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Review Article

The use of simulation in the assessment and management of dysphagia: A scoping review

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KEYWORDS
Dysphagia;
education;
high-fidelity mannequin;
scoping review;
simulation training

Abstract

Background: Dysphagia significantly affects patient wellbeing and healthcare outcomes, highlighting the need for effective training in its management. Few studies have examined its use in the training of students in dysphagia assessment and management.

Aim: This study reviewed the role of simulation in dysphagia education, aiming to improve teaching approaches and clinical outcomes.

Methods: A scoping review was conducted between February and March 2024. An electronic search of CINAHL, Medline, ERIC, and Academic Search Premier was completed to include peer-reviewed, English-language articles published between 2011 and 2022 were retrieved.

Results: A total of 151 articles were screened and 10 were included in the final review. Articles were excluded if the focus was on the biomechanics and computational modeling of swallowing, or did not include students. The findings indicate that simulation enhances student competencies in dysphagia care. However, while offering benefits such as increased knowledge and confidence, challenges remain, and there is a scarcity of interprofessional-focused research.

Conclusions: The study underscores the importance of simulation in dysphagia education and calls for further quantitative research and global perspectives to better integrate simulated learning with practical skills.

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Introduction

Simulation training is increasingly recognised as an effective tool in the training of nurses and speech-language therapists (SLTs), particularly in the assessment and management of dysphagia, emphasising the importance of an interdisciplinary team approach (Interprofessional Education Collaborative, 2023; Potter & Allen, 2013). SLTs are primarily responsible for providing care to patients with feeding and swallowing difficulties, or dysphagia (Clark & Ebersole, 2018). However, given the heterogeneous

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nature of swallowing, it requires a multidisciplinary team for it to be effectively assessed and managed. Nurses play a crucial role in the initial screening of dysphagia patients to determine their ability to feed and swallow safely and to implement any dietary modifications or manage nonoral feeds as recommended by the SLT (Clark & Ebersole, 2018). Additionally, in situations where there is a high risk of aspiration, nurses are essential during swallow examinations to provide necessary suctioning, especially in patients with a tracheostomy. The use of simulation-based training can enhance these skills by providing realistic, hands-on scenarios, ensuring better patient care and safety.

Simulation has long been a favored method for teaching clinical skills in nursing and is now starting to be recognised for its value in training not only nurses, but SLTs as well (Benadom & Potter, 2011; Ward et al., 2015). Simulation-based training offers a multifaceted approach to clinical education, particularly in the field of dysphagia management. It integrates various pedagogical strategies, such as information dissemination, demonstration of technical skills, and practice-based learning activities (Mills et al., 2020; Ward et al., 2015). Recognized for its ability to safely teach clinical skills, simulation may prepare students effectively for real-world clinical placements (Penman et al., 2021). One of the significant benefits of simulation in training for dysphagia is its ability to create a risk-free environment where students can learn and practice complex procedures without the potential for harming patients (Kim & Lee, 2020; Mills et al., 2015). This aspect is crucial in dysphagia management, where incorrect techniques can lead to serious complications, including aspiration and pneumonia (Wilkinson, Codipilly, & Wilfahrt, 2021). The use of simulation in dysphagia training is essential, and the incorporation of the *Healthcare Simulation Standards of Best Practices* (INACSL Standards Committee, 2021) ensures that these simulations are structured effectively to maximize learning and safety. Furthermore, the Council for Clinical Certification in Audiology and Speech-Language Pathology allows graduate students in speech-language pathology to apply up to 75 hours of clinical simulation toward their professional certification (American Speech-Language-Hearing Association, 2020). Similarly, the National Council of State Boards of Nursing supports the use of simulation to replace clinical expereinces whne guided by best practice standards (National Council of State Boards of Nursing). However, gaps remain regarding the types and range of simulation activities that can be effectively used in dysphagia training, highlighting the need for further research in this area.

Methods

A scoping review was chosen as the methodology. This supports a systematic approach to knowledge synthesis in an emerging field, assisting in the identification of gaps in the evidence for future examination (Arksey & O'Malley, 2005; Levac, Colquhoun, & O'Brien, 2010; McGowan et al., 2020; Tricco et al., 2018). The review aimed to describe the use of simulated teaching in dysphagia to provide recommendations for making appropriate teaching and learning decisions to ensure better clinical outcomes. Researchers Arksey & O'Malley, 2005 characterize a scoping review as a method for systematically mapping the extent, range and nature of relevant literature within a specific field of interest. Therefore, the scoping review was identified as an appropriate methodology to meet the aims of this study. This framework involves five key stages: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results used to conduct the scoping review. An ethics waiver was received from the University of the Witwatersrand Human Research Ethics Committee (nonmedical) (number: HREC-NMW24/03/03).

