

Evaluation Resource Guide

Allied Health Telehealth Capacity Building Project

September 2016

Evaluation Resource Guide: Allied Health Telehealth Capacity Building Project

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For more information contact:

Allied Health Professions' Office of Queensland, Department of Health, GPO Box 48, Brisbane QLD 4001, email allied_health_advisory@health.qld.gov.au, phone (07) 3328 9298.

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Overview

Allied Health Telehealth Capacity Building

The [Allied Health Telehealth Capacity Building Project](#) is a joint initiative of the Allied Health Professions' Office of Queensland (AHPOQ), Department of Health and the Cunningham Centre, Darling Downs Hospital and Health Service. The project will develop, implement and evaluate strategies designed to increase workforce capability to use telehealth for the delivery of allied health clinical services in Queensland Hospital and Health Services (HHSs).

Aim

1. Support the expansion of allied health telehealth-supported clinical services in Queensland HHSs through coordinating collaborative activities by key stakeholders including AHPOQ, Cunningham Centre, Clinical Access and Redesign Unit and HHSs.
2. Develop, implement and evaluate telehealth capacity building strategies targeting high demand service areas, particularly those relevant to rural and remote communities. Strategies will primarily focus on the development of practical, work-relevant training programs and supporting resources.

Objectives

1. Generate/collate, pilot and evaluate products/programs and resources to support the development and implementation of allied health telehealth services. Training and resource development will focus on: service redesign and clinical redesign.
2. Develop, implement and evaluate allied health telehealth collaborative networks that support peer learning, reduce duplication and enhance dissemination of information and resources between teams and clinicians statewide.
3. Develop and disseminate resources that support robust evaluation of current and emerging telehealth services.

Evaluation resource guide

The Evaluation Resource Guide addresses objective 3 of the Allied Health Telehealth Capacity Building Implementation Plan. Evaluation of telehealth services is also addressed in the Service Redesign learning module developed as part of objective 1. The learning module will be available in 2017. For more information please visit the Cunningham Centre Allied Health Education and Training team site at https://www.health.qld.gov.au/cunninghamcentre/html/allied_health.asp.

The Evaluation Resource Guide is structured in two sections:

[Section 1:](#) Evaluation project planning

[Section 2:](#) Evaluation resources including outcomes measures and links to evaluation tools

Scope and focus of the Evaluation Resource Guide

The Evaluation Resource Guide has been developed to support allied health professionals or teams evaluate their use of telehealth. The [Allied Health Telehealth Capacity Building Scoping Project](#) findings were used to guide the scope and focus of the resource guide as described below.

- **Form of evaluation**
The evaluation resource guide focuses on formal evaluation of telehealth services. Formal evaluation has a plan, includes at least one specified aim or question to be addressed by the evaluation, involves collection of information (data) and analysis or interpretation of the information to form a finding or outcome that is useful to the health professional, team or organisation.
- **Clinical service focus**
The evaluation resource guide primarily examines the use of telehealth for the delivery of allied health clinical services, although some aspects may also be relevant to the use of telehealth for supervision or training. The guide does not focus on health technology assessment methods i.e. technical evaluation of new technologies. This is a complex area with a large base of existing literature and standards.
- **Purpose**
The resource guide assumes the purpose of the evaluation is to assess the impacts, outputs and outcomes of a telehealth service to support decision-making of the team. This implies that the evaluation will include some form of comparison with another service, benchmark or standard.
- **Broad application**
Information in this document may be applied to a broad range of formal evaluation activities. However the focus is on workplace-based quality improvement projects or audits rather than large funded research studies. Complex implementation programs for telehealth, multi-phase trials or funded research projects require significant investment of time and expertise in the development of the evaluation methodology which cannot be summarised in this basic guide.
- **Form of telehealth**
Consistent with the scope of the Allied Health Telehealth Capacity Building Implementation Plan, the evaluation resource guide focuses on the use of real-time videoconference (synchronous telehealth).
- **Aspect of evaluation**
The guide focuses on assisting allied health professionals to identify and select evaluation tools and indicators. Other aspects of evaluation including data collection and analysis methods, stakeholder engagement and governance are not in scope or covered only superficially.

