indicated that it was, followed by those who did not know (37.0%, n = 27) and those who felt that it was not (2.7%, n = 2). Many respondents commented that electrical stimulation would only be within the scope of practice for those SLPs who are trained and certified in its use. A majority additionally stated that they were unsure whether ASHA supports its use (72.6%, n = 53), followed by those who felt that the organization does not (16.4%, n = 12) and those who indicated that the organization does (11.0%, n = 8).

**DISCUSSION**

This study sought to examine current trends in and perceptions related to the use of NMES as a therapeutic intervention in the management of individuals with dysphagia among ASHA-certified clinicians (certificate of clinical competence or clinical fellow) in the state of Iowa. Given the rising number of individuals requiring dysphagia management services both within and outside of the “traditional” health care settings, SLPs across all clinical settings were surveyed. The results of this survey, including the clinician-perceived barriers to the adoption of NMES, provide important information regarding the use/nonuse of this treatment modality and suggest a number of clinical and research implications for dysphagia management.
Overall, 70% of the respondents indicated familiarity with the use of electrical stimulation in the treatment of dysphagia. However, despite this familiarity and the frequent provision of dysphagia services by the sample surveyed (74% of facilities and 62% of total respondents), only 17% of the facilities providing dysphagia services were reported to offer NMES as a treatment option, and only three respondents personally used this modality in treatment. In light of frequent anecdotal reports of the use and benefits of NMES in patients with dysphagia from practicing clinicians and marketing campaigns, the low incidence of its use among this sample in Iowa was surprising. Such a limited sample of users does not allow for reliable descriptions of practice patterns and clinical outcomes related to NMES. However, these results highlight the clinically relevant question, and second goal of the current study, related to why clinicians are not using NMES in their treatment of individuals with dysphagia, including the necessity of identifying barriers to the adoption of its use.

The physical therapy literature has described the potentially negative impact of both current empirical controversy and clinical tendency to accept subjective and commercially motivated claims on the actual potential of electrical stimulation as a viable clinical modality (Alon, 1991). Such controversy regarding methodology and results, along with commercial marketing, similarly applies to the use of NMES in the treatment of individuals with dysphagia. The resulting contradictory and, at times, unsubstantiated claims regarding clinical results can be problematic to many clinicians, potentially resulting in confusion over the appropriateness and efficacy of NMES. Yet, it is unclear what role such factors play in clinicians’ decisions to use or not use this modality. Despite empirical studies, systematic reviews, and anecdotal reports of positive benefits, many clinicians in the current study did not indicate using NMES. Because studies of efficacy and effectiveness alone do not ensure the use of a new treatment modality, it is therefore important to characterize nonusers’ perceptions related to the use of NMES in the management of dysphagia in order to address the question of what factors contribute to the nonuse of this modality. Such an understanding is of clear importance to the interplay between empirical research and clinical practice in providing evidence-based treatment to individuals with dysphagia.

Perceived Benefits

The nonusers surveyed in the current study described numerous potential benefits associated with the use of electrical stimulation, and although a variety of these benefits are indeed reflective of empirical findings, many appear to indicate misconceptions possessed by this subset of nonusers. Commonly cited benefits included general improvements in swallow function and safety, improvements in sensory or muscle function and coordination, and upgraded diets. The broad descriptions of the more functional potential benefits (e.g., “improved swallow function”) are reflective of those generalized benefits reported in the current literature (e.g., Blumenfeld et al., 2006; Carnaby-Mann & Crary, 2007; Ryu et al., 2009). However, documented improvements in swallowing physiology, including both sensory and motor function, remain both limited and contradictory. General improvements in swallowing physiology have been documented following low levels of sensory stimulation (Ludlow et al., 2007). Decreased residue and penetration/aspiration in mildly to moderately impaired patients have been reported, although more severely impaired patients did not show similar levels of improvement (Shaw et al., 2007). Laryngeal elevation during swallowing has also been found to improve; however, this improvement resulted from synchronized surface NMES (thyrohyoid muscle contraction synchronized with the swallowing act of the tongue and pharyngeal constrictor), which is a different method than is generally used in clinical practice (Leelamanit, Limsakul, & Geater, 2002). Further, both a lack of improved laryngeal elevation (Shaw et al., 2007) and the presence of hyoid and laryngeal depression/reduced peak elevation (Humbert et al., 2006; Ludlow et al., 2007) have been associated with the use of electrical stimulation.

