

Research Article

Speech-Language Pathology Management for Adults with COVID-19 in the Acute Hospital Setting: What Do We Know?

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Abstract

The purpose of this study was to collate and summarize the content covered in published literature describing speech-language pathology management of adult patients with COVID-19 in the acute hospital setting as of February 2022. This review serves as an updated review of the initial recommendations to guide speech-language pathology management for adults with COVID-19 in the acute hospital setting previously provided by Namasivayam-MacDonald and Riquelme in July of 2020. This scoping review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Scoping Review Extension protocol. We searched for



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relevant peer-reviewed articles in the following electronic databases: MEDLINE, EMBASE, and CINAHL. The article review process was conducted using Covidence. Our searches yielded a combined total of 3019 unique citations, of which 54 were accepted for full-text review. Thirty-seven of the 54 studies were review articles, recommendations, or opinion pieces. This translates to mostly low levels of evidence (i.e., Levels VI and VII) and a grade of 'D' when applying the American Society of Plastic Surgeons grade recommendation scale for evidence-based clinical practice guidelines, meaning there is little or no systematic empirical evidence available. The remaining 17 provided empirical data, which translates to higher levels of evidence and a grade of 'B'. The empirical data shared in this scoping review provide support for the ongoing role of the SLP in the acute care setting and the impact COVID-19 and its variants have on the underlying systems for communication and swallowing. This document serves as further proof of the need for ongoing research into the clinical presentations of patients with speech-language, cognitive and/or swallowing deficits resulting from COVID-19, as well as into systems of care that will provide the best outcomes in their rehabilitation.

Keywords

COVID-19; acute care; speech-language pathology; rehabilitation

1. Introduction

Coronavirus disease (COVID-19) emerged as a global pandemic after an isolated infection of an unknown nature was identified in December 2019. In the weeks that followed, a new beta coronavirus strain called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was determined to be the causative agent for this unprecedented infectious disease. For over two years the COVID-19 pandemic has devastated the lives of millions of people around the world. At the same time, its negative impacts on the global economy and health care system have been unfathomable and are still ongoing [1]. To date, evidence suggests that human-to-human transmission of COVID-19 occurs through contact with respiratory droplets generated by coughing and sneezing, infected secretions (such as saliva and sputum), and contaminated surfaces [2]. Most recently, it has been learned that the risk of infection through contact with contaminated surfaces or objects is generally considered to be low [3]. Since December 2020, several variants have been identified and assigned Greek letter designations by the World Health Organization (WHO). According to the National Institutes of Health (NIH) COVID-19 Treatment Guidelines webpage [4], "the data on the emergence, spread and clinical relevance of these new variants is rapidly evolving; this is especially true for research on how variants might affect transmission rates, disease progression, vaccine development, and the efficacy of current therapeutics."

As new variants have emerged throughout the pandemic, speech-language pathologists (SLPs) have continued to perform clinical procedures that involve contact with the mucous membranes of the upper airway, as well as exposure to body fluids, such as saliva and respiratory droplets. In addition to direct clinical examinations, clinicians in many settings have returned to performing instrumental examinations and providing treatment/management services on a regular basis. The use of personal protective equipment (PPE) during speech-language pathology clinical care has

varied by facility, setting and by procedure across the globe. Modifications in PPE are often dictated by setting, level of care, and in some instances, by vaccination status of the person being examined or treated. The impact of the pandemic on the clinical practice of SLPs worldwide remains to be further studied. Many colleagues report high variability in volume and caseload mix. According to Kearney et al. [5], a survey of 665 clinicians from the United States and Canada revealed that completing endoscopic procedures was reduced in volume from 39% to 3% due to the pandemic. Similarly, frequency of tracheoesophageal puncture prosthesis changes was reduced from 24% to 6%. The authors also reported that “COVID-19 testing rates of SLPs, the percentage of SLPs experiencing the financial impact of the pandemic, and percentage who were furloughed varied across SLP work setting.” As new variants emerge and case counts increase and then slowly decrease again, SLPs are likely to continue experiencing hardships.

Given the many changes and barriers to practice experienced by SLPs beginning in March 2020, initial recommendations to guide SLPs’ clinical care for patients with COVID-19 were developed by Namasivayam-MacDonald and Riquelme [6] early in the pandemic. These recommendations were informed by similar recommendations developed for physical therapists and were subsequently adapted with the help of clinicians involved in dysphagia practice from around the globe. The purpose of these initial recommendations was to guide clinical practice based on what was known about COVID-19 at the time of publication. Unfortunately, there were few research studies available to inform or support the recommendations. As such, the purpose of the current study was to collate and summarize the content covered in published literature describing speech-language pathology management of adult patients with COVID-19 in the acute hospital setting. At present, given the multiple variants that have emerged, the clinical picture of patients with COVID-19 and the impact on the acute care setting has varied when compared to the initial wave. It is also relevant to note that the prognosis for patients with COVID-19 in the rehabilitation and ambulatory settings remains minimally explored to date. This review is to serve as an updated review of the recommendations previously provided by Namasivayam-MacDonald and Riquelme [6] for speech-language pathology management of adult patients with COVID-19 in the acute hospital setting.

2. Materials and Methods

This scoping review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Scoping Review Extension protocol [7] and was not a candidate for institutional ethical review. An original search was conducted in February of 2022. We searched for relevant peer-reviewed articles in the following electronic databases: MEDLINE, EMBASE, and CINAHL. The general search strategy, formulated by all authors in conjunction with a librarian, can be found in Table 1, and included terms related to COVID-19, speech-language pathology practice, and duties within an acute care setting and related to pandemic protocols. Google Scholar was also searched to find grey literature using the same search terms. E-publications that were not yet indexed and thus did not appear in our search results, were not included in this review.

Table 1 Electronic search strategy.