Evaluation and telehealth service development

Evaluation should be an integral part of the development, design, growth and ongoing monitoring of telehealth-supported allied health services. This guide does not cover telehealth implementation planning, service development / re-design methods or project management. The Cunningham Centre [Allied Health Telehealth Training Package](#) (available in 2017) includes information on planning a telehealth implementation project.

Application of the Evaluation Resource Guide beyond telehealth

Most content in the guide has broader application to service evaluation beyond telehealth. Excepting indicators and tools that relate to telehealth technology, information in the guide may be used to examine other service development strategies including:

- delegation (support workers / allied health assistants)
- expanded scope including skill sharing
- new allied health services or service expansion in the HHS, and
- partnerships / interagency services and integrated care initiatives.

Development of the Evaluation Resource Guide

- Evaluation frameworks, resources and resource repositories were identified and collated by the AHPOQ, drawing on information in the published and grey literature, the Allied Health Telehealth Capacity Building Scoping Project findings and service evaluation resources from other initiatives such as the [Calderdale Framework](#) implementation resources, [Allied Health Rural Generalist Training Positions](#), and the [Ministerial Taskforce on Health Practitioner Expanded Scope of Practice](#) implementation resources including [Allied Health Collaborative Funding](#) evaluation tools.
- The draft evaluation resource guide was reviewed by a panel of researchers with telehealth and service evaluation expertise, and also provided to the Queensland Health Allied Health Telehealth Network for feedback.
- The finalised resource guide was endorsed by the Allied Health Telehealth Capacity Building Project Steering Group in September 2016 and approved for publication by the Chief Allied Health Officer.

Section 1. Evaluation project planning

Planning an evaluation

Evaluation of telehealth service delivery models should be guided by an evaluation plan. For the introduction of telehealth or a significant expansion or change to existing telehealth services, the evaluation plan should form part of a broader implementation plan that also includes goals and objectives, actions, activities and responsibilities, stakeholder and consumer engagement strategies, awareness raising and change management strategies, budget and operational impacts, and risk identification and mitigation.

Resources and tools: evaluation project planning

- The Cunningham Centre [Allied Health Telehealth Training Package](#) includes information of planning a telehealth project (Service Redesign module, unit 1.4 – available in 2017)
- Allied Health Professions Office of Queensland. Allied Health Rural Generalist Training Positions – Project Planning Guide: Telehealth at <http://qhps.health.qld.gov.au/alliedhealth/html/strategies/rural-remote.htm>
The Project Planning Guide includes an overview of planning telehealth implementation, implementation and evaluation plan templates and some recommended process and outcome indicators. It also includes a brief example of a telehealth implementation and evaluation plan.
- NSW Agency for Clinical Innovation. Understanding Program Evaluation at http://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0008/192437/Framework-Program-Evaluation.pdf
This resource outlines the process of designing and implementing an evaluation including informative process diagrams, example templates and references.
- Flinders University. Planning and Evaluation Wizard (PEW) at <http://www.flinders.edu.au/medicine/sites/pew/developing-a-project-and-evaluation-plan/evaluation-zone/evaluation-overview.cfm>
This resource includes a basic overview of health service evaluation with a focus on health promotion and primary healthcare strategies, although the content is broadly relevant to other areas of healthcare. It also includes evaluation planning templates and links to other resources.
- Telehealth-specific implementation and evaluation frameworks are available. Examples are presented in [Section 2](#).

Quality improvement project or research

Formal evaluation activities require governance. That is, the responsibilities and accountabilities of all individuals and organisational units involved in the evaluation need to be clearly defined. Oversight is required to ensure that the evaluation is conducted consistent with quality and safety standards and any legal and ethical frameworks relevant to the organisation. In the planning phase the evaluation team will need to determine whether this oversight will be provided:

- “internally” in the health service using a quality improvement (QI) activity approval and registration process, and with ongoing oversight by a project steering group or as part of existing health service governance structures such as a unit/service-level management committee, or

- “externally” through a Human Research Ethics Committee and research governance approval process (i.e. a formal research project).