Additional benefits of the method/approach reported by nonusers have also been disputed or questioned by the current literature. Nonusers described NMES as an option when traditional treatment fails or is not appropriate. Although certain studies have reported an advantage of electrical stimulation over traditional treatment (Blumenfeld et al., 2006; Freed et al., 2001), other research has suggested that there is no such benefit (Kiger et al., 2006), and that in patients with severe dysphagia, where traditional treatment may fail, the improvements may be at most minimal (Shaw et al., 2007). The current survey participants also pointed to the benefit of equipment use in increasing patient feedback, motivation, and perception of achievable outcomes. One participant reported having had multiple patients specifically request such treatment, believing it would “cure all.” However, there are risks associated with increased perceived benefit or a false sense of improvement, especially given the lack of correlation between subjective and objective measures of swallow function (Bulow et al., 2008). For example, patients who feel recovered despite showing minimal objective improvements may be less likely to continue following swallowing recommendations, resulting in increased swallowing complications. One respondent in the current study echoed such concerns, stating that NMES may provide false hope to patients and ultimately threaten the SLP’s professional credibility.

Perceived Disadvantages

Although multiple potential benefits of the use of electrical stimulation were reported, various disadvantages, both empirically supported and not, were also frequently reported. Costs related to administering NMES were noted to be significant, including the training and equipment needed and the difficulty with billing for services. Further difficulties with electrode placement and the time-consuming nature of the structured treatment were described. These perceived disadvantages could be similarly described as the infrastructure- or practicalities-related barriers noted in the more general health care literature, which are reflective of general trends in barriers to adopting new technology. It
is of interest to note that these highly treatment-specific responses were indeed based on experience and observation. The majority of the nonusers reporting such disadvantages were either recent graduates (~6 years in the field) who reported being introduced to NMES in their graduate program (classroom and/or clinical practicums) or clinicians who did not personally provide such services but who had previously observed colleagues providing treatment with NMES. Nonusers also questioned whether such surface stimulation actually reaches the targeted muscles, which tend to be deep in the neck. These disadvantages and concerns are appropriately supported by previous literature (e.g., Kiger et al., 2006; Ludlow et al., 2007).

Additional disadvantages related to potential complications and safety issues were also identified; however, such concerns may be unwarranted. Although certain physiological changes noted to occur with electrical stimulation have the potential for increased risk (e.g., hyolaryngeal depression resulting in decreased airway protection; Humbert et al., 2006; Ludlow et al., 2007), the currently published research studies of clinical outcomes (e.g., Blumenfeld et al., 2006; Freed et al., 2001; Kiger et al., 2006; Leelamanit et al., 2002), surveys of clinical practitioners (Crary et al., 2007), and report from a small sample of clinicians in the current study have identified no such treatment-related complications.

**Clinical Implications**

Given these conflicting reports, both within the literature and between participants’ perceptions and the literature, it is of no surprise that nearly half of the nonusers stated that they were uncertain or unsure of the potential benefits of electrical stimulation. Many of these respondents indicated that they did not have adequate information regarding positive outcomes to either describe or speculate as to the potential benefits. Similarly, nearly 40% of the nonusers were uncertain as to the potential disadvantages of this treatment, with ~20% stating that the lack of adequate research is a primary disadvantage.