<i>Population</i>	<i>Concept/Context</i>	<i>General Terms</i>
COVID-19	Speech-language patholog*	AGP
“covid 19”	Speech-language therap*	AGMP

SARS-COV*	Speech therap*	Aerosol Generating Procedure*
2019-nCoV	Speech patholog*	Aerosol transmission
coronavir*	Language therap*	Aerosol*
“corona virus”	Phonoaudiolog*	Aerosol generating medical procedure
“corona*	Logoped*	Endotracheal intubation aerosol
infection*”	Swallow* Therap*	protection
	Voice therap*	Airborne aerosol particle*
	SLP	Respiratory protection device*
	SLT	Respiratory aerosol*
	Dysphagia*	Respiratory infection*
	Deglutition	Infectious respiratory aerosol*
	“Deglutition Disorder*”	Viral aerosol transmission
	Swallowing	Bio-aerosol*
	“post extubation dysphagia*”	Personal Protective Equipment
	“Alternative and Augmentative	Protective equipment
	Communication”	Individual protective equipment
	“augment* communication”	Protective gear
	“alternative communication”	Protective measure*
	“speech generating device”	Healthcare equipment
	AAC	Protective apparel
	“multimodal communication”	Protective garb
	“facilitated communication”	Personal protective system*
	Tracheostom*	Respiratory protective devices
	Laryngectom*	Respiratory protection
		N95
		Mask*
		surgical mask*
		Cognitive impairment*
		Cognitive deficit*
		Cognitive defect*
		Cognitive status
		Cognition disorder*
		Cognitive dysfunction
		Cognitive decline
		Neurocognitive impairment*
		Mild cognitive impairment*
		Mental status
		Mental deterioration
		Mental deficit*
		Mental impairment*
		Mental disorder*
		Dementia
		Alzheimer*
		Delirium

Of note, the initial recommendations provided by Namasivayam-MacDonald and Riquelme [6] were based on international consensus and guidelines initially developed by and for physical therapists. The SLP-specific recommendations [6] did not involve a review of the literature given that the recommendations were developed only two months into the COVID-19 pandemic when no COVID-related empirical evidence was available related to SLP practice. As such, the search strategy employed within the current study serves as an attempt to systematically gather the literature and data that has since been published.

2.1 Study Selection

The article review process was conducted using Covidence (www.covidence.org). Five independent raters excluded citations if they had no abstract; were conference proceedings; did not discuss COVID-19; there was no mention of speech-language pathology or related titles used globally (e.g., speech-language therapist, phon audiologist, logopedist); there was no mention of practice in an acute care hospital setting; and adult patients were not included/discussed. All articles at both the title and abstract screening stage and the full-text review stage underwent duplicate review and discrepancies were resolved by consensus with a third reviewer. The kappa coefficient was calculated to determine interrater reliability at both the abstract and full article review phase.

2.2 Data Extraction

Data were extracted descriptively by a single reviewer and were cross-checked for accuracy by a second rater. Data extraction included: author; year of publication; country of publication; type of study; purpose; setting; members of the care team; PPE used; number of patients diagnosed with COVID; average age of patients diagnosed with COVID; severity of COVID; and main conclusions. Level of evidence was also assigned to each included article based on a nursing care guidelines [8], where Level I is the highest level of evidence and involves systematic reviews of meta-analyses of relevant randomized-controlled trials (RCTs) or evidence-based clinical practice guidelines based on systematic reviews of RCTs, and Level VII is the lowest level of evidence because the evidence comes from the opinion of authorities and/or reports of expert committees.

In addition to this information, reviewers also mapped each article to the initial recommendations outlined by Namasivayam-MacDonald and Riquelme [6] for speech-language pathology management of adult patients with COVID-19 in the acute hospital setting. These open access guidelines published by the American Journal of Speech-Language Pathology were developed based on the physiotherapy guidelines for COVID-19 [9]. The SLP recommendations were extremely comprehensive and covered five main topic areas: 1) workforce planning and preparation recommendations [18 recommendations]; 2) initial SLP involvement with patients with COVID-19 and patients under investigation [13 recommendations]; 3) active SLP involvement with patients with COVID-19 and patients under investigation [11 recommendations]; 4) transmission-based precautions [appropriate use for 5 categories of PPE]; and 5) augmentative and alternative communication (AAC) options for patients with COVID-19 and patients under investigation in isolation [possible solutions for 11 different patient needs]. The workforce planning recommendations include planning for increases in the required SLP workforce, and identifying staff

who had the skills to work in the intensive care unit, as well as how to build capacity if intensive care unit experience is lacking. The recommendations discussing initial SLP involvement with patients with COVID-19 included points about when to conduct assessments, how to reduce exposure, and assessment options in the absence of adequate PPE. Active SLP involvement recommendations focused on caseload management, service delivery and documentation. More specifically, the recommendations focused on patients that presented with various issues associated with dysphagia, such as respiratory compromise, decompensation, cognitive difficulties, and mechanical ventilation. For the latter two topics, appropriate use of PPE and AAC options, specific recommendations were provided based on type of PPE or patient need, respectively, rather than a numbered list of more general recommendations. As such, given that specific, numbered, recommendations were provided for each of the first three topic areas, the articles included in the current review were mapped to these specific recommendations. For the recommendations pertaining to PPE and AAC, reviewers indicated whether these topics were covered in the articles included within the current review due to the lack of specific, numbered recommendations.

3. Results

A PRISMA flowchart depicted in Figure 1 reflects the search and review process for the current review. Our searches yielded a combined total of 3019 unique citations, of which 54 were accepted for full-text review. At the title and abstract review stage, the kappa coefficient was 0.81 and at the full article review stage the kappa coefficient was 0.90.