The research question that guided this scoping review was "What simulation-based training can be used to improve students learning for dysphagia teachings and clinical practice?" The population included students in the fields of nursing, SLT, and dietetics. The study excluded those who are in practice such as nurse practitioners or SLT due to their different scope of practice and competencies. This review focused on understanding the types of simulations being used, outcomes of simulated approaches used in dysphagia education and clinical practice, and recommendations for future use in the field of dysphagia.

Data sources and search strategy

A systematic electronic search for articles was conducted between February and March 2024. Four databases were used: CINAHL, Medline, ERIC, and Academic Search Premier. In addition, the first five pages of google scholar were also searched. The databases were chosen to be comprehensive and to cover simulation in dysphagia. In collaboration with the university senior librarian, the text words in the titles and abstracts of relevant articles, and the index terms used to describe the articles were used to develop a comprehensive search strategy with a set of keywords for CINAHL. The search strategy, encompassing all identified keywords and index terms, was customized for each database or information source. BOOLEAN operators (AND and OR) as well as truncation were used in the search strings using subject headings (MeSH), and keywords with proximity operators, respectively (Table 1). Results published or translated into English were considered, and no date of publication restriction was imposed to ensure the inclusion of potentially longstanding resources.

Table 1 – PIO Literature Search Terms.

Population	Intervention	Outcome Measures
Students OR Speech therapy students OR Nursing students OR Dietetics students AND Dysphagia OR Swallowing disorders	Simulation OR Simulation learning OR Simulation education Simulation could be of low fidelity (e.g., role playing) or higher fidelity (e.g., SPs, virtual patients, digitized manikins, immersive reality, task trainers, and computer-based interactive activities).	Student knowledge/ competency/skills/ confidence

Study selection

The current review included published peer-reviewed journal articles, was limited to primary study designs (qualitative, quantitative and mixed-method approaches), and excluded grey literature and nonacademic sources. Grey literature and nonacademic sources were excluded to ensure the use of high-quality, reliable, and peer-reviewed academic sources, maintaining focus and reproducibility within the constraints of time and resources. The review focused on students in healthcare disciplines (population) who engaged in simulation for the teaching and assessment in dysphagia (intervention), to assess student's knowledge acquisition, skills development, confidence, clinical competence in dysphagia (outcome measures). No restrictions were set for courses and year of student studies. However, only students were included and staff/clinical educators as research participants were excluded. This review considered different forms of simulation. For instance, studies specific to one or more full-scale simulation, computer-based simulation, peer-to peer, or role playing were included. Both intraprofessional and interprofessional simulations were included. Studies could take place in any context or country. Studies had to have a main outcome related to dysphagia, such as student competency, confidence, or technical skills.

The following inclusion criteria were used: (1) studies presented original research published in a peer-reviewed journal, (2) study participants included students, (3) the topic of study clearly focused on simulated teaching and assessment in dysphagia (4) published any time, (5) articles published in English, (6), only primary studies were included. No time frame of published studies was included, although simulation in the field of dysphagia is relatively new (MacBean, Theodoros, Davidson, & Hill, 2013).

This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (McGowan et al., 2020; Tricco et al., 2018). Articles included in this review were published or written between 2011 and 2022 and included studies that used differing simulation modalities. Following the database searches conducted on the 21 February 2024 (SNA), all identified peer-reviewed results were collated and uploaded into Mendeley, and duplicates were removed. The initial search results yielded the following results: Medline (n = 13), CINAHL allied and nursing (n = 34), ERIC educational (n = 2), Academic Search Premier (n = 45). Google Scholar was be searched and articles from the first five pages reviewed (n = 57). A list of references to relevant and retrieved publications was also searched and one additional article was included.