When specifically asked, nearly ⅔ of these respondents indicated that they were unsure if NMES was effective, and >60% indicated that they were unsure if the literature supports its use. These comments, along with the misconceptions related to both perceived benefits and perceived disadvantages of NMES described earlier, are reflective of the awareness/knowledge and personal beliefs/attitudes barriers that are commonly described in the adoption of new technology in health care. These barriers not only appear to be present in multiple health care–related fields (i.e., they apply to the adoption of a variety of new methods, including new medications and the use of new technologies in treatment), but also reflect the views of clinicians with varying levels of expertise and interest. Specifically, such concerns raised by this broad group of nonusers mirror those mentioned by clinicians with a specific declared professional interest in and/or expertise with dysphagia management who indicated that they were not comfortable with the available published data and that they wanted more published data on outcomes, effectiveness, and safety for different patient groups (Crary et al., 2007).

Despite these similarities in sentiment, a number of years separate the current survey from that completed by Crary et al. (2007). Although it is possible that the broader group of clinicians surveyed in the current study are simply lagging behind the more specialized or expert group in the previous study regarding their perceived awareness and knowledge of this treatment modality, it is also possible that the empirical literature has not sufficiently addressed the concerns of these clinicians. Alternatively, access to and understanding of the literature that does address these concerns may be limited, resulting in the misconceptions regarding both the benefits and disadvantages of NMES identified here.

Regardless of whether it is the availability of or access to such literature that is limiting clinicians’ use and understanding of NMES, it is a reality that commercial marketing and subjective claims related to these devices are on the rise. Nearly 20% of respondents indicated that patients have specifically requested NMES treatment, and 15% of respondents have had physicians request information and/or the treatment for patients. These clinicians indicated that their patients are often learning about this intervention on the Internet, and that these patients see it to be a “cure-all” method. Thus, although clinicians may feel unsure regarding the effectiveness of NMES and may desire more information, demand for its use is increasing, particularly among their own patients.

Such a finding highlights the necessary interplay in clinical practice between patients’ requests, clinicians’ expertise, and decision making on the basis of sound scientific evidence, experience, values, and preferences. That is, evidence-based practice necessarily involves the combination of scientific research with both patient and clinician values and preferences (Dollaghan, 2004). As patients are learning more about and requesting this treatment, clinicians must be knowledgeable about the accuracy of such information, be prepared to address those requests, and, ultimately, adopt the new treatment as appropriate. Unfortunately, the results from the current survey targeting clinicians in Iowa suggest that clinicians do not feel adequately equipped given the available scientific research. This would appear to be not only a barrier to adopting NMES, but also a contributing factor to clinicians relying more on subjective claims and experience in shaping their values and preferences regarding its use. For example, one respondent was introduced to NMES while working in the hospitals, where she observed patients responding well to the treatment. Now in the schools, she indicated that she would like to use the modality in that setting. However, when asked whether the literature supports the use of NMES (in the pediatric population), she stated that she was unsure. Clinical experience is an important factor involved in evidence-based practice; however, scientific evidence must also be considered.

Unfortunately, clinicians are not able to stay current on every aspect of clinical practice. Limited access to current literature, along with few rigorous studies, likely contributes to both the concerns and misconceptions of the respondents noted here. Given the recent interest in NMES, it is of no surprise that only lately (i.e., only reported by
respondents who graduated within the past 6 years) has electrical stimulation begun to be introduced as a treatment option for individuals with dysphagia as part of graduate education. Further efforts need to be made not only to continue to develop well-designed clinical studies that may support the use of this modality, but also to better disseminate current and future research findings—especially to those clinicians who are directly involved in the provision of evidence-based practice to individuals with dysphagia. It is important to note that this survey was not intended to directly measure respondents’ knowledge related to aspects of NMES; rather, the goal of this study was to describe respondents’ perceptions regarding the use of NMES, of which knowledge is one possible component. Specifically, the clinicians surveyed in the current study felt as though they lack enough scientific evidence and research, or knowledge, regarding the efficacy and effectiveness of NMES. This apparent disparity between the presence of an increasing amount of empirical research and clinician perceptions of not enough research highlights an important next step in the evidence-based practice process.