Other factors in the research versus quality improvement decision are:

- Risk to participants of the telehealth intervention or evaluation methods. Risks are not just physical risks to clients and their families (or staff) but also risks associated with disclosure and security of personal information, financial or legal risks, risk of distress or psychological harm etc.
- Intention to publish or present the outcomes of the evaluation. Undertaking an evaluation as a quality improvement activity does not completely preclude publication or presentation of the outcomes, but may limit the options for journals or conferences that will accept a paper. Registration of the project through local quality and safety or clinical governance processes will assist the evaluation team to publish or present the work. See the Cairns & Hinterland HHS information below as an example of how quality activities can be managed in an HHS and obtain information from your HHS website / intranet site or research office.
- Access to project funding or scholarships. Projects undertaken as formal research can attract project grants, or scholarships for individuals. An individual leading a research project may also be able to use the project to obtain a qualification such as a masters degree or doctorate.

Resources and tools: research and quality improvement

- National Health and Medical Research Council. Ethical Considerations in Quality Assurance and Evaluation Activities at <https://www.nhmrc.gov.au/guidelines-publications/e111>.
This is the principle resource for guiding decisions on the level of project oversight required.
- Health and Medical Research Unit, Queensland Department of Health. Information for Researchers and Research Sponsors at https://www.health.qld.gov.au/ohmr/html/regu/for_researcher.asp.
This site outlines requirements for quality improvement / clinical audits and research including a description of the research ethics and governance approval stages and templates / tools.
- Cairns and Hinterland HHS. Research Ethics and Governance at http://qheps.health.qld.gov.au/cairns/html/ah_res_doing.htm.
- Cairns and Hinterland HHS. Allied health research education and training at http://qheps.health.qld.gov.au/cairns/html/ah_res_train.htm.
- Darling Downs HHS. Conducting research at DDHHS at <http://qheps.health.qld.gov.au/darlingdowns/html/research/knowledge.htm>
- Mackay HHS. Research: Quality or Research at http://qheps.health.qld.gov.au/mackay/services/edu_research/research.htm.
- Metro North HHS. Collaborative for Allied Health Research, Learning and Innovation (CAHRLI) at <http://qheps.health.qld.gov.au/metronorth/allied-health/cahrl/default.htm>.
- Flinders University. “Ethics” section of Planning and Evaluation Wizard (PEW) at <http://www.flinders.edu.au/medicine/sites/pew/developing-a-project-and-evaluation-plan/evaluation-zone/ethics/what-are-ethics.cfm>
- Allied Health Professions’ Office of Queensland. Research funding at <https://www.health.qld.gov.au/hpresearch/html/scholarupdate.asp>.
This site has information on available and upcoming research funding opportunities.

Principles of effective evaluation of telehealth

A robust evaluation is:

- part of the development and ongoing implementation and monitoring plan for a telehealth service,
- forward-looking and provides useful information that is linked to the strategic goals of the health service and health needs of the community, rather than an isolated research exercise,
- designed to compare telehealth-supported service delivery with the current or alternative model e.g. outreach, no service, centralised service delivery in a major facility,
- driven by the need to examine practical, efficient and sustainable ways to meet clinical service demands, rather than investigating the latest piece of flashy technology,
- designed to be feasible for the team to undertake, considering the time and resource investment, skills and data available/acquirable for the evaluation,
- designed to use a small number of good quality, valid, reliable and (ideally) easily available / collectable outcome measures, rather than a large number of uninformative or flawed tools, and
- undertaken as part of a robust multi-site or coordinated evaluation strategy where possible.

(adapted from [Field, 1996:5](#); [Agboola et al, 2006](#); [Puskin et al, 2010](#))

Designing an evaluation plan or protocol

A formal evaluation should have key aspects outlined in writing prior to commencement. An evaluation conducted as a workplace-based quality improvement activity will generally refer to this as an “evaluation plan”. The evaluation plan may be a stand alone document or may be part of a broader implementation plan. The size and complexity of the evaluation plan may vary considerably depending on the scope, purpose and size of the project and the skills and support available to the team. It may be a few pages or a comprehensive and detailed document. A research project will generally call the document a “research protocol” and this will be a key component of the submission to the Human Research Ethics Committee (HREC) and to the Research Governance Officer (RGO) for site specific approval (SSA).

