


# Implementation of speech pathology telepractice services for clinical swallowing assessment: An evaluation of service outcomes, costs and consumer satisfaction

*Journal of Telemedicine and Telecare*  
2019, Vol. 25(9) 545–551  
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DOI: 10.1177/1357633X19873248  
journals.sagepub.com/home/jtt



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## Abstract

**Introduction:** Timely assessment of swallowing disorders (dysphagia) by speech pathologists helps minimise patient risk, optimise quality of life, and limit healthcare costs. This study involved a multi-site implementation of a validated model for conducting adult clinical swallowing assessments via telepractice and examined its service outcomes, costs and consumer satisfaction.

**Methods:** Five hub-spoke telepractice services, encompassing 18 facilities were established across a public health service. Service implementation support, including training of the telepractice speech pathologists (T-SP) and healthcare support workers in each site, was facilitated by an experienced project officer. New referrals from spoke sites were managed by the hub T-SP as per published protocols for dysphagia assessments via telepractice. Data was collected on existing service models prior to implementation, and then patient demographics, referral information, session outcomes, costs and patient and T-SP satisfaction when using telepractice.

**Results:** The first 50 sessions were analysed. Referrals were predominantly for inpatients at spoke sites. Telepractice assessments were completed successfully, with only minor technical issues. Changes to patient management (i.e. food/fluid changes post assessment) to optimise safety or progress oral intake, was required for 64% of patients. Service and cost efficiencies were achieved with an average 2-day reduction in waiting time and an average cost benefit of \$218 per session when using the telepractice service over standard care. High clinician and patient satisfaction was reported.

**Conclusion:** Telepractice services were successfully introduced across multiple sites, and achieved service and cost benefits with high consumer satisfaction.

## Keywords

Swallowing assessment, dysphagia, telepractice, telehealth, cost analysis

Date received: 21 July 2019; Date accepted: 11 August 2019

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## Introduction

Timely and accurate assessment of swallowing disorders (dysphagia) by speech pathologists is essential to minimise patient risk, limit length of hospitalisation, and optimise quality of life.<sup>1-4</sup> Healthcare costs associated with delivering dysphagia intervention is high,<sup>5-6</sup> and access to care is challenging in rural and remote areas of Australia, due the geographically dispersed population and issues accessing a skilled local workforce.<sup>7-8</sup> With an increasing ageing population, service demands and costs will continue to rise. Hence new service delivery models are required to meet these health service challenges.<sup>9</sup>

To improve patient access to clinical swallowing assessments, a synchronous telepractice model has been developed and evaluated.<sup>10-18</sup> In brief, the telepractice speech pathologist (T-SP) at the hub site connects with the patient at their local facility (spoke site) via live videoconferencing. The telepractice assessment involves all routine clinical tasks including patient interview, oromotor assessment, and food/fluid trials. System modifications to optimise audiovisual information for the T-SP includes the use of a lapel microphone for enhanced audio feedback (e.g. voice quality and coughing), application of white tape across thyroid notch to observe hyolaryngeal excursion, and use of coloured fluids/food with clear cups/utensils.<sup>10</sup> A trained healthcare support worker (HSW) is located at the patient-end to assist with equipment set-up and troubleshooting, patient positioning, and to support the patient to conduct the assessment tasks as directed by the T-SP.<sup>11,18</sup> A 100-patient randomised controlled trial confirmed high levels of agreement between the T-SP and face-to-face assessor, regardless of dysphagia severity, confirming the telepractice model was as safe and effective as face-to-face care.<sup>12,15</sup>

Whilst research studies have validated the telepractice model, the outcomes of implementing this service model within the clinical environment have not been examined. The aim of this paper was to examine the service outcomes, costs and consumer satisfaction of implementing telepractice dysphagia services across 18 facilities within a large public health service in Queensland, Australia.

## Methods

Five hub-spoke speech pathology services, incorporating 18 regional, rural and remote facilities, implemented the new telepractice model (Table 1). All participating sites considered that telepractice could help optimise their current dysphagia assessment services. Ethical approval was obtained (Royal Brisbane & Women's Hospital Human Research Ethics Committee, HREC15/QRBW/29) and participants provided informed consent.