The initial search yielded 151 articles, and 50 duplicates were removed. No new articles were found through the review of the reference lists (Figure 1). Then, 101 article titles and abstracts were screened for relevance by two independent reviewers (SA, KC), with an additional review providing independent secondary review for assessment against the inclusion/exclusion criteria. 81 were excluded for the following reasons: different population focus, did not relate to simulation or dysphagia, were not in the field of medicine or rehabilitation sciences but rather engineering (e.g. simulation in relation to 3d modeling). The full texts of 20 articles were then screened for eligibility, and 10 articles were included in the final review. Full texts that did not meet the inclusion/exclusion criteria were excluded (e.g. studies looked at simulation and the biomechanics and computational modeling of swallowing, studies looked at simulations regarding bolus modifications, and the focus was on clinicians and not students). Any disagreements that arose between the reviewers were resolved through discussion and input from an independent reviewer (AK) until consensus was achieved. An iterative approach to study screening and selection was employed to emphasize a more inclusive final list of studies. All articles were accessed electronically.

Quality assurance

Grading of Recommendation, Assessment, Development, and Evaluation (GRADE) system to grading the quality of

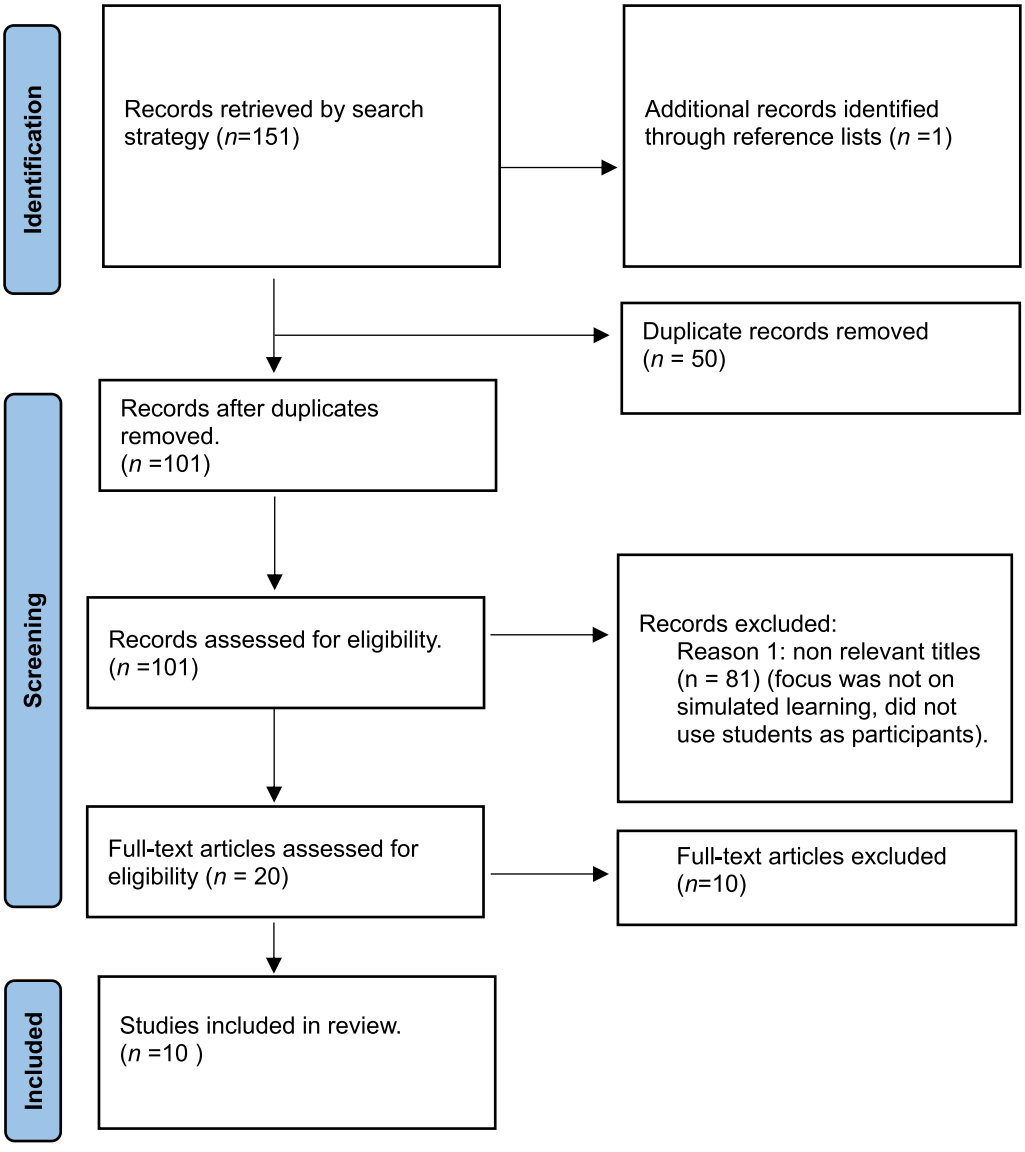

Figure 1 Preferred reporting items for systematic reviews and meta-analysis flow diagram for scoping reviews (PRISMA-ScR) (Tricco et al., 2018).

