Title: A time and cost analysis of speech pathology paediatric feeding services delivered in-person versus via telepractice

Running head: Time and cost analysis of telepractice vs. in-person feeding services

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Abstract

Introduction: Telepractice models of care have the potential to reduce the time and financial burdens that consumers may experience accessing healthcare services. The current study aimed to conduct a time and financial cost analysis of paediatric feeding appointments accessed via telepractice (using videoconferencing) compared to an in-person model.

Methods: Parents of 44 children with paediatric feeding disorders (PFDs) residing in a metropolitan area completed 3 questionnaires relating to (1) Demographics, (2) Time and Cost for In-Person care, and (3) Time and Cost for Telepractice. Both cost questionnaires collected data required for direct and indirect costs comparisons (e.g., out-of-pocket costs associated with the appointment (direct), time away from usual duties (indirect)). Average number of services accessed by each participant, and PFD appointments conducted annually by the service, were collected from service statistics. Analysis involved cost minimisation and cost modelling from a societal perspective.

Results: The telepractice appointment resulted in significant time ($p=0.007$) and cost (\$95.09 Australian dollars per appointment, $SD=\$64.47$, $p<0.0001$) savings per family. The health service cost was equivalent for both models (\$58.25). Cost modelling identified cost savings of up to \$475.45 per family if 50% of appointments in a 10-session block were converted to telepractice. Potential cost savings of \$68,750.07 per annum to society could be realised if 50% of feeding appointments within the service were provided via telepractice.

Conclusion: The telepractice model offered both time and cost benefits. Future service re-design incorporating hybrid services (in-person and telepractice) will help optimise benefits and minimise burden for families accessing services for PFDs.

Introduction

Timely access to feeding services is crucial for children with paediatric feeding disorders (PFDs) ^{1,2}. It is acknowledged that there are multiple factors that create barriers to accessing care, including significant time and financial costs related to distance and travel ³⁻⁶, service availability ⁵⁻⁸ and availability of clinicians with confidence and experience assessing and treating PFDs ^{3,9-12}. Telepractice has been suggested as one potential service delivery model to help mitigate such issues and improve access to paediatric feeding services ^{6,13,14}.

Several studies have examined paediatric feeding services delivered via telepractice, ^{13,15-21} finding services conducted via telepractice to be feasible ¹⁵⁻²², reliable ^{13,21} and acceptable to families ^{19,21,22}. However, to date, there has been limited investigation of the time and costs associated with accessing paediatric feeding services via telepractice. Only two studies have provided preliminary information regarding time and cost requirements ^{15,19}. Both studies were American based, therefore limiting their ability to be applied to the Australian context where the respective health systems are substantially different. Clawson et al. ¹⁹ reported family travel time was decreased when utilising a shared-care telepractice model that linked a specialist metropolitan feeding service with the child's local feeding team. Results of their pilot study reported average savings of \$899 USD and 1.5 days reduced travel time per family per appointment ¹⁹. More recently Clark et al. ¹⁵ estimated fuel cost savings of \$375 (USD) per family during a 10-session telepractice intervention block due to avoided travel between their home and the paediatric feeding service.

Whilst these studies have identified promising time and cost savings, both studies have methodological limitations and a prospective direct comparison between in-person and telepractice feeding services has yet to be described. Consequently, the primary aim of this study was to conduct a cost analysis of service and consumer costs (time and financial) associated with accessing speech pathology paediatric feeding services via telepractice

compared to in-person. It was hypothesised that the telepractice model of care, which in this study involved videoconferencing between the speech pathologist and the parent/child, would result in significant time and financial savings for families.

Methods

This study involved cost minimisation analysis and cost modelling comparing in-person versus telepractice paediatric feeding appointments, with all cost data reported in Australian dollars (AUD). Data reported in this study was collected as part of a larger study conducted in February – July 2019 which investigated the reliability of a) bottle-feeding assessments via telepractice and b) cup and solid feeding assessments via telepractice. The methods of the cup and solid feeding study are detailed further elsewhere and found comparable outcomes between the two assessment conditions ²¹. The bottle-feeding manuscript is in preparation for publication. However, in brief, for both these investigations children and parents who were known to the health service, though may have been new referrals for paediatric feeding disorder (PFD) management, participated in a single videoconferencing telepractice feeding appointment within their home. For the purposes of the current study, information was collected regarding the time and costs associated with both telepractice and in-person sessions, as well as the service access activity of these participants. The study was conducted with ethical clearance from the Human Research Ethics Committees of both [name withheld] (HREC/17/QRCH/276) and [name withheld] (2018001338).