### Standard care

Data was collected on existing service models provided by each hub, to their spoke sites. One hub (Service 1) did not provide a dedicated on-site service, with clinicians travelling to the spoke site only when required. Three hub facilities (services 2, 4 (spoke site 1), and 5) provided a part-time/week service at spoke sites, and two (services 3 and 4 (spoke site 2)) conducted fortnightly visits to their spoke sites, however, if an urgent referral was received between the fortnightly visits, the speech pathologist made an emergency visit to the spoke site and other existing clinic appointments were rescheduled. In this case, all services required the speech pathologist to travel by car to the spoke site(s), except for Service 5, where the patient travelled in an ambulance with a nurse escort to the hub site for appointments (Table 1).

**Table 1.** Standard care across the hub-spoke sites for clinical dysphagia assessment.

Service hub site no.	No. of spoke sites	Return distance from hub to spoke site/s (km)	SP services provided by hub to spoke sites	Mode of accessing SP care outside of scheduled service
1	1	110	No regular service – visit as required	SP travels to spoke site (approx. 1½ h return drive)
2	2	62–130	SP on-site 3 days/week	SP travels to spoke sites (approx. 1–2 h return drive)
3	7	160–308	Fortnightly visit to each spoke site	SP travels to spoke sites (between 1½–3½ h return drive)
4	2	Spoke site 1 = 400 Spoke site 2 = 925	Fortnight visit to each spoke site SP on-site 2 days/week	SP travels to spoke sites (approx. 4 h return drive) SP travels to spoke sites (approx. 10 h return drive)
5	1	160	On-site 2 days/week	Patient travels in ambulance to SP at hub site (approx. 3½ h return travel)

SP = speech pathology.

### Telepractice service implementation

Telepractice services were established by facility staff, supported by a project officer who was a speech pathologist with expertise in telepractice and dysphagia service models, and guided by a service implementation framework.<sup>19</sup> Staff accessed online training (e.g. written matter, instructional videos) and resources (e.g. service forms) developed by study authors (CB and EW) via the health service's intranet. Managers ( $n=5$ ) used the training/resources developed for managers to establish the telepractice service. Speech pathologists ( $n=8$ ) completed clinician training, and the HSW ( $n=11$  allied health assistants;  $n=6$  nursing staff) completed the HSW training programme. Following online training, the T-SP and HSW staff completed 2–3 practical training sessions lead by the project officer. Sessions involved training in telepractice technology and troubleshooting, modification of camera views and patient positioning, and conducting swallowing assessment tasks utilising patient simulation incorporating a mock emergency procedure. Staff attainment of required knowledge/skills prior to commencing the service was determined by the project officer.

Patients were referred from medical or nursing staff at the spoke facility to the hub T-SP for assessment of their swallowing function. All patient referrals were reviewed by the T-SP to confirm appropriateness for assessment and plan food/fluid consistencies to be trialled. Telepractice appointments were conducted at a mutually convenient time using hardware videoconferencing supported by the health service's telepractice network with configured lapel microphone and dual layout at both ends using IP and bandwidth of >385 kbit/s. Assessments were conducted as per the published protocol.<sup>10,12</sup>

### Telepractice service evaluation

Data was collected for the first 50 sessions completed across all services. From each telepractice session data included patient demographics; reason for referral; number of days from referral to telepractice assessment, as well as an estimate of days from referral to assessment if standard care processes (Table 1) had been applied; and the number, duration, and outcome of telepractice appointments. After each appointment, patients and T-SPs completed a clinician satisfaction questionnaire<sup>12</sup> or patient satisfaction questionnaire.<sup>14</sup> Both were rated using a 5-point scale (1 = strongly disagree, 5 = strongly agree). Any technical issues were recorded by the T-SP after each session.

To calculate costs, the telepractice service activity was compared to a modelled standard care service. Cost analysis was undertaken from a healthcare

perspective (i.e. staff wages). A mean total cost per session was computed based on travel costs plus time in wages of all staff involved. Service activity was costed in Australian dollars including overheads at a clinician rate of \$52.30–\$64.80/h, an allied health assistant rate of \$34.80–\$36/h, and a nursing rate of \$55.80/hour. Clinician travel costs for services 1–4 were distance calculated from facility to facility postcode using return car travel multiplied by a cost per kilometre of \$0.66.<sup>20</sup> The travel cost for Service 5 was \$604 incorporating ambulance transport and nursing staff escort. The monthly telepractice system levy was not included as it was an existing cost paid per facility.