This survey offers a snapshot of clinicians’, particularly nonusers’, perceptions on the use of NMES. The results highlight that although many clinicians are aware of potential functional benefits of NMES, misconceptions persist related to benefits in swallowing physiology and treatment complications. Overall, these respondents want access to and the availability of further research related to this modality. Thus, it is not only infrastructure-related concerns, such as those associated with costs and training, that appear to be limiting the use of NMES in dysphagia management—concerns that, although valid, would be best addressed administratively. Barriers related to personal beliefs and attitudes also play a primary role in the nonuse of this modality. It is this second set of perceived barriers that particularly needs continuing attention through the development and dissemination of research in order to ensure the continued use of evidence-based practice.

Study Limitations

Certain caveats must be addressed when discussing the generalizability of this study’s results. Unlike previous studies, the goal of this study was to survey a wider range of clinicians, particularly in the state of Iowa, regardless of clinical setting and patient demographics. Approximately half of all respondents worked in the health care setting, with the remaining respondents working primarily in schools and clinics. Although such a distribution might be expected given the topic of the survey, it does not reflect the general membership of SLP nationally (i.e., ~53% in schools and 38% in health care; ASHA, 2009). Further, it is possible that multiple clinicians from the same facility responded to this survey, potentially yielding results that reflect a more limited number of settings. Although unable to definitively determine which, if any, respondents were representing the same facility, each respondent was provided the opportunity to present his or her unique perceptions and opinions. It is unlikely that current employment setting is the only, or even primary, factor in shaping clinicians’ opinions on the use of various treatment modalities, suggesting that the results presented here are reflective of the perceptions of each individual respondent, regardless of any overlap in work environment. Finally, although the number of respondents is equal to or exceeds those in other recent dysphagia surveys (Hutchins et al., 2011; Martino et al., 2004; Mathers-Schmidt & Kurlinski, 2003), the low response rate here must be taken into consideration. It is possible that using mailed invitations to participate in a web-based survey contributed to this low response rate. Unfortunately, anonymous surveys are unable to account for nonresponse bias and do not allow for insight into the reasons such individuals did not participate. However, this group of 73 practicing SLPs does represent a diverse sample that can contribute to the understanding of clinician perceptions and misconceptions related to the use/nonuse of NMES.

The focus of this study was on trends in the use/nonuse and perceptions specifically related to NMES in dysphagia management. However, it is clear from current research that similar discussion and controversy regarding the effectiveness and efficacy of other commonly used techniques in dysphagia treatment exist (e.g., Ashford et al., 2009; Martino et al., 2004; Mathers-Schmidt & Kurlinski, 2003). Thus, it is possible that the results of the current study reflect clinicians’ more general opinions related to the management of dysphagia; more specifically, clinicians may be seeking more research in general related to the effective and efficacious treatment of dysphagia. Regardless of whether the trends reported here reflect attitudes and perceptions related only to NMES or to dysphagia management in general, the clinical implications of these results highlight important future directions that are equally applicable to both.

Conclusion

The results of the present study suggest that clinicians who are not using electrical stimulation in the treatment of individuals with dysphagia remain uncertain regarding its effectiveness (i.e., benefits) and complications (i.e., disadvantages). Such perceptions persist despite growing literature addressing this treatment modality, with frequent misconceptions regarding effectiveness and complications being reported by these nonusers. Such misconceptions and uncertainty highlight important barriers to the adoption of NMES in clinical practice for dysphagia management, especially related to clinicians’ individual beliefs and attitudes. Thus, to best address clinical and evidence-based practice, the next steps must involve not only continued investigation into the use and outcomes of electrical stimulation, including efficacy research, but also the dissemination of these results. Such research should address the topics of effectiveness and complications as outlined by these respondents, along with factors contributing to these topics that have been previously unaddressed, including optimal dosage, stimulation parameters, and timing. However, for electrical stimulation to continue to be considered as a viable treatment option, it will be important not only to advance the scientific understanding of such an approach to dysphagia management, but also to translate these findings into daily clinical practice.
REFERENCES


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APPENDIX. SURVEY QUESTIONS

Note. The directions and formatting for each question have been modified. Specific answer choices that were provided to participants are indicated in parentheses. The opportunity for additional comments (open-ended) was provided for questions 13, 25, 29–30, 32–36, and 40–43, as well as upon completion of the survey.

