

**Swallowing Assessment and Management
via
Telemedicine**

**Service Evaluation Report prepared for Blackpool
Teaching Hospitals NHS Foundation Trust
Speech and Language Therapy Department**

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1. Executive Summary

Background

Swallowing difficulties (dysphagia) are common following neurological insult or disease. It is acknowledged to precipitate aspiration pneumonia, malnutrition, poor rehabilitation, an increase length of hospital stay, and a reduction in quality of life. It is an independent predictor of poor patient outcome and death. Studies have demonstrated that patients who receive formal swallowing assessments and adequate fluid and nutrition have reduced risk of poor patient outcome. Prompt assessment can avoid deterioration in health and subsequent admission to hospital. However, assessment of swallowing by Speech and Language Therapists (SLT) may be delayed owing to capacity issues, work patterns and waiting lists. Furthermore, patients' swallowing difficulties may go unrecognised by community carers. By the time a patient is admitted to hospital, their swallowing difficulties are more severe and may now precipitate: a decrease in their levels of alertness; an increase in their confusional state; a requirement of alternative feeding; development of a chest infection and some patients may become medically unfit to travel to the acute care setting. This is poor quality of care for the patient and inefficient use of limited NHS resources.

It has been demonstrated in Australia that the use of Telemedicine, with specific system modifications to accommodate Teleswallowing and a carer or health care professional at the patient end, allows for comparable clinical accuracy to that of a speech and language therapy clinical bedside assessment in patients with mild to moderated cognitive impairment (Ward et al., 2012). It is also used on a practical day-to-day level in Vancouver, where geographical distances necessitate innovative, practical health care solutions. Teleswallowing has demonstrated: decreased patient transport usage; reduced specialist travel time; increased and easier access to clinical expertise with more timely assessment, advice and intervention; improved quality of care achieved by more rapid assessment time and no requirement to travel; better decision-making through peer-to-peer discussions and improved community skills and knowledge through on-site education and training.

Aim

Blackpool Teaching Hospitals NHS Foundation Trust SLT team wanted to deliver an improved response time to referrals without incurring extra costs in staffing, with an improvement in the quality of healthcare service currently delivered, that was acceptable to patients, nursing homes and therapy staff despite the exponential increase in demand on the service. This unique service development was supported by the North West IT Innovations Programme award scheme.

Results

The diagnostic accuracy of the system (100% inter-rater reliability for fluid and diet modification) has been demonstrated with concomitant increased awareness of swallowing difficulties by staff within the nursing homes and an increase in response time from referral to assessment. Qualitative analysis demonstrated both patient and therapist acceptability in use of the equipment and ability to establish rapport. This programme of work has demonstrated a reduction in time taken to undertake a swallowing assessment from ninety minutes for a home visit to thirty minutes for a Teleswallow assessment, thereby improving productivity and releasing capacity to address waiting lists and other staffing pressures. As a result of the Teleswallowing system, none of the patients involved in the pilot were admitted to hospital nor required a home visit. The comparative costs (average SLT assessment, travel and location costs only) of i) admission to the acute sector, ii) domiciliary visits and iii) remote assessment and management via Teleswallowing for a single individual are evidenced in the following table.

Table 1: Costs of different service delivery models (one patient).

	Admission to acute sector	Home visit by SLT	Teleswallowing
Therapist specialist assessment cost @ £31.82 per hour	£31.82 (1 hour)	£47.73 (1.5 hours)	£15.91 (30 mins)
Average of two further review appointments @ £31.82 per hour	£63.64 (2 hours)	£95.46 (3 hours)	£31.82 (60 mins)
Average Travel Time @ £31.82 per hour	n/a	£63.64 (3 x 40 minutes)	n/a
Transport (return journey)	£422.54 (ambulance)	£26.13 (3 x 13 miles @ 67p per mile)	n/a
Location Cost @ £223.98 medical ward per day	£2748.23 (average 12.27 days)	n/a	n/a
Total	£3,266.23	£232.96	£47.73

Using Trust data, the potential annual relative costs of the different service delivery models are reported in the table below.

Table 2: Annual relative costs of current service delivery models compared to Teleswallowing Service Delivery Model and subsequent cost efficiencies.

Assessment and 2 reviews 2013-14	Current Service Delivery Models	Teleswallowing Service Delivery Model	Teleswallowing Cost Efficiency
240 admissions to acute sector for eating and drinking difficulties	£783,895.20	£11,455.20	£772,440.00
456 Domiciliary Service referrals	£106,229.76	£21,764.88	£84,464.88
Total	£890,124.96	£33,220.08	£856,904.88

NB: the 456 domiciliary referrals include all domiciliary referrals irrespective of diagnosis as it was not possible to extract dysphagia referrals from the system

Recommendations

The Blackpool Speech and Language Therapy Department has demonstrated by their programme of work that Teleswallowing can be delivered to all patients regardless of cognitive state in a UK setting and by NHS therapists.

1. Teleswallowing as an Augmentative Service Delivery Model

Teleswallowing can be regarded as an augmentative service delivery model that facilitates the development of clinical skills, reduces waiting times, improves the quality of care offered and makes substantial cost efficiencies.

2. Extending Teleswallowing within the local healthcare economy

Following the initial positive findings, this pilot study should be upscaled to test out this model of service delivery with a greater number of patients in similar settings. Further funding or funding reallocation to extend software licence agreements is requisite to continue the current service and allow for expansion of the Teleswallowing service delivery model to other establishments. NHS Broadband internet connection with embedded security to comply with information governance requirements is freely available for Lancashire and Cumbria. This may be accessed by discussion with North West Shared Infrastructure Service.

Teleswallowing training for new staff would be requisite. Training would also need to be available to nursing homes already using the Teleswallowing service delivery model to accommodate staff turnover. Teleswallowing training could be delivered by specialist training programmes or e-training that potentially allows for departmental income generation. Whilst it is recommended that the theoretical component is delivered and managed by dysphagia specialists, maintaining competence could be achieved by establishing Teleswallowing link nurses that cascade the practical training element to others within the home. This could then link to national standards of care that could also be written as a further extension of this project (see final recommendation: National Engagement).

3. Engagement of the Telehealth concept with the wider healthcare community

It may be beneficial to extend this project design to the wider healthcare community within the Fylde Coast NHS locality, utilising the skills of the SLT Project Manager to advise further interdisciplinary teams within the Trust to benefit patient care.

4. Professional Engagement Further consultation with the Royal College of Speech and Language Therapists should be pursued in order to disseminate the results of this seminal service delivery model at a national level and share the knowledge and skills throughout the UK healthcare setting.

5. National Engagement

Clinical competencies (underpinning knowledge and practical skills) required to undertake a Teleswallowing service delivery model should be identified to inform the development of National Occupational Standards (Skills for Health at the Department of Health). This would embed this enhanced service delivery model into the national conscience.

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Finally...

Veronica Southern, Principal Speech and Language Therapist at Blackpool Teaching Hospitals NHS Hospitals Foundation Trust, whose vision, leadership, project management skills and enthusiasm have been integral to the success of this project.

3. Background

3.1 Global and National perspective

The global population is exponentially increasing, with an increase in healthcare need. In the UK, an increasing gerontocracy with concomitant increase in health care needs is challenging the current resources of the National Health Service. However, there is a requirement to deliver an improved quality health care via innovative service delivery whilst improving productivity and delivering cost efficiency savings¹.