Participants

Participants were parents of infants and children with PFDs from an outpatient feeding service at the [name withheld] in [withheld], Australia. To be eligible to participate in the larger study, parents were required to care for a child ≤ 10 years of age who was referred to speech pathology for a feeding appointment, have English language proficiency sufficient

to complete study tasks without use of an interpreter, have internet access within the family home, and reside within a 40km radius of the hospital. The 40km radius restriction was a requirement of the design of the larger study, to enable the in-person clinician to travel to the family home. However, for the context of this paper this distance restriction also ensured the sample represented a model of local service access costs, and ensured data was not biased by high costs incurred by patients attending from regional, rural or interstate areas.

Data collection methods

Demographics/ Service Statistics

Parent demographic information was collected as part of the larger study, using an 11-item purpose built multiple-choice questionnaire modified from a previous study²³. From this, three questions (parent age, relationship status and highest level of education) are reported within this paper. Additional participant information including postcode, child age and number of feeding appointments attended between February – July 2019 were collected from the electronic medical records. Data on the total number of paediatric feeding appointments provided by the health service during the 2018-19 financial year was compiled from the hospital's electronic scheduling management system.

Time and cost data

Consumer time and cost data was collected using two questionnaires - (1) Time and Cost for In-Person care and (2) Time and Cost for Telepractice care. Questionnaires were completed by participants as a paper-based form or online (via SurveyMonkey™) as per parent preference. The in-person questionnaire was completed prior to the telepractice appointment and required parents to report the usual time and cost associated with accessing their child's in-person feeding appointments or general hospital appointments (if they had not

previously attended a feeding appointment). The telepractice questionnaire was completed after the telepractice appointment and reflected time/costs incurred from that single appointment.

Both questionnaires were modified from a previous study ²⁴ and included questions that enabled the calculation of time as well as direct and indirect costs. Direct costs were classified as out-of-pocket costs to the family. Questions pertaining to direct costs included the cost of meals/snacks, accommodation, parking and any other out-of-pocket expenses (e.g., road toll). In addition to the direct costs reported specifically by the parent, other direct costs (travel and internet data) were calculated based on demographic data. Travel costs were calculated by multiplying the return distance traveled from the patient's postcode to the [name withheld] by cost per kilometre (\$0.68) as per the Australian Taxation Office ²⁵. Data usage (approximately 520 megabits for the 60-minute appointment) was calculated at \$5.50 per appointment based on 2018 Australian median data costs ²⁶. The cost of telepractice equipment was not calculated as parent/s utilised their existing personal device.

Indirect costs were calculated using a human capital approach ²⁷ and represent lost productivity of the parent as a consequence of attending the feeding appointment. Questions in the surveys pertaining to indirect costs included time away from usual duties to attend the appointment, attendance of a second person (if applicable) and the need to organise care for other children. To calculate the cost associated with time away from usual duties the productive hours lost were calculated as a percentage of total full-time working hours (7.6 per day) for the average reported time away from usual activities. An hourly wage rate of \$41.63 in Queensland ²⁸ was then multiplied by the lost hours for those in paid employment, or as time lost (valued at \$6.93²⁹) for parents who were not in paid employment. Additional factors such as the cost of attendance of the second person and care for other children are acknowledged as additional indirect costs, however these could not be included in the

indirect cost calculations as insufficient information regarding the second person or out-of-pocket costs for additional childcare was collected. To ensure they were still considered in the overall analysis, these data were analysed separately.

Service Costs

Data pertaining to service costs were collected by the research team based on the health service resources required to conduct the appointment (1 speech pathologist for 60 minutes for both the in-person and telepractice appointments). The clinician who was in attendance in the family home for data collection for the purpose of the larger study would not be involved in the usual telepractice model. Therefore, their involvement was not included in the current cost analysis. Service costs were calculated as the hourly wage without on-costs (standardised to 2018 values) for a non-casual senior health practitioner (HP4.4) in Queensland Health (\$58.25) for the duration of the appointment. The wage was the same between the in-person and telepractice conditions. The cost for the telepractice equipment used by the speech pathologist was not included within this study as existing consumer grade videoconferencing equipment was used, and this, along with the telepractice network was supplied and managed by the health department at no additional cost/levy.