the evidence. The following five domains were assessed: bias arising from the randomization process, bias due to deviations from intended interventions, bias due to missing outcome data, bias in the measurement of the outcome, and bias in the selection of the reported result. Each domain was rated as "low", "some concerns", or "high" risk of bias, and the overall risk of bias was determined according to these results. We evaluated the certainty of the evidence using the GRADE approach for each meta-analysis. The certainty of the evidence can be categorized as either "high," "moderate," "low," or "very low" (Supplementary material 1). As majority of the articles were no randomized control trials, the certainty of evidence was categorized as low or very low and therefore no articles were excluded in the review due to quality.

Charting the data

The data charting template was created by SA and refined by KC. The data extracted included specific details about the population, concept, context, and key findings relevant to the review question. The initial draft of the chart underwent a pilot test using three randomly selected articles, independently reviewed by each author (SA, KC), and with the support of an independent reviewer (AK). Following minor revisions based on the pilot test feedback, the finalized chart was then used independently by both reviewers. Agreement between the two reviewers was 100% during the screening process. Any disagreements were resolved by consensus. As a scoping review methodology is iterative, this allowed for an adjustment to be made regarding

the inclusion of relevant studies during consensus discussions (Levac et al., 2010).

Collating, summarizing, and reporting the results

After extraction, the findings from the included studies were separated, grouped, abstracted, and categorized into themes. Independent categorization based on the study objectives; challenges and supports, was conducted by the two reviewers (SA, KC). Thematic analysis was conducted using Braun and Clark's framework (Braun & Clarke, 2006). Two reviewers extracted information from each article, grouped and labeled findings, categorized themes, and summarized general trends on simulation used for the teaching of dysphagia. The authors developed a code book (*Supplementary file 2 Code Book*) that provided different codes (and descriptions), as well as relevant articles and the frequency of each code. Similar codes were then collated and organized into themes and subthemes. Prominent themes from the reviewers were then selected, relabeled and finalized after a comprehensive review and discussion between both reviewers.

Results

Characteristics of the included studies

Table 2 presents a summary of study characteristics and relevant data from the 10 studies included in the review. There were different study methodologies employed with seven quantitative (70%), and three mixed-method designs (10%). The main simulation modality used was with a high fidelity mannequin (n = 7, 70%), with some studies using a combination of the high fidelity mannequin with nonlife like simulators (Benadom & Potter, 2011), case studies or actors (Broadfoot & Estis, 2020; Clinard, 2022; Miles, Donaldson, & Friary, 2015).

Studies employed diverse methods, although most studies (86%) utilized surveys such as scales and questionnaires. Studies were conducted across three high-income countries: the United States (US) (n = 6, 60%), New Zealand (n = 3, 30%), and Australia (n = 1, 10%). This distribution shows a significant research gap in low- and middle-income countries and highlights the lack of studies from continents such as Europe, Africa, Asia, and South America. The focus on high-income countries in the existing research may overlook diverse perspectives and variables relevant to other regions globally. The majority of studies (70%) had SLP students as a part of their study population. However, there was one study that looked at nursing students, and three other studies that looked at interprofessional education of dysphagia and included both dietetics and SLP students, and nursing and SLP students. Students included those both in undergraduate and postgraduate training programs.

Summary of findings

Findings were mapped and charted into two categories—student learning outcomes and simulation components. Student learning outcomes identified four subcategories: confidence, knowledge, skills, and anxiety. The second category, simulation components, included the subcategories of how simulation can be used to facilitate the teaching of dysphagia and the barriers associated with simulation.