The Quality, Innovation, Productivity and Prevention (QIPP) programme outlines a general UK policy agenda that requires local commissioners and providers to identify and implement specific NHS improvements². In order to support local implementation strategies, the National Institute for Health and Clinical Excellence (NICE), NHS Evidence and the Information Centre for Health and Social Care have all published guidelines regarding innovative use of limited resources³. NHS commissioners and providers need to continually aspire to the QIPP vision of innovative quality health care routed in streamlined infrastructure and a trained workforce that are fit for purpose in the delivery of evidence based practice to improve stakeholder satisfaction, improve the patient experience and outcomes at a reduced cost.

3.2 Local context

Blackpool Teaching Hospitals NHS Foundation Trust serves a population of approximately 440,000 residents across Blackpool, Fylde, Wyre and North Lancashire and 12 million visitors to the area annually. The Trust comprises Blackpool Victoria Hospital which is a large busy acute hospital and two smaller community hospitals, Clifton Hospital and Fleetwood Hospital. The Trust is also responsible for the provision of Adult Community services to a large geographical area, extending from Lytham St Annes in the South as far North as Forton. The preponderance of elderly population within the area places a significant health care burden on the Trust, requiring specialist teams with the right skill mix to meet the complex demands of this group.

The Trust employ more than 6,000 staff serving 830 beds across all sites and more than 56,000 day-case and inpatients, 250,000 outpatients and over 91,000 Accident and Emergency patients every year.

3.3 Current Speech and Language Therapy Service Provision

The Speech and Language Therapy Department, in addition to its Communication Service, provides a Swallowing Assessment and Management Service to the acute care setting and provide outreach to the primary care setting i.e. patients residing in the Fylde Coast community.

Access to Speech and Language Therapy Services for swallowing assessment from patients in the community is via i) GP referral; ii) Allied Health Professional referral; iii) follow up from acute care discharge and iv) open referral from community users. Patient demographics are logged into the SLT data base waiting list and are triaged by SLTs. The allocated therapist will contact nursing homes by telephone and will either arrange a home visit or, in urgent cases, will give direct advice (without observing the patient) based on the information given by the carers. The waiting time is dependent upon demand, staff resources and clinical priorities. Alternatively, patients who experience difficulty eating or drinking or subsequent aspiration pneumonia are admitted to hospital via the GP, rapid assessment unit, the emergency department or the medical assessment unit.

3.4 Inability to meet future caseload

An expected exponential increase in the geriatric population in the future, with an inevitable realisation of an increase in health care requires a different approach. For the last three years, the SLT Team at Blackpool Teaching Hospitals NHS Foundation Trust has been rolling out an innovative programme of computer therapy to the post-stroke aphasic population (patients who have communication difficulties post stroke). This has been led by their Clinical Leader (the Project Leader for this study). This augmentative service delivery has enabled them to adhere, where possible, to the NICE Quality Standard which states that patients with ongoing treatment goals should, where appropriate, have access to therapy for 45 minutes each day for a minimum of five days a week⁴.

The Speech and Language Therapy Department has already introduced an initiative to provide traditional Speech and Language Therapy with computer therapy as a service delivery model. It is able to provide intensive communication therapy to patients in the acute stages of stroke both on an individual and group basis. Using specialist software, SLTs are able to log the progress of the patients and update therapy programmes remotely. This work has allowed for: enhanced therapy experience for patients; optimised skill-mix of the therapy team and demonstrable value-for-money. The success of this service prompted the Clinical Leader to extend her vision of an agile, responsive communication rehabilitation service to include a telehealth service with modifications to remotely

access patients who presented with swallowing difficulties to see if this approach could yield similar benefits in this context.

3.5 Vision of service delivery innovation

The Speech and Language Therapy Department Project Manager believes it would be beneficial to expand the programme to include the dysphagic population (patients who have difficulties swallowing). She, and her SLT Dysphagia Specialist colleagues, would like to address the difficulties of patients with dysphagia in nursing homes so they have better and faster access to swallowing assessments and advice when problems occur. Currently, if a nursing home contacts the SLT Department with an urgent problem, the SLT would hold a telephone consultation and then have to make a personal visit at some point. On a daily basis, SLTs are occupied with scheduled out patient and in patient work and the service does not currently have the capacity to easily respond to urgent situations – especially as they operate across a large geographical area. Potentially, this can result in a patient being brought back into hospital. The Team is ready to think about a new model of service delivery that will harness the power of technology.

3.6 Swallowing difficulties

Swallowing difficulties are common following neurological insult or disease e.g. stroke⁵ and may precipitate aspiration pneumonia, malnutrition, poor rehabilitation, an increased length of hospital stay and a reduction in quality of life. It is an independent predictor of poor patient outcome and death⁶. Early identification, assessment and management of dysphagia has demonstrated documented improvements in patient outcomes⁷. Such benefits have raised the issue of dysphagia intervention to national consciousness. National Clinical Guidelines for good practice support early identification, assessment and prompt management of dysphagia in order to facilitate better patient outcomes, reduce mortality rates and long-term costs (ICSWP, 2012⁸; NICE: Swallowing screening and nutrition management⁹; CG42 Dementia, 2006¹⁰).

Assessment of swallowing by Speech and Language Therapy Services requires either admission to an acute or peripheral hospital out patient facility or organisation of community visits which may precipitate a delay. Delays in assessment and management may increase an individual's risk of aspiration and poor medical state. Furthermore, patients' swallowing difficulties may go unrecognised by community carers so that by the time a patient is admitted to hospital, their swallowing difficulties may now precipitate: a decrease in their levels of alertness; an increase in

their confusional state; a requirement of alternative feeding; development of a chest infection and some patients may become medically unfit to travel to the acute care setting.

3.7 Royal College of Speech and Language Therapy guidelines

Royal College of Speech and Language Therapy guidelines challenge SLTs to provide timely and responsive assessment for people with swallowing difficulties in both the acute and community setting in order to avoid deterioration in the person's medical state. Delays in assessment and management may be detrimental to patients' medical status.

3.8 Teleswallowing

Teleswallowing requires modification to telemedicine equipment to allow for remote assessment and management of swallowing difficulties by directing the carer or healthcare professional. This system's process modification may remove delays in assessment without compromising diagnostic accuracy.

Telehealth has been endorsed by the American Speech Language Hearing Association (ASHA) as an appropriate and suitable service delivery for SLT provided that they are of the same quality as those delivered face by face¹¹. Recognising that resources are increasingly limited, Australian researchers have developed a Teleswallowing programme with inter-rater reliability which is managed by a SLT. Whilst the validity of telemedicine has been documented in patients with dysphagia who have mild to moderate cognitive impairment¹², there is a paucity of literature regarding its use in patients with dysphagia who present with a severe or variable cognitive function. Similarly it is not known if Teleswallowing can be delivered by NHS therapists in a UK setting as high quality, multi-site evidence is not currently available. Therefore it is necessary to ensure Teleswallowing is feasible to be delivered by NHS clinicians before undertaking a lengthy and expensive evaluation.

This pilot project aims to examine the diagnostic accuracy of a Teleswallowing programme for all patients regardless of medical condition or cognitive function. The Teleswallowing programme would not replace the ability to access an SLT where necessary but would aim to offer a potentially viable augmentative system and service delivery to patients in order to offer equal access whilst ensuring maximum flexibility in service delivery options.

The Team is aiming to ensure maximum flexibility in their service delivery options and allow for the development of new, remote care pathways for different clinical conditions and situations.

4. Development and pilot of remote assessment and intervention service delivery

4.1 North West NHS IT Innovation Programme Award

A successful bid to the North West NHS IT Innovation Programme, supported the service delivery project.