Evaluation project statement (project summary description)

The project statement outlines the concise purpose and parameters of the evaluation. The project statement may be just a couple of sentences and should include all or most of the following:

- the context of the evaluation e.g. new service, existing service,
- a concise description of the telehealth service including service context e.g. locations / facilities, frequency and structure of service, profession,
- a description of the form of telehealth e.g. real-time vide-conference, type of devices, specific peripherals or out-of-the-ordinary technology, recipient end support model such as delegated tasks delivered by an allied health assistant during / between telehealth sessions,
- the clinical population relevant to the service / evaluation,
- a broad statement of focus areas of the evaluation (informed by the evaluation question or aim – see next section), and
- the comparison group (if relevant).

A well-constructed project statement can be used in a range of documents including briefing notes, information sheets, newsletter stories and conference abstracts. It provides a consistent message about the project that all members of the allied health team can use when speaking with stakeholders.

Example:

This project will evaluate a six-month trial implementation of a weekly, scheduled telehealth service from Metrocity Hospital speech pathology department to Ruralton Primary Healthcare Centre for assessment and therapy intervention for children aged less than 5 years with speech and language problems. The evaluation will compare clinical outcomes, service access indicators, and parent-rated acceptability of the new telehealth service with the services provided to the same clinical group at Satelliteville MPHS using the existing monthly outreach model. The telehealth trial will employ real-time videoconference telehealth using desktop-based systems (EX60), and a lapel microphone at the Ruralton site.

Focus of the evaluation

The following are broad dimensions of service performance relevant to telehealth service evaluations. They are discussed in more detail in [Section 2](#).

- Access
- Effectiveness
 - Health outcomes
 - Safety and quality
 - Acceptability, satisfaction and appropriateness (patients)
 - Acceptability and adoption (health professionals)
 - Technology and functionality
- Efficiency and service outcomes
 - Inputs (i.e. costs, resources consumed) per output produced
 - Service outputs / value generated for the health of the community

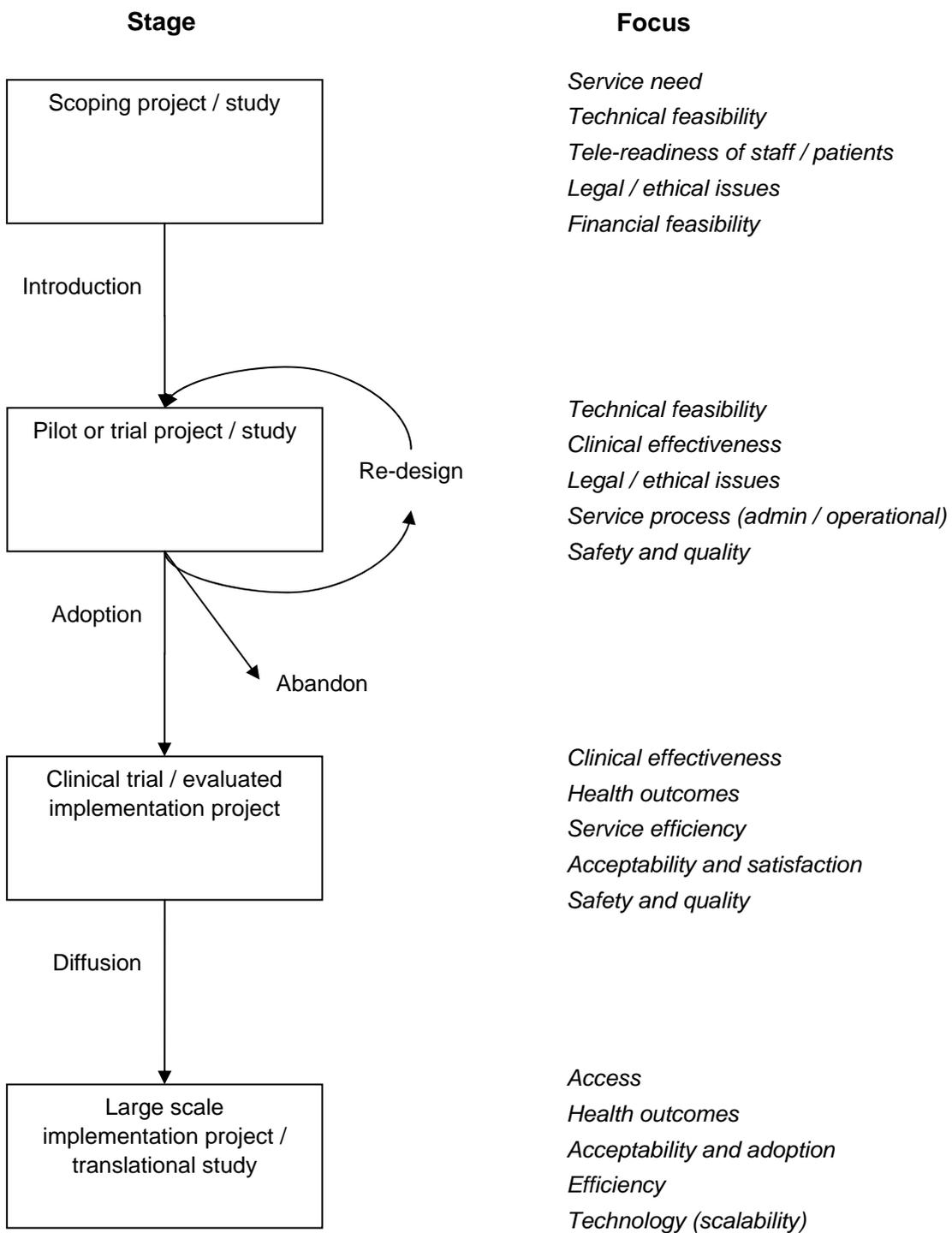
([National Health Performance Authority, 2012](#); [Field, 1996](#); [Nepal et al, 2014](#))