Section One (Demographics)

Demographic Information (All participants)

1. Are you currently employed or seeking employment in the state of Iowa?
2. Are you male or female?
3. Which of the following degrees/credentials are you currently practicing with? (Master’s, CCC-SLP; Master’s, CF-SLP; PhD, CCC-SLP; PhD, CF-SLP; Other, please specify)
4. Which of the following roles best describes how you spend the majority of your time? (Clinical service provider; Administrator/supervisor/director; Consultant; College/university faculty member; Researcher; Other, please specify)
5. How many years have you been employed in the speech-language pathology profession?
6. A. Which of the following settings best describes where you work the majority of the time? (Clinic; Health care; Private/Group practice; School; Other, please specify)
   B. Besides yourself, how many additional speech-language pathologists work in your facility?
7. If you work in a health care setting only, which of the following facilities best describes where you work the majority of the time? (General medical/university hospital; Rehabilitation hospital; Pediatric hospital; Skilled nursing facility; Home health; Outpatient clinic/office; Other)
8. A. Are you familiar with the use of electrical stimulation for the treatment of patients with dysphagia?
   B. Were you introduced to the use of electrical stimulation for the treatment of patients with dysphagia at any point in your speech-language pathology graduate education?

Section Two (Practice Patterns)

Practice Patterns – General (All participants)

9. How many hours per week, on average, do you deliver clinical services?
10. How many hours per week, on average, do you deliver clinical services in the following environments? (Inpatient; Outpatient)
11. How many hours per week, on average, do you deliver clinical services to the following populations? (Infant-toddlers [birth to 3 years]; Preschool [3 to 5 years]; School age [5 to 17 years]; Adults [18 and older])

Practice Patterns – Dysphagia (All participants)

12. Are dysphagia services provided in the facility/facilities where you work?
13. In the facility/facilities where you work, do any professionals other than speech-language pathologists provide the primary swallowing services (assessment or treatment)?
14. A. How many speech-language pathologists provide dysphagia services in the facility/facilities where you work?
15. B. Do you provide dysphagia services in the facility/facilities where you work?
16. Approximately what percentage of your time providing clinical services is spent in dysphagia evaluation and treatment?
17. For how many years have you been providing services for dysphagia?
Practice Patterns – Electrical Stimulation  
(Participants indicating yes to Question 12)

18. A. In the facility/facilities where you work, is electrical stimulation utilized for the treatment of patients with dysphagia?
B. On average, what percentage of treatment services with electrical stimulation is delivered to the following populations? (Pre-adult [less than 18 years]; Adult [18 years and older])
C. How many speech-language pathologists utilize electrical stimulation for the treatment of patients with dysphagia in the facility/facilities where you work?
D. Do you personally currently utilize electrical stimulation for the treatment of patients with dysphagia?

19. A. Have you ever utilized electrical stimulation for dysphagia treatment?
B. If you have utilized electrical stimulation in the past, why did you stop?

For participants who personally utilize electrical stimulation:
20. How long have you been utilizing electrical stimulation for the treatment of patients with dysphagia?
21. Approximately what percentage of your patients do you see during the course of a patient’s electrical stimulation therapy?
22. How many months after the completion of dysphagia treatment do you schedule them to return?
23. How far post-onset of dysphagia would you consider using electrical stimulation?
24. Which of the following criteria do you utilize in selecting electrical stimulation for dysphagia treatment? (Select all that apply: Clinical signs of aspiration; Evidence of aspiration on an instrumental evaluation; Severity of dysphagia; Feeding tube dependence; Lack of progress with other therapy approaches; I do not utilize any specific criteria; Other, please specify)
25. A. Do you utilize any additional therapy techniques concurrently with electrical stimulation?
B. If yes, which other treatment techniques do you utilize? (Select all that apply: Motor/swallowing exercises; Postural adjustments; Compensatory strategies/swallowing maneuvers; Diet modifications; Other, please specify)
26. A. On average, how many sessions per week of electrical stimulation treatment does an individual patient receive?
B. On average, how many minutes is electrical stimulation administered for during each treatment session?
C. On average, for how many total sessions do you treat a patient with electrical stimulation?