4.2 Aim of service delivery innovation

The SLT team aimed to pilot an augmentative service delivery programme, commensurate with the Quality, Innovation, Productivity and Prevention Programme agenda. It aimed to demonstrate a potential:

1. reduction in hospital admissions and readmissions
2. reduction in SLT travel times to nursing homes a distance away
3. improved nursing home patient health and reduced health inequalities
4. improved patient dignity and reduction in distress
5. continuity of care between nursing homes and SLT Department - bringing education, competence and increased confidence to local providers

4.3 Programme of work

Identification of Stakeholders

- (i) IT Department
- (ii) SLT Project Manager and senior therapists with experience in the assessment and management of patients with a range of medical diagnosis, cognitive and swallowing difficulties
- (iii) The Speech and Language Therapy extended team
- (iv) Nursing home managers
- (v) Nursing home senior staff
- (vi) Locum agency staff and other staffing backfill provision

Identification of Equipment

- (vii) Discussion with IT Department
- (viii) IT Department to draw up requisition
- (ix) Requisition sign off and procurement

Training

- (i) Negotiation with Consultant Dysphagia Practitioner regarding training package
- (ii) Negotiation with nursing homes regarding dates and timing of training
- (iii) Delivery of training from the Consultant Dysphagia Practitioner and SLT senior staff
- (iv) Introduction and training on technology

Development and Implementation of Teleswallowing pilot pathway

- (i) Receipt of referral telephone call
- (ii) Negotiation of date and time of Teleswallow consultation
- (iii) Randomisation of patient to iPad assessment first or face-to-face assessment first
- (iv) Assessment
- (v) Documentation
- (vi) Follow-up

Evaluation and Dissemination

- (i) Data cleansing
- (ii) Collection of additional information and statistics
- (iii) Writing of report
- (iv) Dissemination.

4.4 Service delivery innovation timeline (Gantt Chart – see Appendix 1)

The project required strong project management skills, integrating different disciplines to co-ordinate the timely delivery of the service development in terms of infrastructure, software, training, clinical delivery and backfill of staff all within financial and clinical constraints.

4.5 Location and settings

Three nursing homes were identified as referring the most patients and placing the most demand on the Speech and Language Therapy Department.

4.6 IT hardware and software requirements

iPads with Polycom diagnostic quality imaging software were provided and wifi fitted into the three pilot project nursing homes. At each of the three Nursing Homes a Virgin Media Business Broadband

ADSL line was installed providing Quality of Service back to the Trust network. Each site then had a Power over Ethernet Switch installed in a communication cabinet to send the signal to the required wireless Access Points. These were situated within the premises at locations to provide the most convenient network coverage for the tablet devices (iPads). Three further iPads were also deployed for clinician use with 3G SIM cards so that video assessments could be carried out while the clinician was away from their desk.

4.7 Nursing Home Training

Specialist training in swallowing difficulties was commissioned from an external consultant who provided two hours Theoretical training (Appendix 2) related to the Speech and Language Therapy Teleswallowing Assessment and Management Proforma (Appendix 3) to each of the three nursing homes.

A further two hours training was delivered to each nursing home. It focused on a review of theoretical training module and practical training using the pulse oximeter and iPad with remote connection to simulate practical assessment.

4.8 Referral criteria

Referrals for patients to access the service innovation project were accepted as per the SLT Department's usual referral criteria. All patients were considered appropriate for a Teleswallowing assessment regardless of cognitive state or ability to co-operate with the SLT swallowing assessment. Patients requiring assessment or review of swallowing difficulties were accepted. Therefore, there was the potential for all existing and new patients to be referred to access this augmentative service delivery model.

5. Results

Between August 2013 and March 2014 three nursing homes and twelve patients were involved in the Teleswallowing project.

5.1 Nursing Homes

Senior nursing home staff received four hours of identified training consisting of two hour theoretical training and two hours of simulated practice. Belsfield Nursing Home referred four patients, Cornmill Nursing Home referred six patients and Sandycroft Nursing Home referred two patients. This referral rate is reflective of their pre-project referral pattern.

5.2 Subject demographics and clinical characteristics

All patients referred from the nursing homes were able to participate in the study, regardless of medical state, cognitive and behavioural ability (Table 5.5). Patients had a range of medical diagnoses: dementia (n=7); stroke (n=2), head Injury (n=1) and non-specific decline in swallow function (n=2). The age range was 46-94 years old. They presented with various medical status with chest status reported as poor (n=4); moderate (n=1) and good (n=7). They presented with variable cognitive function, assessed as poor (n=7); moderate (n=2) and good (n=3) but were able to co-operate with the assessment process. Although compliance with oral trails was reported as poor (n=1); fair (n=7) and good (n=4), this was the same for both the face-to-face and remote Teleswallowing assessments and therefore did not affect either SLTs' recommendations.

The role of remote and clinical SLT swallow assessor and order of assessment between the clinical assessment and remote assessment was randomised in order to diminish the effects of clinician bias and patient swallow fatigue.

5.3 Reason for referral

Four subjects were referred for deterioration in swallow. Six were referred specifically due to signs of aspiration. There was one incidence of reported deterioration in weight which prompted the referral for swallowing assessment. One patient required swallow review due to improvement in swallow function.

5.4 Assessment response time

Ten patients required urgent assessment following an acute onset of swallowing difficulties, with six patients being identified as showing signs of aspiration. They received assessment on average within 10 days (range 0-21 days) of referral. This includes weekends and the Christmas bank holiday period. This compares favourably to the usual average service response time of 12.5 days (range 5-63 days). However, it would be anticipated that the wait time would be reduced considerably following the pilot period as there was a delay inherent in the pilot protocol. This was caused by the requirement of two therapists (with clinical backfill) and a trained person at the nursing home.

5.5 Assessment Outcomes

Table 3: Patient profiles with remote and face to face recommendations for fluids and diet

	Age	Diagnosis	Cognition	Presentation	Remote outcome fluids	Face – to - face outcome fluids	Remote outcome diet	Face – to - face outcome diet
1	81	dementia	poor	Signs of aspiration	normal	normal	blended	blended
2	46	head injury	poor	Swallow improvement	syrup	syrup	blended	blended
3	89	stroke	good	Signs of aspiration	syrup	syrup	soft mashed	soft mashed
4	91	dementia	poor	Signs of aspiration	custard	custard	blended	blended
5	94	non-specific	moderate	Signs of aspiration	normal	normal	normal	normal
6	75	dementia	moderate	Weight loss	normal	normal	normal	normal
7	89	stroke	good	Swallow deterioration	syrup	syrup	soft	soft
8	89	non-specific	good	Swallow deterioration	syrup	syrup	soft	soft
9	73	dementia	poor	Signs of aspiration	pudding	pudding	blended	blended
10	84	dementia	poor	Swallow deterioration	custard	syrup	blended	blended
11	93	dementia	poor	Swallow deterioration	syrup	custard	soft mashed	soft mashed
12	70	dementia	poor	Signs of aspiration	custard	syrup	blended	blended
Percentage agreement					75%		100%	
Overall percentage agreement					87.5%			
Modified oral intake agreement					100%			

There was 100% agreement between the remote therapist and the face-to-face therapist for modified oral intake. There was 100% agreement on the recommended modified diet consistency and 75% agreement on the recommended modified fluid consistency. The 25% discrepancy on the recommended modified fluid consistency was minimal, a difference of 0.5 scoop of thickener. The overall percentage agreement for diet and fluid recommendations was 87.5%.

There was 100% agreement between the remote Speech and Language Therapy assessment and the clinical Speech and Language Therapy assessment in respect of oral hygiene, use of utensils, use of a large bolus as a therapeutic strategy, number of teaspoons advised, improved sensory stimulation of bolus, empty spoon technique, feeder behaviour (Appendix 3) and advice regarding admission to the acute care.