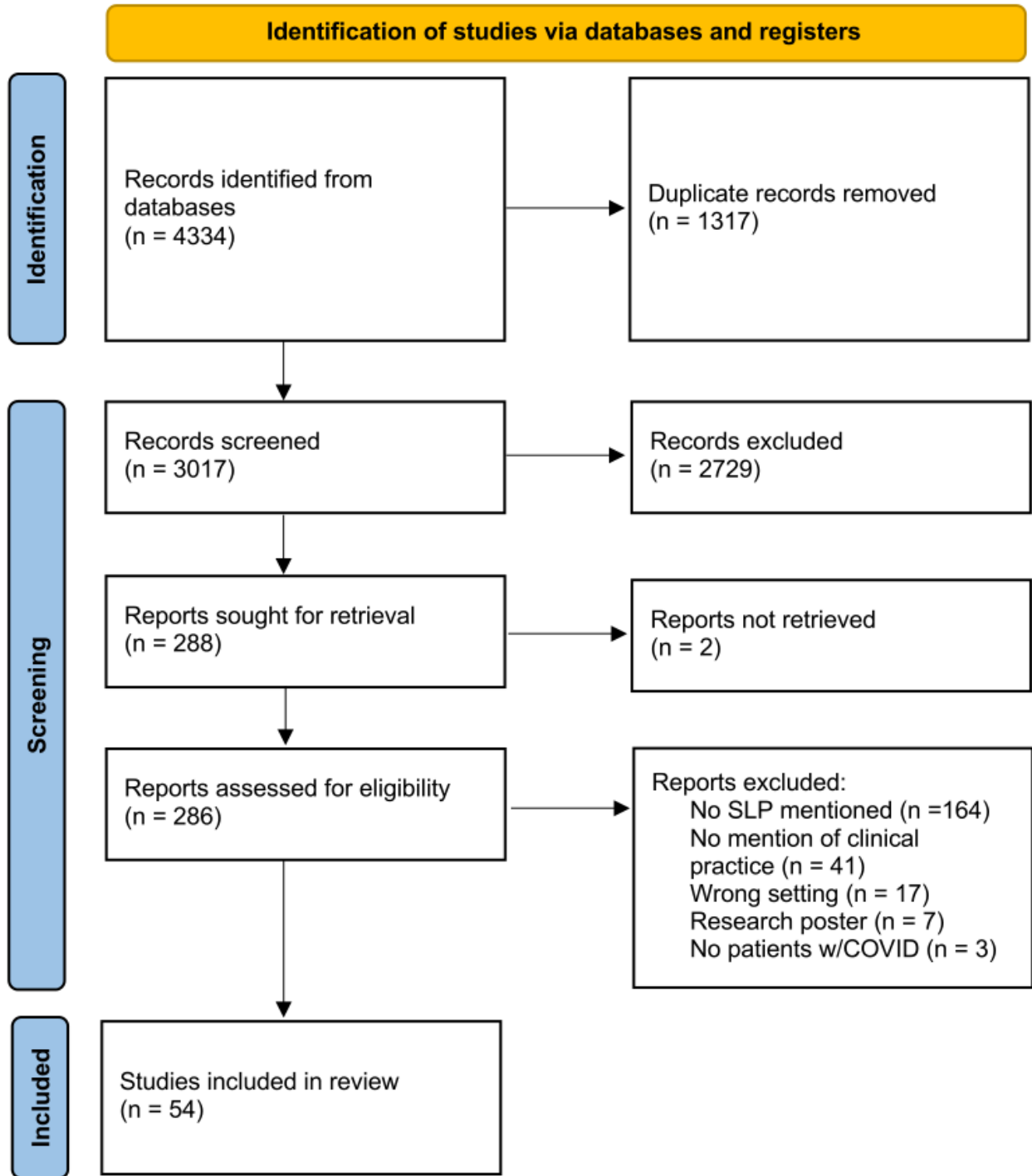


Figure 1 PRISMA diagram.

As can be seen in Table 2, 17 out of the 54 publications provided empirical data [5, 10-25]. Most evidence was either Level IV (well-designed case-control or cohort studies) or VI (case study) and a grade of 'B' when applying the American Society of Plastic Surgeons grade recommendation scale for evidence-based clinical practice guidelines [26], meaning that empirical evidence is available and findings are consistent, but clinicians should remain alert to new information and patient preferences. In Table 3 the 37 publications that did not include empirical data (i.e., review articles, recommendations, or opinion pieces) can be found [6, 11, 27-62]. This translates to mostly low

levels of evidence (i.e., Levels VI and VII) and a grade of 'D' when applying the American Society of Plastic Surgeons grade recommendation scale for evidence-based clinical practice guidelines [26], meaning there is little or no systematic empirical evidence available. As such, it is recommended that clinicians should consider all options in their decision making and be alert to new published evidence.

Table 2 Overview of the articles with empirical data included in the study according to type of article, level of evidence and country/region of origin. Levels of evidence rating scheme is based on the evidence-based nursing care guidelines [8], where Level I is the highest level of evidence and Level VII is the lowest level of evidence.

First author, year	Title	Type of Article	Level of Evidence	Country/Region of Origin
Adams, 2021 [12]	'We are in this together' voices of speech-language pathologists working in South African healthcare contexts during level 4 and level 5 lockdown of COVID-19	Cross-sectional observational study	IV	South Africa
Archer, 2021 [13]	Swallowing and voice outcomes in patients hospitalized with COVID-19: An observational cohort study	Cross-sectional observational study	IV	United Kingdom
Bellinger, 2021 [14]	The effectiveness of physical, occupational, and speech therapy in the treatment of patients with COVID-19 in the inpatient rehabilitation setting.	Cross-sectional observational study	IV	United States
Boggiano, 2021 [15]	Multidisciplinary management of laryngeal pathology identified in patients with COVID-19 following trans-laryngeal intubation and tracheostomy	Longitudinal observational study	IV	United Kingdom
Cavalagi, 2020 [16]	Cranial nerves impairment in post-acute oropharyngeal dysphagia after COVID-19	Case study	VI	Italy
Dawson, 2020 [10]	Dysphagia presentation and management following coronavirus disease 2019: An acute care tertiary centre experience	Cross-sectional observational study	IV	United Kingdom
Exum, 2020 [17]	Applying telehealth technologies and strategies to provide acute care consultation and treatment of patients with confirmed or possible COVID-19	Case study	VI	United States
Ishkanian, 2021 [11]	Clinical conundrum: Dysphagia in a patient with COVID-19 and progressive muscle weakness	Case study	VI	United States

Kearney, 2021 [5]	The impact of COVID-19 on speech-language pathologists engaged in clinical practices with elevated coronavirus transmission risk	Cross-sectional observational study	IV	United States
Lima, 2020 [19]	Functional development of swallowing in ICU patients with COVID-19	Intervention study	III	Brazil
Lima, 2020 [18]	Preliminary results of a clinical study to evaluate the performance and safety of swallowing in critical patients with COVID-19	Cross-sectional observational study	IV	Brazil
Regan, 2022 [20]	Dysphagia, dysphonia, and dysarthria outcomes among adults hospitalized with COVID-19 across Ireland	Cross-sectional observational study	IV	Ireland
Regan, 2021 [21]	Post-extubation dysphagia and dysphonia amongst adults with COVID-19 in the Republic of Ireland: A prospective multi-site observational cohort study	Cross-sectional observational study	IV	Ireland
Rouhani, 2021 [22]	A prospective study of voice, swallow, and airway outcomes following tracheostomy for COVID-19	Cross-sectional observational study	IV	UK
Sandblom, 2021 [23]	Characterization of dysphagia and laryngeal findings in COVID-19 patients treated in the ICU - An observational clinical study	Longitudinal observational study	IV	Sweden
Stierli, 2020 [24]	Insights from an interprofessional post-COVID-19 rehabilitation unit: A speech and language therapy and respiratory medicine perspective	Case report	VI	Switzerland
Traugott, 2021 [25]	Successful treatment of intubation-induced severe neurogenic post-extubation dysphagia using pharyngeal electrical stimulation in a COVID-19 survivor: A case report	Case report	VI	Austria