Analysis

Descriptive statistics were used to analyse demographic information and relevant questionnaire data (e.g., care for other children). Categorical data (e.g., attendance of a second person) from the in-person questionnaire (reported by the parent as no/occasionally/sometimes/always) was collapsed into two categories (yes/no).

Cost Minimisation

Cost minimisation analysis from the societal perspective was conducted and interpreted as cost-savings (i.e., how much money is saved if the traditional in-person appointment is replaced with a telepractice appointment). Chi-square (for categorical data) and paired t-tests (for continuous variables) were used to compare outcomes from the two models. Significance was set at $p < 0.05$.

Cost modelling

Cost modelling was completed on the assumption that 50% of the total number of appointments would be replaced with telepractice appointments (i.e., 50% in-person, 50% via telepractice) as supported by previous research identifying parent preference for a hybrid model of service delivery (i.e., combination of in-person and telepractice appointments) ²¹. Two calculations were completed applying this 50% hybrid model. The first calculation used data regarding the total number of feeding appointments each participant attended (from the electronic medical records) to model potential cost savings to families if 50% of a short block of appointments was conducted via telepractice. The second calculation used the 2018-2019 financial year health service appointment data (from the electronic scheduling management system) to calculate potential cost savings to society if 50% of appointments were offered via telepractice.

Results

Although 55 families participated in the larger study, 9 participants had incomplete questionnaire data (e.g., completed in-person questionnaire but did not complete telepractice questionnaire). Therefore, only the 44 participants with complete data sets were included in the current study ($N = 44$).

Demographics

Participant demographics are outlined in Table 1. The majority of parents had a partner, had completed high school and described their main daily role as unpaid duties. The majority of children within the study (82%) were under 2 years of age.

[Insert Table 1 near here]

Time and cost data

Time associated with respondent attending appointments

Descriptive statistics revealed that attending an in-person feeding appointment took at least half a day for the majority (77%) of parents, compared to 1-2 hours for most (84%) to attend the telepractice appointment (Figure 1). This resulted in statistically significant time savings ($p = 0.007$) for parents. As participants were not asked to provide information about reason/s for time away from usual duties to attend their child's appointment it was unable to be determined why some parents required a full day away from usual activities for their child's telepractice appointment. Further analysis of this subgroup identified that only 2/7 respondents took time away from paid employment to attend the telepractice appointment.

[Insert Figure 1 near here]

Cost associated with respondent attending appointments

The telepractice model of care was associated with significant cost savings of \$95.09 per appointment ($p = 0.0001$) which was contributed to by a significant ($p = 0.001$) reduction in both direct and indirect costs (Table 2) when compared to in-person care. There were no direct costs reported for the telepractice appointment other than \$5.50 for internet data. The indirect costs (due to lost productivity) for each appointment were calculated using the most commonly reported time (duration) away from usual activities (categorical variable "half a

day” was converted to 3.8 hours for these calculations, and the categorical variable “1-2 hours” was converted to 1.5 hours) and are reported in Table 2. The telepractice appointment was not associated with a significant reduction in time off paid employment for parents (n =11 in-person vs n =7 telepractice, $p = 0.29$).

[Insert Table 2 near here]

Other factors associated with attending appointments

The telepractice appointment was not associated with a significant reduction in the need for a second person to attend the appointment (50% in-person vs. 34% telepractice, $p = 0.13$). Telepractice was associated with a significant reduction in the need to organise care for other children (25% in-person vs. 2% telepractice, $p = 0.002$). A detailed description of these factors (e.g., who provided care for other children) is detailed in Table 3.

[Insert Table 3]

Service costs

The service costs (\$58.25) were equivalent for both appointments as the clinician was allocated 60 minutes for both the in-person and telepractice appointments.