5.6 Training

All nursing staff reported that they enjoyed the Teleswallowing training. Staff felt that no aspect of the theoretical or practical element of the training should be altered. The practical element was considered fundamental to the success of the Teleswallowing programme.

5.7 Skill mix, roles and responsibilities

Nurses

Although twenty senior staff nurses were trained to use the Teleswallowing equipment; only six nurses were consistent users of the service. Some of the nurses were regular users of IT and considered themselves computer literate. Two nurses expressed their anxiety regarding the use of the technology but reported this was significantly reduced by the practical element of the training. They were also reassured that they would not be undertaking the assessment alone. None of the nurses reported that the system was too difficult to use following the study.

Speech and Language Therapists

Three specialist SLTs were involved in this project, each with a minimum of 12 years experience of dysphagia assessment and management. Each of the therapists demonstrated similar dysphagia assessment and management styles and had worked closely together for several years. This was an attempt to reduce clinical bias and allow the team to allocate any disparities in their recommendations to the Teleswallowing system rather than the SLTs' individual assessment and management styles.

5.8 Pathway from Referral to Assessment

Staff at the home identified and referred residents as per the current referral pathway. Referrals were received and randomly allocated to two of the three therapists. The type and order of assessment (remote versus face-to-face) was also randomly allocated to avoid bias. The SLT then arranged an appropriate assessment time where therapists, nursing home staff and patient were available.

5.9 Assessment

On the planned assessment date, the SLT phoned to confirm that the patient was still suitable for assessment. Remote and face-to-face assessments were carried out sequentially with minimal time between each (no more than 10 minutes) to avoid change in patient presentation. Each therapist was blinded to the results obtained by her colleague. Assessment was guided, but not dictated by the Proforma (Appendix 3), thereby allowing the SLT to modify her assessment according to the patient's clinical presentation. Clinical management strategies were implemented as directed by the face-to-face assessor.

5.10 Qualitative Evaluation of Teleswallowing Service Delivery (Appendix 4, 5 and 6)

Patient Comments (Appendix 4)

The nature and severity of the patients' conditions meant that they were able to give non-verbal consent to the assessment but the majority of the patients were unable to offer any verbal critical appraisal of the service. One patient was able to comment that he preferred having the assessment done remotely than going to hospital.

Nurse Survey Comments (Appendix 5)

The nurses involved in the project team completed anonymous reflective feedback comments and satisfaction questionnaires on their experiences and perceptions of this service innovation. There was a 58% (n=7) response rate for the questionnaires. In summary, 86% (n=6) of respondents preferred the use of remote assessment and 14% (n=1) had no preference owing to difficulties with the technology (see negative comments below).

Positive comments

- Quicker service delivery.
- The iPad method is speedy, relaxing and safe.
- I like the fast track, it minimises delay of assessment and a plan put in place to reduce distress to patients/residents.
- The assessment worked very well with the client in question.
- I found the assessment to be very effective and enabled a very fast assessment to be made.
- Overall, I have been able to establish skills in swallowing in which I can incorporate into everyday practice.
- I feel that the telerehab system was a more efficient means of service delivery – with this client the length of time it took, he is a complex resident.
- Good system!

Negative comments

- I feel that if assistance to hold the iPad was not available then I feel that completing the practical assessment would be difficult.

Speech and Language Therapy Satisfaction Survey Comments (Appendix 6)

The SLTs involved in the project team completed anonymous reflective feedback comments and satisfaction questionnaires on their experiences and perceptions of this service innovation. There was a 100% response rate for the questionnaires. In addition, individual interviews were conducted with the lead SLT for this service innovation. The themes generated from these data collection sources were analysed together and are presented below.

Positive comments

- Involvement of nursing staff may increase compliance with recommendations.
- Nursing Home staff have increased knowledge when they discuss clients on the phone even when Telehealth is not required or prior to it being arranged. They are more knowledgeable and this makes the case discussions more effective and less risky.
- Telehealth is good for carers and nursing staff to experience as they then understand why recommendations are made.
- We were able to rely on the nurse to describe laryngeal elevation due to the clinical training
- Speed of response to referral eliminates the need for home visits.
- At the beginning of the project we thought there would be a lack of personal touch with iPads, but as the study progressed we found that this was not the case.

Negative comments

- A patient was very agitated but the assessment was still able to take place.
- Would be good to be able to zoom in from a distance, less intrusive.
- Lack of hands-on experience with the technology as the beginning of the study .
- Perhaps a light could be connected to the iPad to let us see better.
- Sometimes I was unable to view inside patient's mouth due to position of iPad/torch, but the nurse was able to supply the details.

Comments specific to Information Technology

Positive comments

- The Trust's IT Department showed a high level of commitment to the project. They quickly attempted to tackle any technical problems we experienced
- It was very quick to link to the homes
- Moving from using an iPad to Polycom on the desktop computer gave better visual clarity
- There was excellent auditory clarity using the Jabra speaker
- Clarity of communication was generally very good and the patients spoke to us normally as they could see our faces
- Rapport with patient was excellent as the patients could see our faces and see we were smiling at them and looking at them
- I did have confidence in assessment and management guidelines given – the training given by the Consultant Practitioner has been taken on board by the nurses in the nursing homes. This has given the SLTs more confidence in working in collaboration and an increased expectation that SLT recommendations will be adhered to.
- You can gain case history over the telephone prior to any assessment to avoid unnecessary delays/anxiety to the patient.
- Don't have more than 2 nursing home staff present during iPad assessment as it's too distracting and too noisy...also distressing to the patient.

Negative comments

- There were considerable technological difficulties experienced with the Polycom software. This made us feel less than confident when it came to doing a remote assessment.
- Confidence is eroded when technical problems are experienced, people will then not use it.

- The Polycom telephone numbers kept changing so we did not know if we were going to be able to connect each time we came to use the technology.
- Lack of training with IT re use of Polycom – we were reliant on IT to help us and although very good, they weren't always available to help us owing to specialist IT knowledge availability.
- WiFi problems at SLT end meant that patients have become distressed due to delays as everything took longer than expected.
- Patients needed to be moved to suitable place to access WiFi signal within some nursing homes as we did not have the money to provide a signal for all parts of each nursing home.
- Initially confidentiality issues at Bellsfield as patients had to be assessed in the front entrance due to WiFi signal.
- Problems with availability of SLTs and nursing home staff to do the assessments. On one occasion, SLT aimed to see two patients at Bellsfield but the nurse was not available to do iPad, so the assessment had to be put back one week.

5.11 A Comparison of Service Delivery Ongoing Costs

It is not possible, given the limited scope of this Teleswallowing service delivery model pilot, to give detailed cost comparisons. A full cost effectiveness analysis over an extended time horizon would incur significant resources. Detailed costs would need to include the use of antibiotics and further medications, intravenous hydration, nasogastric or percutaneous endoscopic gastrostomy placement, giving sets, feeds, diagnostic instrumental assessments e.g. Videofluoroscopy and the multidisciplinary team staff costs for each patient. These more specific acute sector costs have not been considered as part of this limited service review. This, therefore, constitutes a general cost analysis considering SLT time, travel and patient location.

It has been calculated that it would take a senior therapist approximately one hour to undertake an acute ward assessment. This included location and identification of the patient, modification of patient posture, preparation of equipment and consistencies to be used as part of the assessment and reporting recommendations to staff. The average time for a domiciliary assessment to be undertaken is one and a half hours. This includes all the activities as for an acute medical ward assessment with the added time taken for report writing and pertinent documentation for the GP. The average time for a Teleswallowing assessment was 30 minutes. This occurs because the patient is positioned appropriately for the assessment and equipment and consistencies to be used for the

assessment are already prepared by the clinical staff undertaking the assessment. The clinical staff also share the same documentation as the SLT, which makes documentation surrounding case history taking and reporting more streamlined. Currently the Speech and Language Therapy Team undertake an average of two review appointments following an initial assessment.