Table 3 Overview of the articles that lacked empirical data (e.g., reviews, recommendations, opinions, etc.) included in the study according to type of article, level of evidence and country/region of origin. Levels of evidence rating scheme is based on the evidence-based nursing care guidelines [8], where Level I is the highest level of evidence and Level VII is the lowest level of evidence.

First author, year	Title	Type of Article	Level of Evidence	Country/Region of Origin
Altschuler, 2021 [27]	COVID-19 Escalates Patients' Need for Communication Aid: Using visual and tech supports is critical for isolated ICU patients with communication challenges - including the inability to speak	Recommendations	VII	United States
Altschuler, 2021 [41]	Ensuring communication access for all during the COVID-19 pandemic and beyond: supporting patients, providers, and caregivers in hospitals	Review	V	United States
Aoyagi, 2021 [42]	Clinical manifestation, evaluation, and rehabilitative strategy of dysphagia associated with COVID-19	Review	V	Japan
Araújo, 2020 [28]	Speech therapy practice in hospital settings and COVID-19 pandemic.	Review	V	Brazil
Bolton, 2020 [62]	Aerosol generating procedures, dysphagia assessment and COVID-19: A rapid review	Review	V	United Kingdom
Castillo-Allendes, 2020 [61]	Voice therapy in the context of the COVID-19 pandemic: Guidelines for clinical practice	Recommendations	VII	Latin America
Coutts, 2020 [60]	Dysphagia services in the era of COVID-19: Are speech-language therapists essential?	Review	V	South Africa
Curtz, 2021 [43]	Responding to an emerging need: Implementing telehealth in acute hospital rehabilitation	Review	V	United Kingdom
Doll, 2021 [29]	COVID-19 and speech-language pathology clinical practice of voice and upper airway disorders	Recommendations	VII	United States
Eyigör, 2021 [44]	Dysphagia management during Covid-19 pandemic: A review of the literature and international guidelines	Review	V	Turkey

Frajkova, 2020 [59]	Postintubation dysphagia during COVID-19 outbreak - Contemporary review	Review	V	Finland
Freeman-Sanderson, 2021 [58]	A consensus statement for the management and rehabilitation of communication and swallowing function in the ICU: A global response to COVID-19	Consensus statement	VII	Global
Fritz, 2021 [57]	Moving forward with dysphagia care: Implementing strategies during the COVID-19 pandemic and beyond	Recommendations	VII	United States
Goldstein, 2020 [56]	Tracheoesophageal voice prosthesis management in laryngectomy patients during the COVID-19 pandemic	Recommendations	VII	Canada
Jacob, 2020 [55]	A framework for open tracheostomy in COVID-19 patients	Recommendations	VII	England
Kimura, 2020 [54]	Society of swallowing and dysphagia of Japan: Position statement on dysphagia management during the COVID-19 outbreak	Recommendations	VII	Japan
Kinder, 2020 [33]	Safely Assess Swallowing During COVID? IT'S COMPLICATED	Opinion	VII	United States
Kurtz, 2020 [30]	Making instrumental assessments work in a COVID-19 world	Review	V	United States
Langton-Frost, 2022 [45]	Speech-language pathology approaches to neurorehabilitation in acute care during COVID-19: Capitalizing on neuroplasticity	Review	V	United States
Longo, 2021 [46]	The bedside clinical examination as a key element of the swallowing assessment during the COVID-19 pandemic	Opinion	VII	Italy
Lopez, 2020 [31]	Ensuring SLP and patient safety during COVID-19	Opinion	VII	United States
Manzano-Aquihuatl, 2022 [47]	Position statement of the Latin American Dysphagia Society for the management of oropharyngeal and esophageal dysphagia during the COVID-19 pandemic	Recommendations	VII	Latin America
Marler, 2021 [32]	"I'm smiling back at you": Exploring the impact of mask wearing on communication in healthcare	Review	V	UK

Mattei, 2020 [63]	Guidelines of clinical practice for the management of swallowing disorders and recent dysphonia in the context of the COVID-19 pandemic	Recommendations	VII	France
Meister, 2021 [53]	Multidisciplinary safety recommendations after tracheostomy during COVID-19 pandemic: State of the art review	Review	V	United States
Miles, 2021 [52]	Dysphagia care across the continuum: A multidisciplinary Dysphagia Research Society Taskforce report of service-delivery during the COVID-19 global pandemic	Review	V	Global
Mumtaz, 2021 [34]	COVID-19 rehab fright management	Review	V	Pakistan
Namasivayam-MacDonald, 2020 [6]	Speech-language pathology management for adults with COVID-19 in the acute hospital setting: Initial recommendations to guide clinical practice	Recommendations	VII	North America
Printza, 2021 [48]	Dysphagia severity and management in patients with COVID-19	Review	V	Greece
Schindler, 2021 [51]	ESSD commentary on dysphagia management during COVID pandemic	Recommendations	VII	Europe
Schwartz, 2021 [49]	Dysphagia, COVID-19, and the clinical swallow evaluation: Consistently inconsistent	Review	V	United States
Sheehy, 2020 [35]	Considerations for postacute rehabilitation for survivors of COVID-19	Recommendations	VII	Canada
Vergara, 2020 [36]	Assessment, diagnosis, and treatment of dysphagia in patients infected with SARS-CoV-2: A review of the literature and international guidelines	Review	V	Global
Vergara, 2021 [37]	Swallowing and communication management of tracheostomy and laryngectomy in the context of COVID-19: A review	Review	V	Global

Weinstein, 2021 [38]	Clinical swallow assessments do not assess swallow function	Opinion	VII	United States
Wong, 2020 [40]	Pandemic planning for hospital-based speech-language pathologists: Emerging lessons from coronavirus disease	Recommendations	VII	Canada
Zaga, 2020 [50]	Speech-language pathology guidance for tracheostomy during the COVID-19 pandemic: An international multidisciplinary perspective	Review	V	Global

Table 4 displays the information covered in each of the included publications that contained empirical data, per the recommendations developed by Namasivayam-MacDonald and Riquelme [6] pertaining to SLP practice in acute care during the COVID-19 pandemic. This mapping allows us to determine the information that can be gathered from each article, as it pertains to workforce planning, SLP assessment and treatment, PPE requirements and use of AAC. Publications that did not include empirical data were excluded from this table, as low level evidence should not be used to support recommendations made by Namasivayam-MacDonald and Riquelme [6].