## Results

### Service outcomes

The first 50 assessments involved 46 unique patients. Patients were 23 males and 23 females, mean age 81.65 years (range 39–102 years). The majority of referrals were for inpatients at spoke sites (92%), with most patients (74%) referred due to reported or suspected difficulty swallowing food and fluids (13% referred for safety to upgrade current food/fluids). Sites completed between 2 and 27 assessments during the study period (highest was Service 3 with 7 spoke sites) (Table 2).

The difference in number of days from referral to swallow assessment via telepractice ( $m=2.01$  days;  $SD=2.12$ ) compared to standard care procedures ( $m=4.08$  days;  $SD=4.27$ ) was 2 days ( $t=3.080$ ,  $p=0.002$ ). Post assessment, the majority of patients (64%) required a change to diet and/or fluid consistency, with almost equal numbers requiring either upgrade ( $n=16$ ) or downgrade ( $n=14$ ) of diet/fluids. Almost half (42%) were able to be discharged after a single assessment, with 42% scheduled for a review assessment at next scheduled spoke site visit, while 16% were referred for review assessment via telepractice (Table 3).

Average appointment duration was 45 min. Clinicians reported only minor technical or equipment issues including height of camera positioning, connection of lapel microphone, image pixilation with movement, and inconsistent sound quality. However no session was cancelled due to technical issues. Only one session was discontinued when the patient became too unwell to proceed. Clinicians reported that patients with visual, hearing, and cognitive issues (i.e. confusion) ( $n=21$ ) and those sessions conducted at the patient's bedside ( $n=5$ ) required additional support from the HSW to ensure the session ran smoothly. Some operational issues ( $n=5$ ) were reported including delays in appointment scheduling due to staff leave,

**Table 2.** Telepractice service sessions.

Service hub site no.	No. referrals	No. telepractice sessions completed	No. telepractice sessions incomplete	Average days wait from referral to assessment	
				Standard* care	Telepractice care
1	12	11	1	2.00	1.00
2	3	3	0	3.33	0
3	27	27	0	3.44	2.85
4	2	2	0	13	2.5
5	6	6	0	9.78	1.72
Total	50	49	1	4.08	2.01

\*Time from date referral received to when clinician was able to schedule face-to-face assessment.

**Table 3.** Telepractice session outcomes.

Service hub site no.	Clinical management post session		Follow-up post session		
	Change diet/fluids	No change diet/fluids	Discharge from service	Review at next site visit	Review via telepractice
1	10	2	10	1	1
2	3	0	1	2	0
3	15	12	9	13	5
4	1	1	1	1	0
5	3	3	0	4	2
Total	32	18	21	21	8

**Table 4.** Healthcare cost comparison per service (in Australian dollars).

Service hub site no.	Standard care service Mean total cost (range)	Telepractice care service Mean total cost (range)	Total mean cost saving
1	206 (191–223)	56 (42–84)	150
2	176 (165–181)	91 (74–99)	85
3	228 (52–478)	62 (14–87)	166
4	1117 (1125–1108)	136 (121–151)	981
5	500 (148–701)	104 (76–151)	396
Total	288 (52–1125)	70 (14–151)	218

Standard care costs include speech pathologists' wages and travel time; telepractice care costs include telepractice speech pathologist wages and healthcare support worker wages.

incomplete referral documentation, and delays in commencing the appointment due to patient transit/equipment set-up.

### Cost analysis

Cost analysis revealed the average mean total cost of a telepractice session was \$70, compared with \$288 for a standard care session. A mean cost saving of between \$85 and \$981 was achieved depending on site (Table 4). Greatest benefit was achieved by Service 4, which had the greatest distance between facilities. The smallest

benefit was realised by Service 2 due to shorter distance between sites. Separate costing for staff training for the telepractice service was calculated using an hourly wage rate for 3 h of training per staff member. Using this calculation, the average training cost for a T-SP was \$122 and HSW was \$74.