Transport costs were informed by Ambulance Service data with the average costing per 'see and convey' return trip being £422.54. Transport costs for the home visit assessments were calculated as £0.67p per mile (April 2014) and the average distance was 7.5 miles (13 miles return) taking 20 minutes (40 minutes return).

The annual average length of stay for a patient admitted to the medical ward with aspiration pneumonia, dysphagia, feeding problems not otherwise classified and other signs and symptoms concerning food and fluid intake was calculated at 12.27 days (Appendix 7). There are no location cost implications for home visits. The location cost for the Teleswallowing assessment is built into the staff cost.

Comparative costs between admission to the acute sector, home visit and remote assessment via Teleswallowing for one patient are presented in Table 4 below. This does not include initial costs of hardware and software for the Teleswallowing service delivery.

Table 4: Costs of different service delivery models (one patient).

	Admission to acute sector	Home visit by SLT	Teleswallowing
Therapist specialist assessment cost @ £31.82 per hour	£31.82 (1 hour)	£47.73 (1.5 hours)	£15.91 (30 mins)
Average of two further review appointments @ £31.82 per hour	£63.64 (2 hours)	£95.46 (3 hours)	£31.82 (60 mins)
Average Travel Time @ £31.82 per hour	n/a	£63.64 (3 x 40 minutes)	n/a
Transport (return journey)	£422.54 (ambulance)	£26.13 (3 x 13 miles @ 67p per mile)	n/a
Location Cost @ £223.98 medical ward per day	£2748.23 (average 12.27 days)	n/a	n/a
Total	£3,266.23	£232.96	£47.73

Grateful thanks are given to the departments at Blackpool Teaching Hospitals NHS Foundation Trust (Finance, Salaries and Wages and Clinical Coding) who provided the costs. Length of stay for related swallowing difficulties is provided in Appendix 6.

5.12 Project costs (12 patients)

We are unable to report on the cost efficiencies of Teleswallowing in respect of admission avoidance to the acute care setting as we do not know if the patient would have still have been admitted to the acute care setting if they received a prompt Teleswallowing assessment prior to admission.

However, we can theorise that had a swallowing assessment been undertaken in a timely and responsive manner, the potential admission avoidance costs for one patient would have been £3,218.50 (£3,266.23 - £47.73). For the twelve patients involved in the project, there would have been a potential admission avoidance cost efficiency of £38,622.00 (£3,218.50 x 12).

For every patient with dysphagia that received a domiciliary service (calculated at an initial assessment and two further review home visits) a cost efficiency of £185.23 (£232.96 - £47.73) would be achieved if a Teleswallowing service delivery assessment had been available. For the twelve patients involved in the project, a Teleswallowing service delivery model would have given a cost efficiency of £2,222.76 (£185.23 x 12). However, the cost of the IT equipment needs to be offset against this saving.

5.13 Potential annual costs efficiencies

Acute Admission

There were 240 patients admitted to the acute care setting with difficulties related to eating and drinking during 2013 – 2014 (Appendix 7). The cost of admission and delivering a swallow assessment and two review visits is £783,895.20 (£3,266.23 x 240). If these people had avoided admission to hospital by receiving swallowing assessment and management via Teleswallowing, a cost efficiency of £772,440.00 (£3,218.50 x 240) would have been achieved.

Domiciliary Service

The number of out patient referrals from nursing home and residential settings that required domiciliary assessment for the twelve month period 2013-2014 was 456. Currently the Speech and Language Therapy Team undertake an average of three appointments per patient (two review appointments following an initial assessment). Therefore, the average number of domiciliary visits per annum is currently 1,368 (456 x 3). The cost of delivering a domiciliary service was £106,229.76 (456 x £232.96). If these people had received swallowing assessment and management via Teleswallowing, a cost efficiency of £84,464.88 (£185.23 x 456) would have been achieved. This presumes that all home visits could be replaced with Teleswallowing and that patients would have

appropriate equipment, internet connection and carers to assist with the remote assessment of swallowing difficulties.

5.14 Teleswallowing service delivery cost efficiencies

Preventing admission to the acute sector and eliminating the need for a domiciliary service by the use of Teleswallowing would deliver a potential cost saving of £856,904.88 (£772,440.00 + £84,464.88).

Using Trust data, the annual relative costs of the current service delivery models compared to the Teleswallowing Service Delivery Model and the subsequent cost efficiencies are reported in Table 5.

Table 5: Annual relative costs of current service delivery models compared to Teleswallowing Service Delivery Model and subsequent cost efficiencies.

Assessment and 2 reviews 2013-14	Current Service Delivery Models	Teleswallowing Service Delivery Model	Teleswallowing Cost Efficiency
240 admissions to acute sector for eating and drinking difficulties	£783,895.20	£11,455.20	£772,440.00
456 Domiciliary Service referrals	£106,229.76	£21,764.88	£84,464.88
Total	£890,124.96	£33,220.08	£856,904.88

5.15 Capacity

The Teleswallowing Service Delivery increased SLT productivity and capacity. As well as recognising the cost benefits of the Teleswallowing service, it is evident that the significant reduction in time taken to undertake the Teleswallowing assessments would increase capacity of the senior SLTs. Using the Teleswallowing system, they would now be able to undertake three assessments in the same time required for one home visit. This would allow the speech and language therapy department to offer a rapid and more responsive service, removing the need for a rapid response service.

5.16 Information Technology infrastructure requirements/start-up cost per site

It is important to recognise that the infrastructure required for each Nursing Home is a one-off cost which has been broken down as an annual cost per equipment lifecycle as shown in Appendix 8. The

lifecycles given are indicative of today's expectations but these may change as driven by advancements in technology.

The assumption is that a Speech and Language Therapy Department will already have a PC/laptop for the connection. Full costings for each site incurred for this pilot service development are detailed in Appendix 8. For the purpose of this project, each nursing home received a pulse oximeter (cost £300.00) and training detailed in Appendix 2 (cost: £1,200.00).

However, for future projects, IT costs may be reduced or eliminated by use of the site's existing equipment and infrastructure, the SLT Department's existing equipment and infrastructure and the NHS regional IT infrastructure. Also economies of scale would apply to bulk purchases. For the purpose of this report, it is not possible to quantify the exact IT cost efficiencies.

5.17 Summary

The SLT team aimed to pilot an augmentative Teleswallowing service delivery model, commensurate with the Quality, Innovation, Productivity and Prevention Programme agenda. The results demonstrate that:

- there is a potential to reduce hospital admissions and readmissions as none of the patients that took part in the service development were admitted to the hospital;
- reduction in SLT travel times as none of the patients that took part in the service development required a domiciliary visit;
- improved nursing home patient health by rapid response to referrals;
- improved patient dignity and reduction in distress as all patients were able to be assessed by the Teleswallowing system and increase collaboration and continuity of care between nursing homes and SLT Department as both nurses and SLTs reported that targeted education and training increased competence to local providers.

The cost efficiencies may be identified from: a potential reduction in admissions; a potential reduction in home visit requirements and the potential increase in capacity and productivity for senior SLTs.

6. Recommendations

The Blackpool Teaching Hospitals NHS Foundation Trust Speech and Language Therapy Department has demonstrated by their programme of work that Teleswallowing can be delivered to all patients regardless of cognitive state in a UK setting and by NHS therapists.