Student learning outcomes

Student confidence: Research across seven studies investigating the impact of simulation activities on student confidence in dysphagia assessment and management consistently reveals an increase in confidence postsimulation (Benadom & Potter, 2011; Clinard, 2022; Freeland, Pathak, Garrett, Anderson, & Daniels, 2016; Miles et al., 2015; Miles, Friary, Jackson, Sekula, & Braakhuis, 2016; Sia, Halan, Lok, & Crary, 2016; Ward et al., 2015). Students attributed an increase in confidence to enhanced clinical skills, more effective patient interactions, and a deeper understanding of the clinical or hospital settings (Broadfoot & Estis, 2020; Clinard, 2022; Miles et al., 2015; Ward et al., 2015). They also reported feeling more prepared and adept at conducting timely assessments, navigating patient notes, and hospital files with greater efficiency (Broadfoot & Estis, 2020; Miles et al., 2015). Additionally, students gained valuable experience in pediatric care, including holding infants, understanding specialized equipment, and implementing modified interventions (Clinard, 2022; Ward et al., 2015). The simulation also improved students' understanding of multidisciplinary roles, fostering a better collaborative approach with nurses, speech-language therapists, and dietitians (Broadfoot & Estis, 2020; Miles et al., 2016; Potter & Allen, 2013).

Student skills: Four studies focusing on clinical skill development postsimulation found notable improvements on students' clinical skills, particularly in complex tasks like swallowing and dysphagia management (Broadfoot & Estis, 2020; Miles et al., 2016; Miles et al., 2015; Ward et al., 2015). Ward et al. (2015) found that students' clinical reasoning and practical skills in managing paediatric dysphagia improved notably after engaging in both lectures and high-fidelity simulation sessions. Students demonstrated enhanced abilities in assessing oral feeding skills, recognizing feeding distress signals, utilizing objective assessment tools, offering suitable feeding recommendations, and diminishing the overall risk to patients (Broadfoot & Estis, 2020; Miles et al., 2016). The opportunity for hands-on practice allowed students to build technical skills with mannequins that mimicked clinical scenarios and become more familiar with hospital environments which helped them translate theoretical knowledge into clinical competence (Miles et al., 2015; Ward et al., 2015).

Table 2 – Characteristics of the Included Studies.

Article Number	Author(s)/Year and country	Study Design	Participants and Sample	Simulation Modality	Simulation Activity	Quality Appraisal
1	Benadom & Potter (2011) United States	Randomized controlled study (HPS and nonlifelike simulation training)	Graduate SLP students, n = 18	Hybrid	Training and passing of flexible nasal endoscope on the high fidelity mannequin and nonlife like simulator. Trans nasal endoscopy on two volunteers.	Low
2	Broadfoot & Estis (2020) United States	Pre-/post-training within- and between-subjects design	Graduate SLP and Undergraduate nursing students, and nonhealth care students, n = 60	High fidelity mannequin	Training video and simulation based feeding scenario video using high fidelity mannequin.	Low
3	Clinard (2022) United States	Mixed methods study	Second year SLP students, n = 58	Hybrid	Written case study (control group). Orientation, predebriefing, infant feeding simulation using high fidelity mannequin and actor, and a debriefing session (experimental group)	Low
4	Freeland et al., (2016) United States	Pre-/post-training within- and between-subjects design	Nurses, n = 32	High fidelity mannequin	Simulation of adult feeding scenario video using high fidelity mannequin and debriefing session.	Low
5	Miles et al., (2020) New Zealand	Observational, descriptive study	Final year SLP students, n = 18	Virtual patients	Virtual patient case history and interview	Low
6	Miles et al (2016) New Zealand	Quantitative. Pre/ post training within subjects	Dietetics and SLP students, n = 31	High fidelity mannequin	Training and orientation and simulated clinical scenarios with high fidelity mannequin, and a debriefing session.	Low
7	Miles et al., (2015) New Zealand	Mixed methods study	Graduate SLP students, n = 19	Hybrid	Training and orientation and simulated clinical scenarios with high fidelity mannequin and actors, and a debriefing session.	Low
8	Potter & Allen (2013) United States	Observational, descriptive study	Nursing and SLP students, n = 60	Mannequin	Training clinical swallow exam on a tracheostomised static mannequin	Low
9	Sia et al., (2016) United States	Longitudinal descriptive study	SLP students	Virtual patients	Virtual patient case history and interview	Very low
10	Ward et al., (2015) Australia	Prospective repeated measures cohort design.	SLP students, n = 29	High fidelity mannequin	Tutorial and clinical feeding assessment on high fidelity mannequin of a baby and child.	Low