### Consumer satisfaction

Some patients were unable to complete the satisfaction survey due to reduced capacity therefore data is presented for 44 patient sessions (Table 5). High levels of

**Table 5.** Clinician and patient satisfaction with telepractice sessions.

Question	Strongly disagree % (n)	Disagree % (n)	Unsure % (n)	Agree % (n)	Strongly agree % (n)
Clinician (n = 50)					
I was happy with the rapport between the T-SP and patient	0	8 (4)	4 (2)	46 (23)	42 (21)
I was happy with the rapport between the T-SP and HSW	0	0	2 (1)	24 (12)	74 (37)
The telepractice system was easy to use	0	4 (2)	4 (2)	46 (23)	46 (23)
The audio quality of the system was adequate	0	2 (1)	2 (1)	36 (18)	60 (30)
The visual quality of the system was adequate	0	4 (2)	6 (3)	46 (23)	44 (22)
I believe that I was able to assess this patient and their swallowing via telepractice	2 (1)*	0	6 (3)	42 (21)	50 (25)
Patient (n = 44)					
I was satisfied with the telepractice assessment	0	0	0	48 (21)	52 (23)
I would be happy to undergo an assessment of my swallowing in the future via telepractice	0	0	9 (4)	48 (21)	43 (19)

T-SP = telepractice speech pathologist; HSW = healthcare support worker; \* = this assessment was ceased due to patient illness unrelated to the assessment.

satisfaction were reported overall. All patients reported they were happy with the telepractice assessment and most were happy to undergo an assessment in the future. Similarly, clinicians were happy with the rapport established between session participants, the technical system elements, and despite the minor issues previously mentioned, believed they were able to adequately assess the patient's swallowing function via telepractice (Table 5).

## Discussion

This study has reported on the successful implementation of telepractice dysphagia assessment services across 18 facilities within a large public health service. Utilising a validated clinical assessment model, service establishment was optimised by specifically designed online implementation and staff training resources. Results demonstrated a reduction in patient waiting times, with service and cost benefits compared to standard care, along with high patient and clinician satisfaction.

Previous research has demonstrated that using telepractice to improve patient access to dysphagia intervention enhances outcomes.<sup>21–23</sup> This study contributes to this evidence. Through reducing patients' average waiting time by half, patients were seen more efficiently than in the standard care model. Assessments also optimised care for 64% of the cohort who required change to their diet and/or fluids post assessment. Half of this group demonstrated swallowing deterioration, requiring diet/fluid modification to limit aspiration risk. The other half were safe for their diet/fluids to progress towards a normal texture. Overall this new service has enabled patients to receive timely dysphagia assessment

and management to optimise recovery, potentially helping to minimise associated health complications of aspiration.

Eliminating clinician travel also provides service efficiencies and enhances staff wellbeing. This study's results are consistent with other published research confirming significant time-savings when using a telepractice model in comparison to standard care.<sup>23–24</sup> In addition, this telepractice service supported continuity of care by eliminating the need for clinicians to reschedule existing appointments when attending the patient's facility for an urgent assessment. This outcome has supported speech pathology services to meet patient needs and local health service demands, while achieving cost savings. The telepractice service also supported enhanced occupational workplace safety for clinicians. Through providing a safe, valid and immediate mode of assessment, there was reduced clinician stress created by either having to delay assessments, or manage urgent patient issues over the phone without visualisation of the patient. It also can reduce the risk to personal safety incurred by driving long-distances to rural and remote locations.

The high patient and clinician satisfaction reported is consistent with other studies examining speech pathology telepractice services.<sup>14,21–23</sup> Key elements contributing to this positive outcome was the use of a validated protocol, and the role of the trained HSW, who was required to support over half of the patients referred who presented with hearing, visual or cognitive difficulties. Comprehensive online and practical training facilitated by the project officer ensured that both the T-SP and HSW were skilled to meet the patients' needs and manage basic technical and operational issues to ensure the telepractice sessions ran smoothly.



An acknowledged limitation is that not all sites had equal opportunity to implement the service due to variable referral rates. Participating sites were also self-selected, and potentially more committed to achieving successful implementation. Qualitative interviews with staff would provide further insights into implementation barriers and successes.

## Conclusion

This study reports on the successful implementation of a telepractice model for clinical swallowing assessment. The model enhanced service efficiencies through reduced patient waiting times, time savings for clinicians through reduced travel, was well received by patients and clinicians, and had direct cost benefits for the health services.

## Acknowledgements

We would like to thank the study participants, the participating hospital and health services, Dr Sanjeewa Kularatna for assistance with the cost analysis, and the Queensland Health Telehealth Support Unit.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Funding for this study was received from the Allied Health Professions Office of Queensland: Collaborative Grant and HP Research Grant.

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