1. Teleswallowing as an Augmentative Service Delivery Model

Teleswallowing can be regarded as an augmentative service delivery model that facilitates the development of clinical skills, reduces waiting times, improves the quality of care offered and makes substantial cost efficiencies. This programme of work has demonstrated that this innovative use of simple technology is fundamental in meeting the needs of patients and alleviating the burden to the acute sector whilst maintaining diagnostic accuracy and quality of care. Having demonstrated the diagnostic accuracy of the Teleswallowing equipment and improvement in quality of care owing to more responsive assessment times and cost efficiency from admission avoidance, it would be appropriate to continue this service delivery model. This is especially in the light of Department of Health concerns regarding the increase in demand on the health service (Appendix 9: Forward from Dementia: A state of the nation report on dementia care and support in England, November 2013).

2. Extending Teleswallowing within the local healthcare economy

To allow for continuation of the current service and allow for expansion to other establishments, the Teleswallowing service delivery model would require further funding or funding reallocation to extend software licence agreements. NHS Broadband internet connection with embedded security to allow for information governance is freely available for Lancashire and Cumbria. This may be accessed by discussion with North West Shared Infrastructure Service.

In order to offer this service delivery model to other nursing homes within the district, it is recommended that the networks and the collaboration between the SLT team, patients, carers and primary care staff should be maintained and expanded. Training for new staff would be requisite. Training would also need to be available to nursing homes already using the Teleswallowing service delivery model to accommodate staff turnover. Training could be delivered by specialist training programmes or e-training that allows for departmental income generation. Whilst it is recommended that the theoretical component is delivered and managed by dysphagia specialists, maintaining competence could be achieved by establishing Teleswallowing link nurses that cascade the practical training element to others within the home. This could then link to national standards of care that could also be written as a further extension of this project (see final recommendation: National Engagement).

Potentially, remote assessment via Teleswallowing may benefit within different settings such as individuals' homes. However, appropriate IT infrastructure and training of other members of the interdisciplinary and healthcare team such as the Care Home Support Team and District Nurses would be requisite to the success of this model. A more detailed feasibility study would be required to inform the delivery of Teleswallowing with this client group. To maximise cost efficiencies in the immediate future, it would be more appropriate to focus speech and language therapy resources on out patient referrals from nursing and residential homes to prevent deterioration in condition and hence hospital admission and readmission.

3. Engagement of the Telehealth concept with the wider healthcare community

This project has provided proof of concept for teleconsultation in a care home setting and may be replicated in any environment where IT infrastructure and carer availability allows. It would be advisable to extend this project to the wider healthcare community within the local context, thereby utilising established care pathways to underpin similar developments and improving collaboration between the healthcare team, patients, carers, secondary care staff and the voluntary sector.

The expertise gained and clinical leadership demonstrated in this project could be used to extend the concept of teleconsultation to other therapy professions.. This clinical leadership is important as it allows for exploration and identification of emerging evidence based service developments, accessing funding streams, enabling collaboration between stakeholders, enabling service redesign and disseminating findings not only at a local level but to provide proof of concept for wider national engagement.

4. Professional Engagement

Consultation with the Royal College of Speech and Language Therapists should be pursued in order to disseminate the results of this proof of concept study at a national level and share the knowledge and skills throughout the UK healthcare setting.

5. National Engagement

Clinical competencies (underpinning knowledge and practical skills) required to undertake a Teleswallowing service delivery model should be identified to inform the development of National Occupational Standards (Skills for Health at the Department of Health). This would embed this enhanced service delivery model into the national conscience.

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8. Appendices

Appendix 1: Gantt Chart of Project Management Forecast

Task Name	Duration	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14
1 Concept Development	20.02.12 - 23.03.12																												
Agreement of Management	20.02.12 - 23.03.12																												
Agreement of Staff (SLT/IT)	20.02.12 - 23.03.12																												
Submission of Application	24.03.12																												
2 Finance																													
Allocation of Funding	01.04.12 - 01.09.12																												
Discussion with Funder	01.04.12 - 01.06.12																												
Finance Governance	01.04.12 - 01.06.12																												
Renegotiation of Submission to Increase Bid	01.06.12 - 01.08.12																												
3 Stakeholders																													
Identification of Nursing Homes	01.09.12 - 14.09.12																												
4 Planning																													
Negotiation of Equipment Requirements	01.10.12 - 01.02.13																												
Procurement of Equipment Requirements	01.10.12 - 01.02.13																												
Set Up Team	01.02.13 - 01.05.13																												
Define Launch	01.05.13 - 14.05.13																												
5 Training	01.06.13 - 31.07.13																												
6 Project Implementation																													
Launch	01.08.13																												
7 Evaluation																													
Data Collection	01.08.13 - 03.03.14																												
Technical Liaison with IT Team	01.08.13 - 31.03.14																												
Data Cleansing	01.02.14 - 03.04.14																												
Data Analysis	01.02.14 - 03.04.14																												
Service Evaluation	01.02.14 - 03.04.14																												
Report	01.02.14 - 03.04.14																												
8 Disseminate																													
Dissemination of Information to Trust & Beyond	01.02.14 - 01.05.14																												
Liaison with Trust Officials to Extend Project	01.03.14 - 01.05.14																												
Liaison with Funder re Scalability of Project	01.03.14 - 01.04.14																												
Liaison with Royal Collage re Dissemination	01.03.14 - 01.04.14																												
Launch of Service Evaluation & Dissemination	07.04.14																												
Application to Royal College Conference	07.03.14																												

Appendix 2: Outline of Theoretical and Practical Training delivered to Nursing Home Staff

Theoretical Training

The normal swallow

Swallowing difficulties i.e.

Definition

Aetiologies

Impact – why this is important

What can go wrong at each stage and why -

Signs and symptoms of dysphagia – eg coughing, aspiration, tongue weakness, poor bolus manipulation etc

Environmental variables- distractions, background noise, pre-eating routine etc

Good feeding practice – including tools used for feeding such as large spout, small spout, spoon size etc

Altered physiology in response to modified fluid and diet consistencies

SLT assessment and recommendation proforma:-

pulse oximeter

posture/ head position

alertness

comprehension level/cognition

oral hygiene

dentition

saliva management

anterior and superior laryngeal movement on palpation

oromotor movements

oral trials – what could happen/what to expect/utensils (different spoons and types of cup)

signs of aspiration or other difficulty– wet voice/voice quality, breathing changes, food residue in mouth etc

compensatory swallow techniques which might be used such as head turns etc

Potential recommendations

Further referral/assessment that may be needed eg VF, further input, referral on to dietitian.

Practical Training

Revision of theoretical training and simulated remotely directed practical assessments