Cost modelling

Analysis of service use revealed children accessed up to 10 in-person feeding appointments within the 6-month data collection period. Therefore, potential cost savings would be \$475.45 per family if 50% of in-person appointments in a 10-session block were replaced with telepractice appointments. A total of 1,446 speech pathology paediatric feeding appointments were undertaken at the health service within the 2018-19 financial year.

Potential cost savings to society of \$68,750.07 per annum could therefore be realised if 50% of in-person speech pathology feeding appointments were replaced with telepractice appointments.

Discussion

Results from this study confirm that the telepractice appointment model was associated with significant time and cost savings for families compared to a traditional in-person appointment. Health service costs were equivalent for both models. These results, in combination with previous research reporting that feeding assessments conducted via telepractice are reliable and have high levels of parent satisfaction ²¹, support that telepractice is a viable clinical service model for delivering appointments for patients with PFDs. Given the burden that caring for a child with a feeding disorder can have on families ^{5,6,8} integration of a telepractice model within paediatric feeding services has the potential to enhance quality of life through reduced burden, inconvenience and costs associated with accessing necessary care ^{5,6,8}.

The time and cost savings identified within this study are consistent with previous research in paediatric feeding, ^{15,19} other areas of speech pathology practice, ^{24,30} as well as research into paediatric health services in general ³¹. However, it is likely that the cost savings discussed within this study would be greater if the time of caregivers who were not in the workforce were valued at a higher rate, or at a rate similar to those in paid employment. Hence, the cost savings reported here represent a lower bound estimate of the potential cost gains from telepractice. Additionally, as the current study methodology limited participants to those living within a 40km radius of the service, it is also acknowledged that the estimated time and cost savings realised by the telepractice service in this study are likely an under-representation of benefits for families living at greater distances from the feeding service or

in non-metropolitan areas⁶. Regardless, our results confirm that even families who live in or close to metropolitan areas can experience significant time and cost savings when using a telepractice model.

Although parents reported that they needed to take time off work to attend the telepractice appointment, this is not an unexpected finding considering that the telepractice appointments, just like traditional in-person appointments, were only offered during standard work hours. Hence, taking time off from paid employment for families would be required regardless of the service model (telepractice or in-person) provided. To this end both in-person and telepractice services need to consider offering more flexible appointment timings (e.g., weekends, after hours) to help minimise the impacts to parental work commitments⁶. It is unknown though why some parents in the current study reported that they were required to take a full day away from their usual duties to attend their child's telepractice appointment. It is possible that structural factors related to employment (e.g., inability to access flexible working arrangements) may have contributed to this. However, at present this finding cannot be fully explained and requires further investigation.

Results from this study and others⁶ have demonstrated that other factors, such as organising care for other children, may contribute to the burden parents experience accessing feeding appointments. Whilst the telepractice model did not eliminate the need for a second person to attend the feeding appointment, the reason for the second person attending the in-person or telepractice appointment (e.g., to provide transport, to better understand the child's feeding needs) was not recorded. Consequently, it is difficult to determine the clinical implications of this and may in fact be due to parental preference rather than a necessity for the appointment. It is possible that the telepractice model may ultimately reduce the need for an additional person to attend the appointment, if the reason they were attending was simply to help provide transport or parental assistance (e.g., to care for other children). However,

equally a telepractice session at home may also encourage attendance of a second person to participate in the child's care. For example, the second parent/carer may be at home and able to attend the appointment to receive education and/or ask questions to better understand the child's feeding needs - which they may not have otherwise been able to do if the appointment was not conducted in the family home. Future research should focus on identifying and understanding the reason/s multiple people attend feeding appointments, to better understand how the telepractice service model could support these needs.

Integration of telepractice feeding services also has the potential to result in improved access to services, resulting in greater equity of access and improved service efficiencies. Consistent with Clawson et al.¹⁹ this may be achieved through shared care with telepractice support from a specialist feeding service for children with complex needs, or as reported by Burns et al.³⁰ it may be achieved through earlier access to services by reducing the need for clinician and/or patient travel. These benefits can also translate to improvements for the health service with reduced clinician travel leading to increased service capacity and improved access to workforce training and support. With prior research identifying that parents have indicated a preference for a hybrid model of care i.e., combining both telepractice and in-person appointments²¹, it is pertinent that clinicians and health services consider the individual needs of their clients and the preferences of the families they serve. True cost differences will be individual and dependent on the local health service model and how families choose to integrate telepractice appointments into their health care journey (e.g., infrequent telepractice vs. exclusively telepractice vs. alternating telepractice and in-person appointments).