Table 4 Publications included in the review that contained empirical data mapped to workforce planning recommendations covered by Namasivayam-MacDonald and Riquelme [6] in their initial recommendations to guide clinical SLP practice when working with adults with COVID-19 in the acute care setting.

Workforce Planning Recommendation	Studies Supporting Recommendation
1.1 Plan for potential increase in the required SLP workforce	
1.2 Identify additional staff who could be deployed to areas of higher COVID-19 activity	
1.3 Identify SLPs with ICU experience and facilitate their return to the ICU	
1.4 SLPs who do not have recent critical care or cardiorespiratory experience should support non-ICU services	Bellinger, 2021 [14]
1.5 SLPs with advanced ICU skills should triage referrals and support more junior SLPs	
1.6 Identify existing learning resources for SLPs who could be deployed to the ICU or other isolated units for patients with COVID-19	Archer, 2021 [13]
1.7 Keep SLPs informed of plans	Adams, 2021 [12]; Kearney, 2021 [5]
1.8 SLPs considered to be high risk for developing serious illness from COVID-19 should avoid exposure to the virus	
1.9 SLPs who are pregnant avoid exposure to COVID-19	
1.10 Workforce planning should include consideration for pandemic specific requirements, such as increased time to enforce infection control procedures	Adams, 2021 [12]
1.11 Consider organization of the workforce into teams that will manage patients with COVID-19 versus those who are noninfectious	
1.12 Be aware of and comply with relevant regional and/or hospital guidelines for infection prevention and control in healthcare facilities	Kearney, 2021 [5]; Sandblom, 2021 [23]
1.13 Senior SLPs should help determine the appropriateness of speech-language pathology interventions for patients with COVID-19	
1.14 Identify hospital-wide plans for allocation/cohorting of patients with COVID-19	
1.15 Identify additional physical resources that may be required and how risk of cross-infection can be minimized	

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- 1.16 Identify and develop a facility inventory of physical resources and determine process of equipment allocation as pandemic levels increase
 - 1.17 SLPs will likely have an increased workload with a heightened risk of anxiety and should be supported
 - 1.18 Promote debriefing and psychological support for SLPs
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Twenty-two out of 54 (41%) articles included in this review discussed workforce planning [5, 12-14, 23, 31, 32, 34, 35, 40-42, 44, 45, 47, 52, 54, 56-58, 60, 63]. However, as can be ascertained from Table 4, only 5 out of 17 (29%) studies with empirical data [5, 12-14, 23] supported the recommendations initially developed by Namasivayam-MacDonald and Riquelme [6]. Notably, pandemic planning was the focus of the recommendations paper by Wong [40], but this was based on a business model rather than empirical evidence. Across all types of publications, the most commonly covered topics surrounding workforce planning included compliance with relevant national, provincial/state/territorial, and/or hospital guidelines for infection prevention and control (recommendation 1.12; [5, 23, 31, 54, 60, 63]); recognition that staff have an increased and/or varied workload with a heightened risk of anxiety both at work and at home (recommendation 1.17; [32, 34, 40, 58]); and considerations around debriefing and psychological support for staff (recommendation 1.18; [32, 34, 40, 58]). Of note, the article by Mumtaz and colleagues [34] focused on the fears of healthcare workers associated with COVID-19 contraction. Per Table 4, recommendations specifically supported by empirical evidence were recommendations 1.4, 1.6, 1.7, 1.10, and 1.12. Recommendations not covered by any publications in the review pertaining to workforce planning included: taking advantage of the skills of SLPs with ICU experience (recommendation 1.5); considering staff who are at high risk of contracting the virus when planning staffing and rosters (recommendation 1.8); considerations for staff who are pregnant (recommendation 1.9); and determining facility plans for cohorting COVID-19 patients and using these plans to determine resource requirements (recommendation 1.14).

Initial SLP involvement with patients (i.e., screening and assessment) was the most commonly covered topic in the literature, discussed by 41 out of 54 (76%) articles [5, 10, 11, 15-18, 20, 22-25, 27-33, 36-38, 40, 43-45, 47-54, 57-62]. However, as can be ascertained from Table 5, 12 out of 17 (71%) articles with empirical data [5, 10, 11, 15-17, 19, 20, 22-25] supported the initial involvement recommendations developed by Namasivayam-MacDonald and Riquelme [6]. Across all articles, the most commonly discussed topic was administration of endoscopic procedures (recommendation 2.10; [5, 15, 16, 20, 23, 25, 28, 30, 31, 33, 36, 38, 44, 47, 51-54, 57-59, 61-63]). Other commonly discussed topics included: performing point-of-care risk assessments to determine needs for videofluoroscopic swallowing studies (recommendation 2.9; [28, 30, 33, 36, 38, 47, 50, 51, 53, 54, 57, 58, 63]); the implementation of face-to-face procedures only when required (recommendation 2.1; [18, 28, 29, 37, 40, 47, 51, 52, 54, 58, 59, 63]); being mindful of the length of close contact with patients with COVID-19 (recommendation 2.5; [25, 27-29, 36, 38, 40, 44, 45, 47, 48, 50, 51, 54, 58, 59, 61, 62]); and avoiding testing volitional cough and gag reflex (recommendation 2.6; [16, 23, 28, 31, 33, 36, 45, 47, 48, 50, 51, 54, 57, 58, 62]). Per Table 5, recommendations specifically supported by empirical evidence were recommendations 2.1, 2.3, 2.5, 2.6, 2.7, 2.8, 2.10 and 2.11. None of the articles included in this review discussed documenting modifications to clinical procedures (recommendation 2.13) and only two highlighted the differences in assessment of patients with COVID-19 in versus outside of the ICU (recommendation 2.4; [47, 49]).