Appendix 3: Teleswallowing Assessment and Management Proforma

Teleswallowing Assessment and Management Proforma			
Patient Name:.....		Therapist Name:.....	
Patient NHS:.....		Nurse Name:.....	
Patient number:.....		Nursing Home:.....	
Information required from nursing staff prior to Speech and Language Therapy contact			
Reason for assessment via Teleswallowing			
Appropriate medical history			
Individual's medication list to hand for reference			
Cognitive status and compliance (general)			
Chest status (history and current)			
Consistencies and amount taken orally			
Onset of swallowing difficulties (acute/slow progression)			
Description of difficulties: oral preparatory, oral transit, signs of aspiration, reflux			
Monitor and record pre-swallow SpO2			
Prepare equipment: straw, spoons (large, small), beakers (large, small spout), cups, thickener, testing material ie drinks and biscuit			
Assessment			
Alertness at baseline i.e. fluctuating, drowsy, alert			
Comprehension, cognition, compliance on day of assessment			
Posture (habitual mealtime posture)			
Head position – midline flexion			
Oral hygiene (optimum cleanliness for assessment): - dentition (usual for mealtimes)			
- saliva management			
Oral movement:			
- lip seal			
- soft palate (puff out cheeks)			
- tongue moves side to side (corners of mouth)			
- tongue moves into cheek			
- tongue protrusion			
- tongue tip elevation (point tongue tip to nose)			
- tongue tip depression (point tongue tip to chin)			
- lick lips			
- lick over teeth			
Ask the patient to say 'ahhh'			
Ask the patient to cough			
Dry swallow (feel throat with 3 fingers)			
Delivery of oral trials			
Water	Thickener	Yoghurt	Biscuit
no swallow i.e. water leaks out	no swallow i.e. water leaks out	no swallow i.e. water leaks out	no swallow i.e. water leaks out
residue in mouth	residue in mouth	residue in mouth	residue in mouth
immediate/delayed cough	immediate/delayed cough	immediate/delayed cough	immediate/delayed cough
choke	choke	choke	choke
short of breath	short of breath	short of breath	short of breath
wet/gurgly voice	wet/gurgly voice	wet/gurgly voice	wet/gurgly voice
poor forward movement of the adam's apple on palpation	poor forward movement of the adam's apple on palpation	poor forward movement of the adam's apple on palpation	poor forward movement of the adam's apple on palpation
signs of distress (colouring, tearing etc)	signs of distress (colouring, tearing etc)	signs of distress (colouring, tearing etc)	signs of distress (colouring, tearing etc)
monitor and record post-swallow SpO2	monitor and record post-swallow SpO2	monitor and record post-swallow SpO2	monitor and record post-swallow SpO2
any other reason for concern	any other reason for concern	any other reason for concern	any other reason for concern

Recommendations																		
Environment																		
<input type="checkbox"/> quiet environment																		
Patient Characteristics																		
<input type="checkbox"/> levels of alertness <input type="checkbox"/> posture & comfort <input type="checkbox"/> dentures in and fit (if appropriate)																		
Pre-swallow																		
<input type="checkbox"/> check SLT/ dietary recommendations <input type="checkbox"/> check likes/dislikes <input type="checkbox"/> have the correct/specialist utensils that affect head posture																		
<input type="checkbox"/> texture modification <input type="checkbox"/> head positioning (chin tuck eliminates 80% aspiration)																		
Feeder behaviour																		
<input type="checkbox"/> appropriate feeder position <input type="checkbox"/> tell the person what's happening <input type="checkbox"/> eye contact <input type="checkbox"/> develop a trusting relationship <input type="checkbox"/> help person to self-feed if possible <input type="checkbox"/> monitor for multiple swallows needed to clear one mouthful																		
<input type="checkbox"/> encourage throat clear/coughing <input type="checkbox"/> monitor for signs of difficulty <input type="checkbox"/> check temperature throughout meal <input type="checkbox"/> clear mouth of residue <input type="checkbox"/> good oral hygiene routine																		
Head postures																		
<input type="checkbox"/> chin tuck <input type="checkbox"/> head back																		
<input type="checkbox"/> head turn to damaged side (chin to shoulder) <input type="checkbox"/> head tilt to good side (ear to shoulder)																		
Compensatory techniques																		
<input type="checkbox"/> safe swallow (breath hold) <input type="checkbox"/> repeat/clearing swallows <input type="checkbox"/> effortful swallow																		
Specific Swallow recommendations																		
<input type="checkbox"/> utensils <input type="checkbox"/> one consistency at a time <input type="checkbox"/> number of teaspoons (for swallow fatigue) <input type="checkbox"/> specific swallow techniques <input type="checkbox"/> pacing (allow for clearing swallows) <input type="checkbox"/> small, frequent meals <input type="checkbox"/> modification of medication																		
<input type="checkbox"/> bolus size <input type="checkbox"/> bolus texture <input type="checkbox"/> bolus placement in mouth <input type="checkbox"/> bolus type (improve sensory aspect of bolus) <input type="checkbox"/> verbal, physical prompts <input type="checkbox"/> clean mouth and undertake oral hygiene <input type="checkbox"/> stay upright for 30-60mins following meals																		
Oral Intake Recommendations																		
<table border="0"> <tr> <td>Fluid:</td> <td>Diet:</td> </tr> <tr> <td><input type="checkbox"/> nil by mouth</td> <td><input type="checkbox"/> nil by mouth</td> </tr> <tr> <td><input type="checkbox"/> syrup</td> <td><input type="checkbox"/> blended</td> </tr> <tr> <td><input type="checkbox"/> custard</td> <td><input type="checkbox"/> soft</td> </tr> <tr> <td><input type="checkbox"/> pudding</td> <td><input type="checkbox"/> normal</td> </tr> <tr> <td><input type="checkbox"/> normal</td> <td><input type="checkbox"/> other</td> </tr> <tr> <td><input type="checkbox"/> other</td> <td></td> </tr> </table>					Fluid:	Diet:	<input type="checkbox"/> nil by mouth	<input type="checkbox"/> nil by mouth	<input type="checkbox"/> syrup	<input type="checkbox"/> blended	<input type="checkbox"/> custard	<input type="checkbox"/> soft	<input type="checkbox"/> pudding	<input type="checkbox"/> normal	<input type="checkbox"/> normal	<input type="checkbox"/> other	<input type="checkbox"/> other	
Fluid:	Diet:																	
<input type="checkbox"/> nil by mouth	<input type="checkbox"/> nil by mouth																	
<input type="checkbox"/> syrup	<input type="checkbox"/> blended																	
<input type="checkbox"/> custard	<input type="checkbox"/> soft																	
<input type="checkbox"/> pudding	<input type="checkbox"/> normal																	
<input type="checkbox"/> normal	<input type="checkbox"/> other																	
<input type="checkbox"/> other																		
Onward referral																		
<input type="checkbox"/> admission to hospital <input type="checkbox"/> referral to dietitian <input type="checkbox"/> referral to occupational therapy <input type="checkbox"/> referral to Ear Nose and Throat																		
<input type="checkbox"/> referral to videofluoroscopy <input type="checkbox"/> referral to physiotherapy <input type="checkbox"/> referral for Gastroenterology																		
Patient Outcome																		
<input type="checkbox"/> day 1	<input type="checkbox"/> week 1	<input type="checkbox"/> week 2	<input type="checkbox"/> week 3	<input type="checkbox"/> week 4														
Recs tolerated	Recs tolerated	Recs tolerated	Recs tolerated	Recs tolerated														
Signs of aspiration reduced	Signs of aspiration reduced	Signs of aspiration reduced	Signs of aspiration reduced	Signs of aspiration reduced														
Chest status	Chest status	Chest status	Chest status	Chest status														
Adequate nutrition	Adequate nutrition	Adequate nutrition	Adequate nutrition	Adequate nutrition														
Adequate hydration	Adequate hydration	Adequate hydration	Adequate hydration	Adequate hydration														
Quality of life	Quality of life	Quality of life	Quality of life	Quality of life														
Further assessment requested	Further assessment requested	Further assessment requested	Further assessment requested	Further assessment requested														
Hospital admission	Hospital admission	Hospital admission	Hospital admission	Hospital admission														
Death	Death	Death	Death	Death														

Appendix 4: Satisfaction questionnaire for the person with swallowing difficulties

(Ward et al., 2011)

1. I was satisfied with the level of service provided by the computer system
2. I am happy with the level of rapport generated during the session from the nurse and the telemedicine SLT.
3. I found the computer and the computer system not frightening.
4. I could hear everything appropriate for me
5. I could see the Teleswallowing SLT and understood what she required.
6. I feel that it was easy to understand what was requested of me by the Teleswallowing SLT
7. I feel that the telerehabilitation system was efficient for me.
8. I feel that the telerehabilitation system would be a useful service delivery tool for other patients with swallowing disorders.
9. I preferred using this system rather than being admitted to hospital
10. I preferred using this system rather than attending hospital for an out patient appointment
11. I preferred using this system rather than waiting for a therapist to come to the home to assessment.