Limitations

A limitation of this study was that it was completed within an Australian public healthcare model, where the service and equipment were funded by the State Government. Consequently, the service costs would not be representative of costs experienced by the private sector and/or other countries that utilise a fee-for-service model and/or where services need to purchase telepractice equipment. Additionally, the appointment costs were reported from parents' general experience with in-person services (i.e., not a single appointment) and the telepractice costs were only based on a single appointment. Therefore, there may be some variability in cost savings dependent on additional factors (e.g., appointment day, attendance of second person). Due to this limitation the exact cost of the attendance of a second person and/or organising care for other children was unable to be calculated and therefore has only been reported descriptively. As all participants within this study resided <40km from the speech pathology feeding service, the costs for families living in non-metropolitan areas are unknown, though can only be postulated to be higher than reported here.

Conclusions

This study confirmed that speech pathology appointments for children with PFDs conducted via telepractice can achieve significant time and cost savings (particularly on avoided transportation and parking costs) for families when compared to traditional in-person appointments with equivalent health service costs. These results continue to reinforce that the inclusion of telepractice as a service delivery model has the potential to lead to improved service equity and access for families, ultimately reducing the burden of care associated with accessing paediatric feeding services.

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Table 1.*Parent and child demographic information (N = 44)*

Characteristics	n (%)
<u>Parent age</u>	
18 – 25 years	4 (9)
26 – 34 years	23 (52)
35 – 44 years	15 (34)
Not specified	2 (5)
<u>Child age</u>	
1-5 months	14 (32)
6 – 12 months	11 (25)
13-23 months	11 (25)
2-4 years	7 (16)
5-7 years	1 (2)
<u>Parent relationship status</u>	
Single	2 (5)
Partnered	42 (95)
<u>Parent highest level of education</u>	
Grade 10 or below	3 (7)
High school	5 (11)
Certificate or diploma	20 (45)
Bachelor's degree	13 (30)
Master's degree	3 (7)
<u>Parent usual daily activity</u>	
Unpaid duties (e.g., childcare, housework)	32 (73)
Paid employment	12 (27)
<u>Family distance from hospital</u>	
<10km	9 (20)
10 – 19km	11 (25)
20 – 29km	10 (23)
30 – 40km	14 (32)
<u>Child's number of previous feeding appointments</u>	
0	16 (36)
1-2	11 (25)
3-7	13 (30)
8-10	4 (9)

Table 2.*Cost comparison (AUD) of in-person versus telepractice feeding appointment (N = 44)*

	\$ AUD (SD)		Cost saving	p
	In-person	Telepractice		
Parent direct cost	62.59 (29.08)	5.50	57.09	<0.001
Transportation	29.27	-		
Food and drinks	9.41	-		
Parking	18.58	-		
Internet data	-	5.50		
Other	4.85	-		
Parent indirect cost	62.60 (62.13)	24.60 (23.44)	37.69	<0.0001
Health service cost	58.25	58.25	0	#
Total cost of appointment	183.44	88.35	95.09	<0.0001

Note: “-” = nil applicable cost for this model, # = not calculated, bold = significant at $p < 0.05$.

Table 3.*Description of factors associated with attending feeding appointment (N = 44)*

	In-person n (%)	Telepractice n (%)
Type of leave taken from paid employment:		
Paid leave	2 (5)	1(2)
Leave without pay	7 (16)	4 (9)
Time off in lieu	1 (2)	0
No leave (self-employed)	4 (9)	2 (5)
Relationship of second person attending appointment:		
Partner	16 (36)	10 (22)
Relative	4 (9)	4 (9)
Nanny	1 (2)	1(2)
Not specified	1 (2)	0 (0)
Time off work for second person:		
Yes	14 (32)	5 (11)
No	8 (18)	10 (23)
Care for other children provided by:		
Unpaid relative/friend	4 (9)	1 (2)
Paid childcare	6 (14)	0
Partner	1(2)	0

Figure 1.

Parental time away from usual daily activity to attend 1 hour feeding appointment (N = 44)