The healthcare team will need to determine the main focus area/s for their evaluation. Factors to consider include:

- What is the purpose of the evaluation?
- Who is driving or requesting the evaluation?
- Who are the major stakeholders and what do they need to know about your telehealth service?
- How will the outcomes be used?
- How will the evaluation produce benefits for patients, their families and the community?

The focus of the evaluation may be influenced by the stage of telehealth implementation. Figure 1 describes the changing focus of evaluation from scoping through to a large scale implementation of telehealth.

Figure 1 Focus of evaluation across a telehealth implementation cycle



(Adapted from [Weinhold et al in Gurtner & Soyez, 2015](#))

Evaluation aim or question

Terminology: aims, objectives and questions

The evaluation of a service model or clinical intervention strategy requires a clear description of the primary evaluation aim or question. An evaluation undertaken as a workplace-based quality improvement activity will generally have an “aim”, and one or more “objectives” that relate to the aim. These will be included in the evaluation plan that is developed as part of the broader project implementation plan. If conducted as research, the focus of the evaluation tends to be constructed as a “primary research question”, with potentially one or more “secondary research questions”. These questions will be reflected in the research protocol. Although there are some differences between the quality improvement and research constructs of an evaluation, the fundamentals are similar. Consequently, the Evaluation Resource Guide uses the terms question / aim and plan / protocol synonymously.

Irrespective of how it is framed, the starting point for an evaluation has to be a small number of concise and specific statements identifying what you wish to find out about the telehealth service. Their purpose is to clearly identify the focus areas for your information collection. This will drive the design and methods for the evaluation, and the indicators, tools and measures to be used.

Primary evaluation question or aim

Some telehealth services develop with the purpose and goal described in a formal project plan, implementation plan or business case. Where available, this document should be used to inform the evaluation question / aim. However, many telehealth services develop from a “one-off” treatment strategy for a client with access barriers and evolve as the health professional gain skills and confidence in the use of telehealth (Field, 1996). The Allied Health Telehealth Capacity Building Scoping Project (Queensland Health, 2015) identified that this is a common scenario for allied health telehealth services in Queensland. Consequently, the evaluation may need to commence with stakeholder discussions to articulate the goal or intended outcomes of the service, in order to then develop the evaluation question or aim that examines if they are being achieved.

Key points to consider when developing the evaluation question or aim are:

- What decisions will be informed by the results?
- Who will be the primary users of the evaluation results?
- What are the outcomes that the telehealth service is likely or trying to achieve?
- What opportunities may be developed by the evaluation?
- How does the evaluation fit in the existing evidence available for telehealth?