Appendix 5: Satisfaction questionnaire for the nurse

(Ward et al., 2011)

1. I was satisfied with the level of service the computer system allowed me to provide clients.
2. I am happy with the level of client-clinician rapport generated during the session.
3. I found the computer and the computer system easy to use during the session.
4. The audio quality of the system was appropriate for the assessments performed.
5. The visual quality of the system was appropriate for the assessments performed.
6. I feel that it was easy to understand what was requested of me by the Teleswallowing SLT
7. I feel that I was able to satisfactorily and competently assess the client to the best of my abilities using the system.
8. I feel that the telerehabilitation system would be a more efficient means of service delivery for this particular patient.
9. I feel that the telerehabilitation system would be a useful service delivery tool for patients with swallowing disorders.
10. How do you feel the telerehabilitation system could be altered to further enhance your assessment and management recommendations?
11. What did you particularly like about the telerehabilitation system?
12. What did you not like about the telerehabilitation system?
13. I feel more confident assessing the person with swallowing difficulties as part of this system.
14. I feel more confident in my ongoing management of the person with swallowing difficulties.
15. I feel I am more aware of the criteria of patient who should be referred for swallowing assessment
16. I feel more confident identifying signs of swallowing difficulties.

Appendix 6: Satisfaction questionnaire for the remote Speech and Language Therapist
(Ward et al., 2011)

1. I was satisfied with the level of service the computer system allowed me to provide clients.
2. I am happy with the level of client-clinician rapport generated during the session.
3. I found the computer and the computer system easy to use during the session.
4. The audio quality of the system was appropriate for the assessments performed.
5. The visual quality of the system was appropriate for the assessments performed.
6. I feel that I was able to satisfactorily and competently assess the client to the best of my abilities using the system.
7. I feel that the telerehabilitation system would be a more efficient means of service delivery for this particular patient.
8. I feel that the telerehabilitation system would be a useful service delivery tool for patients with swallowing disorders.
9. How do you feel the telerehabilitation system could be altered to further enhance your assessment and management recommendations?
10. What did you particularly like about the telerehabilitation system?
11. What did you not like about the telerehabilitation system?

Appendix 7: Admission rate to hospital from 01.04.13 – 31.03.14 from Blackpool Teaching Hospitals NHS Foundation Trust

Primary Diagnosis Code	Number of Patients 01.04.13 – 31.03.14	Average Length of Stay
Aspiration Pneumonia	195	14.31
Dysphagia	28	3.36
Feeding Problems not Otherwise classified	10	4.20
Other signs and symptoms Concerning food and fluid intake	7	2.57
Grand Total	240	12.27

Number of Referrals 01/04/2013 to 31/03/2014 with an address of Care/Nursing/Residential Home (Extract Date: 07/04/2014) from Blackpool Teaching Hospitals NHS Foundation Trust - Community Health Services

Address Type	Referrals
Care_Home	100
Nursing_Home	261
Rest_Home	73
(blank)	1,220
Grand Total	1,654

Appendix 8: Information Technology Infrastructure Costs

Description	Quantity	On-off Cost	Recurrent Cost	One-Off Total	Recurrent Total	Hardware Cost
Video Conferencing Advanced subscriptions	1		£184.80		£184.80	
APPLE IPAD 16GB WI-FI - BLACK	1					£299.45
AIRWATCH DEVICE LICENCE PER ANNUM - This will be pro-rata (This will be renewed on the 1st April each year thereafter via a a budget transfer to IT Services who will manage the renewal on your behalf)	1		£24.00		£24.00	
IT Support per annum - this will be pro-rata (This will be renewed on the 1st April each year thereafter)	1		£24.00		£24.00	
HYPCCP17 - Lifetime A Port Product, The Bergame II	1	£9.16		£9.16		
Video Conferencing Advanced subscriptions	1		£184.80	£0.00	£184.80	
Installation (DSL-IPVPN) One off cost	1	£472.50		£472.50		
Installation (DSL-IPVPN) Annual Rental (DSL-IPVPN)	1		£900.00		£900.00	
Switch 24 port PoE	1					£1,160.00
12u Cabinet	1					£237.00
Cisco Aironet 1142 Controller-based AP - The minimum requirement is for 1 AP per site but this will be dependant on site survey and Nursing Home layout	1					£325.01
Cisco Wireless Access Points Delivery	1	£10.00		£10.00		

Sub Total	£491.66	£1,317.60	£2,021.46	£3,830.72
Vat @ 20%	£ 98.33	£ 263.52	£ 404.29	£766.14
Total	£589.99	£1,581.12	£2,425.75	£4,596.86

Grand Total	£4,596.86
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Expected Lifespan	Comparable Annual Cost
5	£59.89
5	£232.00
5	£47.40
5	£65.00

Hardware Annual Cost	£404.29
Vat @20%	£80.86
Hardware Annual	£485.15

Grand Total Annual	£2,066.27
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Appendix 9: Dementia – a state of the nation report on dementia care and support in England – Foreword by The Secretary of State for Health

We are facing one of the biggest health challenges ever, a challenge as big as the fights against cancer, heart disease and HIV. Dementia steals lives. It also imposes a huge emotional and financial cost. It is time to fight back.

Around 670,000 people in England have dementia and this number is set to double in the next 30 years.¹ Dementia costs £19 billion a year, and this is going to increase massively. The cost in heartbreak is incalculable.

Already an estimated twenty-one million people in our country have a close friend or family member with dementia. Directly or indirectly, it will soon affect every one of us.

As a nation, we need to wake up to what is fast becoming one of the greatest pressures on families, carers, and health and care systems.

In March 2012, the Prime Minister launched his Dementia Challenge – a national programme of action to deliver sustained improvements in health and care, create dementia friendly communities, and boost dementia research.

This Dementia report, with its accompanying map of variation, available at <http://dementiachallenge.dh.gov.uk/map/>, shines a light on the quality of dementia care in England. The very best services are excellent and show what is possible. But the worst show that we still have some way to go. The message is clear: we can and must do better.

There has been some major progress. We are better at identifying and assessing people with dementia in hospitals and have responsibly reduced the prescription of antipsychotic medication.²

But it is unacceptable that less than half of people with dementia receive a diagnosis and that there is such variation across the country in how long people wait before being seen by a memory service. The availability of post-diagnosis support varies far too much as well.

47 percent of people with dementia do not feel part of their community. They often experience anxiety and depression and three quarters do not feel society is geared up to deal with dementia.³ 62 percent of people with dementia living alone are lonely and it can sometimes be hard to access services, which only adds to this isolation.⁴

I am determined we make our fight against dementia global, so I am delighted the UK is hosting the first G8 dementia summit in December. The summit will be unprecedented in bringing together G8 governments, the World Health Organisation (WHO) and the Organisation for Economic Co-operation and Development (OECD), along with pharmaceutical companies, philanthropists, academics, research funders and industry.

It will give us a tremendous chance to make real progress much faster. The planned follow-up events next year mean there is a great opportunity to forge a major lasting legacy.

While we continue to pursue a cure, it is vital we look at how we can help people manage dementia better, support them to lead healthier lives, and deliver real improvements in care.

We have a moral responsibility to fight dementia – and together we will.

¹ Prime Minister's challenge on dementia

² National Dementia and antipsychotic prescribing Audit, 2012

³ Dementia 2012: A national challenge, Alzheimer's Society, 2012

⁴ Dementia 2013: The hidden voice of loneliness, Alzheimer's Society, 2013