Student knowledge: Four studies addressed the simulation's influence on students' theoretical understandings of dysphagia (Clinard, 2022; Miles et al., 2016; Miles et al., 2015; Ward et al., 2015). Mean ratings of students ' perceptions of knowledge before and after the simulation were assessed, as well as eight months later, following actual clinical practice in Ward et al. (2015). All studies indicated that simulation activities augmented the students' knowledge, with coursework significantly bolstering initial learning (Ward et al., 2015). Knowledge improved after both coursework and simulation activities (Ward et al., 2015). However, after coursework alone students struggled to quickly synthesise theoretical knowledge required for clinical decision making and the application of the knowledge learnt (Miles et al., 2016; Miles et al., 2015). Clinard (2022) reported a 76% increase in knowledge in an experimental group using simulations, compared to a 33% increase in a control group. The hands-on experience allowed students to integrate knowledge from coursework into their practical assessments, demonstrating the powerful role of simulations in reinforcing academic learning, particularly when dealing with medically complex infants.

Student anxiety: Two studies examining student anxiety levels pre-and post-simulation found SLEs to significantly reduce student anxiety when transitioning to real clinical settings (Clinard, 2022; Ward et al., 2015). There were slight but no significant changes regarding general anxiety in managing patients with dysphagia when attending lectures alone (Ward et al., 2015). However, when lectures were coupled with simulations students reported lower levels of anxiety. Ward et al. (2015) noted that students experienced lower levels of anxiety after participating in simulation sessions, particularly regarding paediatric dysphagia management. The realism of the simulations helped students feel more prepared and confident, thus reducing anxiety about handling complex cases . Despite gaining experience through simulation, some students reported persistent anxiety when assessing and managing dysphagia, concerned about the potential to cause harm, make errors, and encounter negative intervention outcomes (Clinard et al., 2022). This suggests that while simulation is valuable, there remains a challenge in alleviating anxiety associated with the complexities of dysphagia, particularly working with the paediatric population.

Simulation components

Facilitators to simulation in the field of dysphagia

(1) Multiple repetitions.

Five studies described how simulation offered students the ability to repeat exposures both with and without supervision (Benadom & Potter, 2011; Broadfoot & Estis, 2020; Freeland et al., 2016; Miles et al., 2016; Miles et al., 2015; Miles, Hayden, Carnell, Halan, & Lok, 2021; Sia et al., 2016). Studies reported that through multiple repetitions students' performance competence increased and allowed students to practice providing more holistic care through the ability to repeat and change certain responses. Simulation provided students with the opportunity to work on ensuring they are listening for the right information to help guide their assessment and management, whilst trying to minimise certain cultural or linguistic biases (Miles et al., 2021). For example, Miles et al. (2021) stated how some students held certain gendered and cultural biases such as wives do all the cooking or Chinese patients predominantly eat rice.

(2) Controlled environment.

In four studies, students conveyed a strong appreciation for the structured learning environment provided by simulation training (Freeland et al., 2016; Miles et al., 2016; Miles et al., 2015; Sia et al., 2016). This controlled setting not only allowed students the latitude to learn from errors without real-world consequences but also served as an orientation to the dynamics of a hospital setting. Through simulation, students became acquainted with a variety of protocols ranging from comprehensive procedures such as hygiene and infection control measures to the more rudimentary aspects of hospital procedure, like positioning themselves correctly in relation to the patient and/or equipment (Miles et al., 2016; Miles et al., 2015). This preparation aimed to minimise the adjustment period in actual clinical environments, facilitating a smoother transition to professional practice.

(3) Interprofessional development and training.

Three studies stated how simulation allowed for more opportunities to work across and within disciplines in the assessment and management of dysphagia (Broadfoot & Estis, 2020; Miles et al., 2016; Potter & Allen, 2013). Simulations promoted interprofessional communication and joint case-based care and planning (Miles et al., 2016). These were obtained through direct observation during simulation activities, where students were evaluated on their ability to effectively communicate with other healthcare professionals and collaboratively plan patient care (Potter & Allen, 2013). Feedback from facilitators and peers, as well as structured debriefing sessions, provided further insights into the students' performance in interprofessional communication and teamwork. However, it is still important to clearly define each professions scope and responsibilities within the case as these can sometimes become blurred regarding the balance of leadership and defining roles and boundaries with the other professionals (Miles et al., 2016; Potter & Allen, 2013).