More specific questions that flow from the overarching ones above are:

- Will the results be used by health service management to inform continuation of the telehealth service model, expansion of the service model to other locations / professions / clinical areas, or the allocation of resources?
- Will the results be used by the clinicians / team members to inform their continuation or expansion of the telehealth service model?
- Will the results be used by the team to support a business case for additional resourcing, new equipment, or additional administrative / operational support for the telehealth service?
- Will the results be used by other health services to inform their decision to develop and implement a telehealth service model?

- Will the results be reported to the Patient Safety Unit or be included in accreditation or other HHS submissions to demonstrate the safety and quality of the telehealth service model?
- Will the results be used by the evaluation team for conference presentations, peer-reviewed papers or other research outputs?
- What current or emerging political or policy directions may the evaluation findings support the team to access e.g. new funding streams, collaboration opportunities?
- To what degree will the results duplicate or extend on the existing evidence available for the use of telehealth in this healthcare setting, clinical area or client group?

The questions above are adapted from [Field \(1996\)](#), which provides an extensive list of potential evaluation questions for telehealth services in the “Summary” chapter.

Secondary evaluation questions or objectives

Secondary research questions or evaluation project objectives should try to anticipate the queries that may arise from the primary finding, and collect information to explain or address them. For example, an allied health team finds that telehealth improves access to services for rural consumers, as measured by a 20% increase in occasions of service (OOS) in a Primary Healthcare Centre compared to the former outreach model. Does this mean the telehealth service is superior to the alternative service model? Should it be continued in its current form, altered or discontinued? By itself, the finding probably does not provide enough information to answer these key questions for the health service. The answer would depend on other factors, as access is only one indicator of health service performance. For example, the finding would look quite positive for stakeholders and decision makers if it were achieved with no reduction in clinical outcomes or patient satisfaction, and no increase in cost to the health system. However, the finding may be interpreted differently if it was associated with a 26% decrease in OOS in the regional hospital due to clinician’s time being directed to the telehealth service or was marked by a decline in clinical outcomes or increase in patient complaints or PRIMEs. The evaluation should try to anticipate these key informational requirements that will help to contextualise the primary finding and address probable supplementary question that your stakeholders will pose. Most telehealth evaluations should include question/s or objectives from a number of different dimensions of health service performance ([Field, 1996](#)).

Identifying and framing the question

There are a range of strategies available to assist a team to develop research questions or evaluation aims and objectives once the main focus for the evaluation is established. The support of an experienced researcher is particularly valuable in this phase.

Resources and tools: identifying aims, objectives or questions

- Queensland Government. Developing an evaluation framework at <http://www.qld.gov.au/web/community-engagement/guides-factsheets/evaluating/evaluation-framework.html>
Step 3 relates to identifying the key evaluation question and informational requirements.
- International Centre for Allied Health Evidence. iCAHE's Learning Hub: EBP e-learning resource at <http://www.unisa.edu.au/cahe/learninghub>.
Step 1 of the iCAHE evidence-based practice guide relates to formulating a well-built question. The site uses a number of best practice tools to developing a question including PICO and ECLIPSE.