Table 5 Publications included in the review that contained empirical data mapped to initial involvement recommendations for practice with patients with COVID-19 covered by Namasivayam-MacDonald and Riquelme [6] in their initial recommendations to guide clinical SLP practice when working with adults with COVID-19 in the acute care setting.

Initial Involvement Recommendation for Practice with Patients with COVID-19	Studies Supporting Recommendation
2.1 Direct speech-language pathology interventions should only be provided with adequate clinical indicators to minimize COVID-19 exposure	Lima, 2020 [18]
2.2 SLPs should meet regularly with senior medical staff to determine indications for SLP assessment in patients with COVID-19	
2.3 Initial determination of the appropriateness of a referral should be completed indirectly	Exum, 2020 [17]
2.4 Outside of the ICU, SLPs should conduct clinical swallow evaluations on patients with COVID-19 only when they have stable vitals signs and acceptable respiratory status	
2.5 SLPs should remain aware of the duration of close contact to help limit contact	Rouhani, 2021 [22]; Traugott, 2021 [25]
2.6 During direct clinical swallow evaluations, SLPs should avoid testing a volitional cough and the gag reflex. SLPs should also minimize the number of medical devices and other reusable equipment that are exposed to infected patients during assessments	Cavalagi, 2020 [16]; Sandblom, 2021 [23]
2.7 SLPs should work with nursing staff, as per usual practice, to establish and carry out an oral care plan	Ishkanian, 2021 [11]; Rouhani, 2021 [22]; Stierli, 2020 [24]
2.8 In the absence of adequate PPE (i.e., N95 masks or the equivalent), SLPs may consider the use of telepractice to facilitate direct clinical swallow evaluations	Kearney, 2021 [5]
2.9 SLPs should undertake a point-of-care risk assessment to determine need and appropriateness for videofluoroscopic swallowing studies	
2.10 Given that it is an AGP, SLPs should avoid performing all SLP-led endoscopic procedures, including FEES, videostroboscopy, and manometry, on patients with confirmed COVID-19 unless necessary	Boggiano, 2021 [15]; Cavalagi, 2020 [16]; Dawson, 2020 [10]; Kearney, 2021 [5]; Regan, 2022 [20]; Sandblom, 2021 [23]; Traugott, 2021 [25]
2.11 SLPs should clean all equipment after each use with facility-designated disinfectants and minimize use of adjunct tools	Cavalagi, 2020 [16]; Sandblom, 2021 [23]

2.12 SLPs should reevaluate their approach to service delivery and perform a point-of-care risk assessment for every patient interaction

2.13 If any clinical procedures are modified as part of a risk management approach to the COVID-19 pandemic, document this clearly in the health record

Active SLP involvement (i.e., management of communication and swallowing difficulties) was also commonly covered by all articles included in the review, with the only topics not being covered being end-of-life care for patients with COVID-19 (recommendation 3.8) and the documentation of modifications to clinical procedures (recommendation 3.11). As can be ascertained from Table 6, 12 out of 17 (71%) articles with empirical data [5, 10, 11, 14, 15, 18, 20-25] supported the active SLP involvement recommendations initially put forth by Namasivayam-MacDonald and Riquelme [6]. These articles supported recommendations 3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 3.9, and 3.10.

Table 6 Publications included in the review that contained empirical data mapped to active SLP involvement recommendations for practice with patients with COVID-19 covered by Namasivayam-MacDonald and Riquelme [6] in their initial recommendations to guide clinical SLP practice when working with adults with COVID-19 in the acute care setting.

Active SLP Involvement Recommendation for Patients with COVID-19	Studies Supporting Recommendation
3.1 Involvement with patients with possible dysphagia post-extubation	Boggiano, 2021 [15]; Dawson, 2020 [10]; Lima, 2020 [19]; Regan, 2022 [20]; Regan, 2021 [21]; Sandblom, 2021 [23]; Stierli, 2020 [24]; Traugott, 2021 [25]
3.2 Involvement with patients with possible dysphagia in the presence of respiratory compromise	Ishkanian, 2021 [11]; Sandblom, 2021 [23]
3.3 Involvement with patients with possible dysphagia upon decompensation	Boggiano, 2021 [15]; Ishkanian, 2021 [11]
3.4 Involvement with patients who show signs of cognitive difficulties and inability to communicate basic needs	Bellinger, 2021 [14]
3.5 Involvement with patients who require augmentative and alternative communication equipment	
3.6 Involvement with patients with tracheostomies with/without mechanical ventilation	Boggiano, 2021 [15]; Dawson, 2020 [10]; Rouhani, 2021 [22]; Sandblom, 2021 [23]; Stierli, 2020 [24]

3.7 Involvement with patients with laryngectomies with/without mechanical ventilation	Rouhani, 2021 [22]; Stierli, 2020 [24]
3.8 Involvement with patients who require end of life care	
3.9 When rehabilitation cannot take place due to limited in-person rehabilitation options during the pandemic and/or when deconditioning may impact the swallow, SLPs should consider providing swallowing maintenance exercises to patients	Regan, 2022 [20]
3.10 SLPs should consider using telepractice to provide rehabilitation to outpatients with swallowing and/or communication impairments	Kearney, 2021 [5]; Regan, 2022 [20]
3.11 If any clinical procedures are modified as part of a risk management approach to the COVID-19 pandemic, document this clearly in the health record	

PPE recommendations were provided in almost one third (17 out of 54; 31%) of all publications [28, 29, 31-33, 40, 46, 51, 53, 54, 56-58, 61, 62, 64], but PPE was not explicitly discussed with supporting evidence in any of the articles reporting empirical data. Suggestions for integration of AAC devices, whether they be low or high technology, were only discussed in five publications [27, 31, 32, 41, 58], but none with empirical data.

4. Discussion

The COVID-19 pandemic has been a global fixture for over 24 months now. This is a relatively short time for extensive empirical data specific to the practice of SLPs in acute care settings to emerge in peer-reviewed journals. Only 17 of 54 studies included in this review provided empirical data (see Table 2). This is a small amount of support to guide the broad areas of SLP practice engaged in the acute care setting. The remaining 37 studies encompass reviews, recommendations, or opinion studies (see Table 3).