27. A. After the completion of dysphagia treatment with electrical stimulation, do you have patients return for a follow-up visit?
B. How many months after the completion of dysphagia treatment do you schedule them to return?

Section Three (NMES Outcomes)

Patient Outcomes and Clinician Satisfaction  
(Participants indicating yes to Question 18d)

28. Do you use any methods for assessing progress during the course of a patient’s electrical stimulation therapy?
29. What methods do you utilize to assess progress when treating a patient with electrical stimulation for dysphagia? (Select all that apply: Clinical/bedside swallow evaluations; Instrumental swallow evaluations; Clinical observation rating scales; Patient satisfaction and/or quality of life surveys; Other, please specify)
30. Do you ever adjust the frequency and/or intensity (i.e., sessions/week and minutes/session) of a patient’s treatment with electrical stimulation based on measures of progress?
31. Approximately what percentage of patients with dysphagia have you found to improve following treatment with electrical stimulation?
32. For each of the following primary outcomes, in approximately what percentage of your patients do you see improvement? (0–25%; 26–50%; 51–75%; 76–100%) Reduced aspiration; Advanced oral diet; Decreased use of compensatory strategies; Increased pharyngeal muscle range of motion; Increased pharyngeal muscle strength; Decreased discomfort during swallowing; Other, please specify
33. For those patients experiencing each of the following primary outcomes, how would you characterize the degree of improvement, on average? (No improvement; Minimal improvement; Moderate improvement; Extensive improvement; Complete recovery) Reduced aspiration; Advanced oral diet; Decreased use of compensatory strategies; Increased pharyngeal muscle range of motion; Increased pharyngeal muscle strength; Decreased discomfort during swallowing; Other, please specify
34. A. What complications, if any, have you found in treating patients with electrical stimulation? (Select all that apply: Worsened swallow function; Lack of change in swallow function; Increased muscle fatigue; Increased aspiration; Pain and/or discomfort; Laryngospasms; Progression of comorbid disease; I have not identified any complications; Other, please specify)
B. What populations or groups of patients, if any, would you exclude from trials of electrical stimulation for the treatment of dysphagia?

continued on next page
35. Taking into account all aspects of use, outcomes, and your experiences:
   A. How satisfied are you with the use of electrical stimulation for the treatment of dysphagia? (Extremely dissatisfied, Somewhat dissatisfied, Satisfied, Somewhat satisfied, Extremely satisfied)
   B. How satisfied are your patients with the use of electrical stimulation for the treatment of their dysphagia? (Extremely dissatisfied, Somewhat dissatisfied, Satisfied, Somewhat satisfied, Extremely satisfied)

Section Four (Perceptions)
Nonuser Perceptions
(Participants indicating no to Question 12 or 18d)
36. Do you think electrical stimulation is an effective treatment for patients with dysphagia? (Yes; No; Unsure at present time)
37. What are the potential benefits of utilizing electrical stimulation for the treatment of dysphagia?
38. What are the potential disadvantages of utilizing electrical stimulation for the treatment of dysphagia?

General Perceptions (All participants)
39. A. Have you ever attended a training/certification course or continuing education seminar on the use of electrical stimulation for the treatment of dysphagia?
   B. If yes, please list all courses/seminars attended.
40. A. Have any physicians requested you to research and/or utilize electrical stimulation?
   B. Have any patients requested treatment with electrical stimulation?
41. Do you think the use of electrical stimulation for the treatment of patients with dysphagia is within the scope of practice for speech-language pathologists? (Yes, No, I don’t know)
42. Does the American Speech-Language-Hearing Association support the use of electrical stimulation for the treatment of patients with dysphagia? (Yes, No, I don’t know)
43. Does the current literature support the use of electrical stimulation for the treatment of patients with dysphagia? (Yes, No, I don’t know)