Barriers to simulation in the field of dysphagia

(1) Need for increased realism.

In four studies, students discussed the inherent limitations of simulation training, particularly in its capacity

to replicate the complexities of real-life patient interactions and clinical environments (Benadom & Potter, 2011; Broadfoot & Estis, 2020; Freeland et al., 2016; Miles et al., 2016). One noted shortcoming was that the mannequins used in simulations were not equipped to handle food or liquids, a critical component in the assessment and management of dysphagia (Benadom & Potter, 2011). Moreover, these mannequins lacked the capability for physiological monitoring, preventing students from tracking real-time responses that are imperative in dysphagia treatment (Freeland et al., 2016). Consequently, facilitators were often required to describe potential reactions and outcomes that could not be directly observed during the simulation (Benadom & Potter, 2011; Freeland et al., 2016). In addition to the limitations with the mannequins, many students felt that the simulation settings fell short of emulating the full spectrum of activity and pressures found in a live clinical setting, often referred to as the "hustle and bustle" of a hospital environment (Miles et al., 2016).

(2) Cost of simulation.

Three studies commented on the associated costs of a simulated learning environment (Benadom & Potter, 2011; Clinard, 2022; Ward et al., 2015). According to Benadom and Potter (2011), a high fidelity mannequin can range up to well over USD $95 000, this does not include the additional training and resources that are required to run a simulation. Ward et al. (2023) conducted a financial analysis of the costs associated with a 5-day simulation-based learning programme for SLT students. The results indicated that, on average, it cost USD $6,213 to run a simulation-based learning programme, with costs ranging from USD $3,628 to USD $8,789, depending on local labor/staff costs and the extent of in-kind support. Personnel was the largest cost component, accounting for 76.6% of the total financial costs (Ward et al., 2023).

(3) Transferable skills and knowledge to practice.

Studies that reported on improved skills learned through simulation may not be transferable to human patient scenarios and this requires further exploration (Broadfoot & Estis, 2020). Studies have reported on the importance of not only relying on the use of a mannequin but to also incorporate actors before live patients in order to successfully transfer clinical skills (Freeland et al., 2016). Furthermore, although the use of virtual patients can prepare students, it is important that scenarios are adjusted to challenge different patient presentations and the impact of socioeconomic factors, cultural and linguistic implications on patient care (Miles et al., 2021).

Discussion

This scoping review suggested that simulation-based training is an effective and efficient method for educating all students in the field of dysphagia in preparation for working with both infants and adults in a clinical setting. Overall, students demonstrated improved confidence, skills, and knowledge around dysphagia. These findings align with previous scoping reviews on simulated learning in healthcare (Hoang, Copnell, Lawrence, & Peddle, 2022; Lee, Pais, Kelling, & Anderson, 2018; Zhang et al., 2023). Additionally, this study highlighted potential facilitators that should be considered when designing a simulation around the assessment and management of dysphagia including the opportunities for multiple repetitions, the use of a controlled environment and opportunities for interprofessional development and training. A controlled learning environment is the simulated learning environment which provides the student with a structured setting where variables, such as the content, pace, and methods of instruction, are carefully managed to ensure consistency. Furthermore, it is also important to note some of the limitations regarding the need for realism, the associated cost of running simulations, and the need for further research to establish the carry-over to real-life patients.

Different simulation modalities were used in the current study including high fidelity mannequins, virtual patients, and actors. However, it is important to note that the choice of simulation modality would be dependent on the outcomes of the course. High-fidelity mannequins or task trainers would be used for more specific clinical skills training such as endoscopic scope insertion (Benadom & Potter, 2011) or the identification of clinical signs and symptoms (Broadfoot & Estis, 2020), whereas skills such as communication or feedback would require the use of actors or simulated patients (Miles et al., 2021). Given the heterogeneity of dysphagia, it is important to choose the appropriate tool to maximize the intended outcomes, and to consider the need for increased realism when working with patients with dysphagia. Based on the findings, interprofessional activities involving multiple professionals can utilize various forms of simulation, depending on the desired outcomes. Selecting the appropriate type of simulation is essential to effectively enhance student attitudes, confidence, and patient outcomes, with a hybrid approach potentially offering additional benefits (Hoang et al., 2022). There is a limited body of research on interprofessional education in dysphagia, despite the critical need for multidisciplinary teamwork in this area (Baughn, Garand, & Ambrocio, 2023). Further exploration is especially needed in the Global South to address this gap. The Global South refers to regions of the world primarily in Africa, Latin America, Asia, and the Middle East that are generally less economically developed, historically marginalized, and often face challenges related to poverty, inequality, and political instability. It contrasts with the wealthier, industrialized nations of the Global North (Collyer, 2018; Demeter, 2020).