As we focus on the available empirical data to date, Table 4, Table 5 and Table 6 provide a listing of the publications within the framework espoused by Namasivayam-MacDonald and Riquelme [6]. In the area of workforce planning (Table 4), the important role played by SLPs with this population is presented by Bellinger, Ouellette & Leonard Robertson [14]. They reported on the effectiveness of physical therapy, occupational therapy, and speech-language pathology services to patients with moderate to severe COVID-19 in an inpatient rehabilitation unit. They analyzed pre- and post-testing results and found statistically significant improvements in mobility, self-care, and cognitive performance. The authors concluded that the data presented “can be used to impact the appropriate progression of patients through the health care continuum”, further demonstrating the important role of the interdisciplinary team with this population.

In a retrospective review of 164 COVID-19 patients referred for speech-language/swallowing assessment, Archer and colleagues [13] reported that 78% had undergone a tracheotomy and 13.4% presented with a new neurological impairment. While individualized compensatory approaches were utilized for dysphagia management, only 11% were found to be candidates for direct exercise programs. At their hospital in the UK, the authors reported that patients were introduced to some form of oral intake by day #2 post-initial assessment. In their sample, all patients were discharged

from the hospital on oral diets. Post-discharge, 17.1% presented with dysphonia and 7.8% with dysphagia, requiring community-based follow-up. This data suggests that while clinical improvements may differ from other clinical populations, the need for follow-up services post discharge from hospital needs further attention. This data supports the need to identify existing resources for service provision as well as SLP training.

Attempts to further characterize the changes in oropharyngeal and laryngeal physiology have also been noted. Sandblom and colleagues [23] evaluated 25 COVID-19 patients in the ICU in the latter stage of care or shortly post-discharge. Upon endoscopic evaluation, they found pooling of secretions in 92% of patients and 44% showed signs of silent aspiration on at least one bolus trial. All patients showed post-swallow residue in the pharyngeal recesses. Additionally, Sandblom and colleagues noted that 76% of their sample presented with impaired vocal fold movement and erythema of the vocal folds (60%) and of the arytenoid region (60%). It is unclear how long the impairments persisted in the sample; however, it becomes immediately clear that SLP intervention is critical for rehabilitation of both swallowing and voice disorders in this population.

Recommendations for practice by SLPs with this population (initial and active) are presented in Table 5 and Table 6. Published clinical reports suggest that patients with COVID-19 also present with dysphagia and dysphonia post-extubation secondary to acute respiratory distress syndrome (ARDS) [10, 19]. Severe dysphagia persisting 24 hours post-extubation was reported in 20% of patients by Lima et al. [19], requiring full or partial enteral tube feeding, and 53% presented with moderate dysphagia requiring dietary or behavioral interventions. Dysphagia has previously been associated with ARDS and correlated with length of stay in the ICU in patients without COVID-19, persisting beyond hospital discharge in one-third of patients [65].

In efforts to better understand the impact of the pandemic on SLPs in the acute care setting in South Africa, Adams and colleagues [12] shared insightful information on the changes in SLPs roles, limitations in services provided to patients (e.g, no ambulatory services) and the overall resilience of healthcare professionals facing novel and unprecedented situations. While written from the perspective of SLP practice in South Africa, the insights shared are likely common for countries where access to allied health professionals is limited.

Despite this evidence demonstrating the need for speech-language pathology services with this complex patient population, the mechanisms leading to speech, language, cognition, and swallowing difficulties in this population are largely hypothesized. A case study by Cavalagli and colleagues [16] outlines the potential neurological pathophysiology of cranial nerve dysfunction that results in dysphagia. Figure 2 of their article provides a conceptual model of the patient's possible pathogenic correlation, noting that in conjunction with ICU acquired weakness, patients present with neuromuscular incoordination leading to poor respiratory swallow coordination, and impaired management of oropharyngeal secretions. In efforts to better understand the complexity of mechanisms that lead to communication and swallowing symptoms in this population, a review of clinical presentations was included in Figure 2 of the study by Cavalagli and colleagues to facilitate our evolving understanding of the pathophysiology involved.

Specific to voice sequelae, another set of recommendations was published by a group of 11 experts in voice and swallowing from five different countries [61]. This group reached a 95% consensus for the 65 recommendations presented to clinicians on the management of voice disorders during the pandemic. More recently, Boggiano and colleagues [15] studied 25 patients retrospectively who had undergone trans-laryngeal intubation during the course of their treatment

for COVID-19. Their results showed that 63% of the sample presented with laryngeal abnormalities that were considered significant. These included edema, abnormal vocal fold movement, atypical lesions, and erythema. In addition, the authors report that 88% of patients who aspirated during the endoscopic examination did so silently. Overall, Boggiano et al. [15] conclude that “the incidence of laryngeal pathology in this sample was higher than a non-COVID-19 cohort with similar characteristics.”

When addressing the needs of patients with a tracheoesophageal voice prosthesis, Goldstein et al. [56] suggest increased use of a heat moisture exchanger (HME) to reduce risk of transmission, reduce crusting and reduce potential trips to the hospital. This recommendation was based on their review of the literature. Proposed guidelines for protection during tracheotomies or care for open tracheostomies are presented in a review paper by Jacob et al. [55]. They suggest creating a core COVID-19 Airway team that will adhere to strict protocols and reduce the risk of transmission among other colleagues. In a prospective study, Rouhani et al. [22] reported on the high incidence of laryngeal injury among patients who underwent endotracheal intubation and tracheostomy insertion during the COVID-19 pandemic. The study is ongoing as the team of researchers aim to “study complications over the medium term, which may offer insight into the natural history of ICU related laryngeal injury.” This would be a good addition to future empirical evidence.

The empirical studies identified provide support in a range of practice areas. Dawson et al. [10] presents compelling evidence from one hospital in Birmingham, UK on the prevalence of dysphagia in patients with COVID-19 based on experience from the first wave of the pandemic. As noted in Table 4 and Table 5, this supports initial and active SLP involvement for patients with COVID-19. Specifically, they found 29.9% of patients admitted with SARS-CoV-2 were referred for swallow assessment. Their findings suggest (p. 986):

- The prevalence of dysphagia is high in patients admitted with COVID-19, which is an important facet of rehabilitation needs.
- Dysphagia was multi-factorial, and co-existed with delirium, fatigue and difficulty achieving effective respiratory-swallow coordination.
- Patients with a tracheostomy following COVID-19 required greater total therapy sessions from the speech-language pathologist.
- Acute care protocols require robust, well-established and appropriately funded SLP teams to provide timely, effective rehabilitation for patients with complex upper airway compromise following COVID-19 and acute care admission.
- A whole systems approach from an integrated multi-disciplinary team is required to manage concurrent and complex etiologies associated with COVID-19 and an acute care admission.
- With intensive therapy, most patients can regain normal swallow function following COVID-19.

In a study conducted in the Republic of Ireland, Regan and colleagues [20] reported that post-extubation, 90% of patients referred for a dysphagia assessment required altered oral intake, 36% were not allowed oral intake and 59% required tube feeding. In their analysis, age, proning and pre-existing respiratory disease were predictors of oral intake status post-extubation. In their sample, 66% presented with dysphonia. At time of discharge, dysphagia persisted in 27% of the participants and dysphonia in 37%. Based on their data, they conclude that “Prompt evaluation and intervention is needed to minimize complications and inform rehabilitation planning.”

One of the few treatment papers found for this review was a case study where pharyngeal electrical stimulation was utilized to improve oropharyngeal dysphagia [25]. The data suggests that dysphagia intervention is crucial to optimize full recovery in this population. In the category of transmission-based precautions, the focus on telehealth in acute care has been mentioned but not necessarily completely studied. While a review, the paper by Curtz and colleagues [43] presents several algorithms for physical therapy, occupational therapy and speech-language pathology decision-making. The flow charts are comprehensive and focus on identifying appropriate patients for telehealth intervention while in the acute care setting.

Overall, the empirical data included provides support and some guidance to the SLP working in the acute care setting. Areas that remain to be explored are specific clinical service protocols that demonstrate positive outcomes. For example, has the manner in which a clinical swallow assessment is conducted changed due to what we have learned from our work with patients with COVID? Anecdotal clinical reports suggest that some clinicians remain conservative in their approach, while others took risks during the pandemic and have now incorporated models of care that may be seen as more aggressive. The data on these changes, presented as an example here, are yet to be shared.

It is of interest to note that in a literature and international guidelines review article focused on dysphagia in patients with COVID-19 published in November 2020 [36], Vergara and a group of international co-authors identified and reported on three publications that met inclusion criteria, as well as 19 international guidelines. In their conclusions they state: "International associations have provided extensive guidance regarding the level of risk related to the management of dysphagia in this population. To date, there are no scientific papers offering disease and/or recovery profiling for patients with dysphagia and coronavirus disease 2019." Given the few studies found at the time of their review, the current mapping review serves as a more detailed follow-up, demonstrating that primary data collection has been conducted and analyses are ongoing to deepen our understanding of how SLPs can effectively manage those with COVID-19.

In looking at how to best prepare for future incoming waves of this or other pandemics that impact SLP practice in hospital settings, Wong [40] presents an interesting view on pandemic planning for speech-language pathologists. She highlights the "lack of speech-language pathology-specific publications on frameworks to guide pandemic planning." The analysis presented was conducted using the Stuff, Staff, Space and Systems framework [66] and includes a comprehensive table of suggestions for the clinician (p. 157). Collaboration, supports and review of systems are highlighted throughout. The systems approach presented serves to proactively assess potential problems before they arise and to help plan for future events. Wong [40] highlights the need to create a "culture of learning" and likens the process of preparation to that of a clinical assessment, where "understanding the system in which the speech-language pathology service works may be more thoroughly and efficiently tackled through a well thought out assessment." The information presented and the framework used should be kept in mind for future healthcare crises where resources are stretched.

As we move forward, interesting gaps and questions are raised by Coutts [60] regarding dysphagia services to this clinical population and the essential nature of speech-language pathology services. Several of the gaps presented include the limited data on prevalence of dysphagia countries outside of North America and Europe, the impact of this pandemic on under-resourced healthcare systems, the unclear future of the impact COVID-19 will have on the profession, and the

paucity of global data on dysphagia practice in different facilities. The author emphasizes that SLPs need to advocate for their roles in high care settings and that telerehabilitation warrants further investigation.

This scoping review of the literature, based on the initial, open access recommendations set forth by Namasivayam-MacDonald and Riquelme [6] highlights the need for, and benefits of, the ongoing investigation of how speech-language pathology service delivery models and specific clinical protocols were, and continue to be, challenged during this pandemic and its ongoing waves. The incoming myriad of patient presentations further challenge investigations into specific patient care approaches. In particular, the emergence of new and heterogenous variants in combination with individual vaccination status and comorbidities. It is highly suggested that the decision-making process clinicians undergo when providing communication and dysphagia services in the acute care setting to adults be further explored and shared, within the context of variants and overall sequelae. It is relevant to note that much of the empirical data available to date relates to the initial wave of the pandemic, hence the integration of findings with current trends must be prioritized by clinicians worldwide. The underlying neurophysiology impacted by COVID-19 also warrants exploration in the context of communication, cognition, and swallowing. Furthermore, it is important to recognize the changing rehabilitation needs and the impact of long COVID on this population moving forward. Long COVID presents challenges to many in their daily lives and little is known about its impact on patient care upon re-admission to the acute care setting, for related or unrelated causes. The profession of SLP and future practice has been impacted and will continue to be influenced by the ongoing exploration on how we do what we do.

5. Conclusions

In conclusion, SLPs remain essential healthcare workers at the frontlines. The empirical data shared in this scoping review provides support for the ongoing role of the SLP in the acute care setting and the impact COVID-19 and its variants have on the underlying systems for communication and swallowing. The non-empirical data presented and available to date allow for additional exploration of the role of the speech-language pathologist with this specific clinical population. The recommendations previously provided by Namasivayam-MacDonald and Riquelme [6] have been explored and updated from the available evidence. This document serves as proof of the need for ongoing research into the clinical presentations of patients with speech-language, cognitive and/or swallowing deficits resulting from COVID-19, as well as into systems of care that will provide the best outcomes in their rehabilitation.

Author Contributions

LFR: Conceptualization, methodology, supervision, writing. SD: Methodology, data curation. AH: Methodology, data curation. IH: Methodology, data curation. AS: Methodology, data curation. SWA: Methodology, data curation. ANM: Conceptualization, methodology, formal analysis, supervision, writing.

Competing Interests

The authors have declared that no competing interests exist.

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