One finding suggested that the controlled environment of the simulation enhanced this learning (Freeland et al., 2016; Miles et al., 2016; Miles et al., 2015; Sia et al., 2016). Looking at simulation pedagogy, there must be specific outcomes related to the scenario. The specific

outcomes that are targeted will ultimately lead to improved knowledge and skills in the intended area, which has been proven as seen in the results from this review. The majority of the studies in this review looked at knowledge, skills, and confidence, and to the authors, these concepts are difficult to separate. It can be assumed that if knowledge and skills improve, confidence will be directly positively impacted as well. This notion was confirmed as seen in the results from the studies in this review. Developmentally, when moving students along the novice to expert continuum as suggested by Miller (1990) and Croskerry (2009), simulation is a helpful tool to assist students developmentally to move along this continuum. It can prove to be a bridge between theory and practice, in dysphagia.

In terms of scenario to translation to practice, it can also be assumed that if the confidence has improved, then anxiety at clinical placements should decrease. However, this needs to be further explored as not many studies in this review investigated the impact of anxiety on students postsimulation at clinical sites. This scenario to real-life transfer is also dependent on the type of simulation that is used. This was noted in the findings by Broadfoot and Estis (2020) which stated that not all simulations were easily transferable. The concepts around the type of simulation and realism for carryover needs to be further explored, especially in dysphagia.

In the current review, the research studies have indicated that simulation was supported as an effective component in improving students' confidence, skills, and knowledge when assessing and managing patients with dysphagia (Benadom & Potter, 2011; Clinard, 2022; Freeland et al., 2016; Miles et al., 2016; Miles et al., 2015; Sia et al., 2016; Ward et al., 2015), or could be used to enhance or supplement the theoretical teachings such as lectures or nonsimulated training as it can serve as a bridge to enhance integration (Broadfoot & Estis, 2020; Freeland et al., 2016; Miles et al., 2016). Additionally, although studies reported improved confidence and skills, all of these were self-reported and this requires additional research to identify the link between the aforementioned outcomes and actual clinical competencies when working in a clinical setting. As such, the methodologies used in these studies were also primarily qualitative which resulted in a low GRADE score. Therefore, future research should explore the use of more objective measures such as checklists, clinical observations, or supervisor reporting and their application to real-life patients.

Strengths and limitations

The strengths of this scoping review lie in the meticulous and current search of the relevant literature. The process was structured with explicit inclusion and exclusion criteria, accompanied by justifications for each. A significant strength of this review is its methodological rigor, ensuring that the findings are based on a systematic and reproducible search strategy. This robust approach enhances the review's reliability and validity. Moreover, the use of a PRISMA-ScR flow chart not only increases transparency but also aids in assessing the review's comprehensiveness and the potential for replication by other researchers. Some limitations of this review were around the exclusive inclusion of articles published only in English. This language restriction may introduce language bias, potentially excluding valuable research published in other languages. Furthermore, the exclusion of grey literature could lead to publication bias.

Conclusion

The findings on the use of simulation in dysphagia training align with previous reviews, but there is limited data to clearly define both student learning outcomes and the specific components of simulation that should be prioritized. Further research is needed to explore how skills, knowledge, and confidence acquired through different types of simulations—such as those using actors—translate to real-life patient care. Additionally, there was considerable variation in the types of simulations used, the activities involved, as well as the delivery methods and duration. This review also highlighted the lack of research from the Global South, revealing a significant gap that healthcare professionals in these regions must address. Curricula and student populations in Northern Hemisphere countries differ greatly from those in the South, making it difficult to generalize findings across these contexts. Training students in the assessment and management of dysphagia remains a complex challenge, and further research is required to identify the most effective simulation methods and practices.

Ethics statement

This study was approved by the University of the Witwatersrand Human Research Ethics Committee (HREC Non-medical) with an ethics waiver (HRECNMW24/03/03).

Declaration of competing interest

The authors declare no conflict of interest.

CRediT authorship contribution statement

Skye Nandi Adams: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Kim Coutts:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ecns.2024.101661.

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