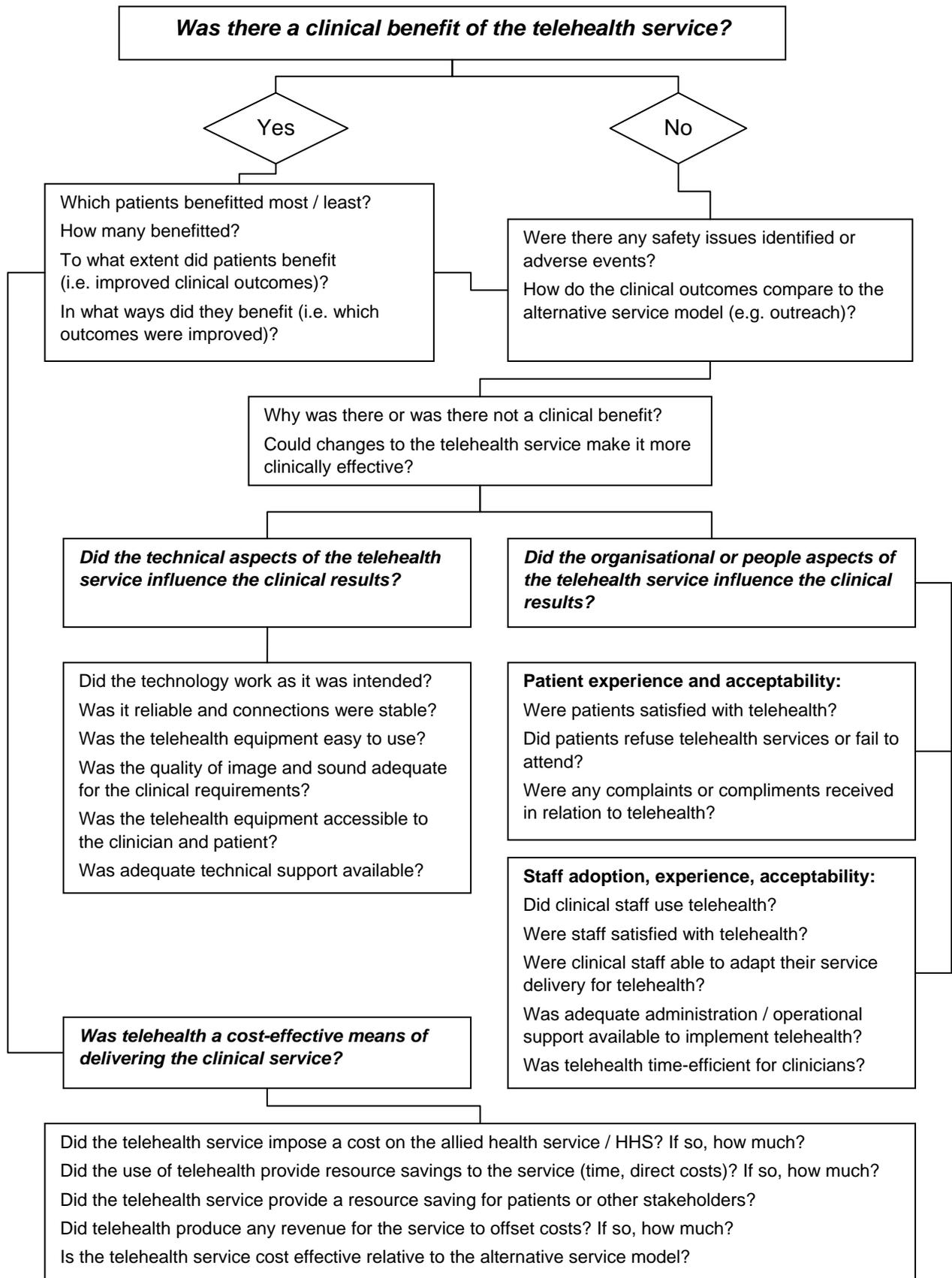
Examples of a team mapping possible question or focus areas for their evaluation

Two examples of the way a team may structure their brain-storming on evaluation questions are shown on the following pages. Both examples are based on published evaluation frameworks.

- Figure 2 provides an example of how evaluation questions may be developed and mapped during the development of an evaluation plan. This method involves identifying the key question that relates to the chosen focus of the evaluation – in this case, whether it provide a clinical benefit. The diagram shows how a range of secondary questions can be generated by following a logical process of anticipating possible outcomes. In this way the supplementary questions try to explain the potential reasons for the main outcome. Most “work backwards” to identify factors in the process of implementing telehealth, its acceptability, technological and administrative processes and resourcing requirements that may have influenced the observed clinical outcome. Please note that not all questions in this diagram would be covered by a single evaluation study – not without a sizable grant and an army of research students. A small workplace-based evaluation project may focus on a smaller number of these secondary questions in their evaluation plan.
- Figure 3 shows a different method of planning an evaluation. This example has used a service efficiency focus. From this diagram the aims and objectives of the evaluation plan would be generated, reflecting the informational needs of stakeholders identified in the model. Compared to Figure 2, this model has a more linear structure, following the path from resource inputs, to implementation processes, to outputs and indicators and finally to outcomes that should address the stated aim of the telehealth service. This method can work well as an adjunct to implementation project planning which would generally follow a similar linear sequence. Questions would then be generated to address the key evaluation findings required by stakeholders (in italics).

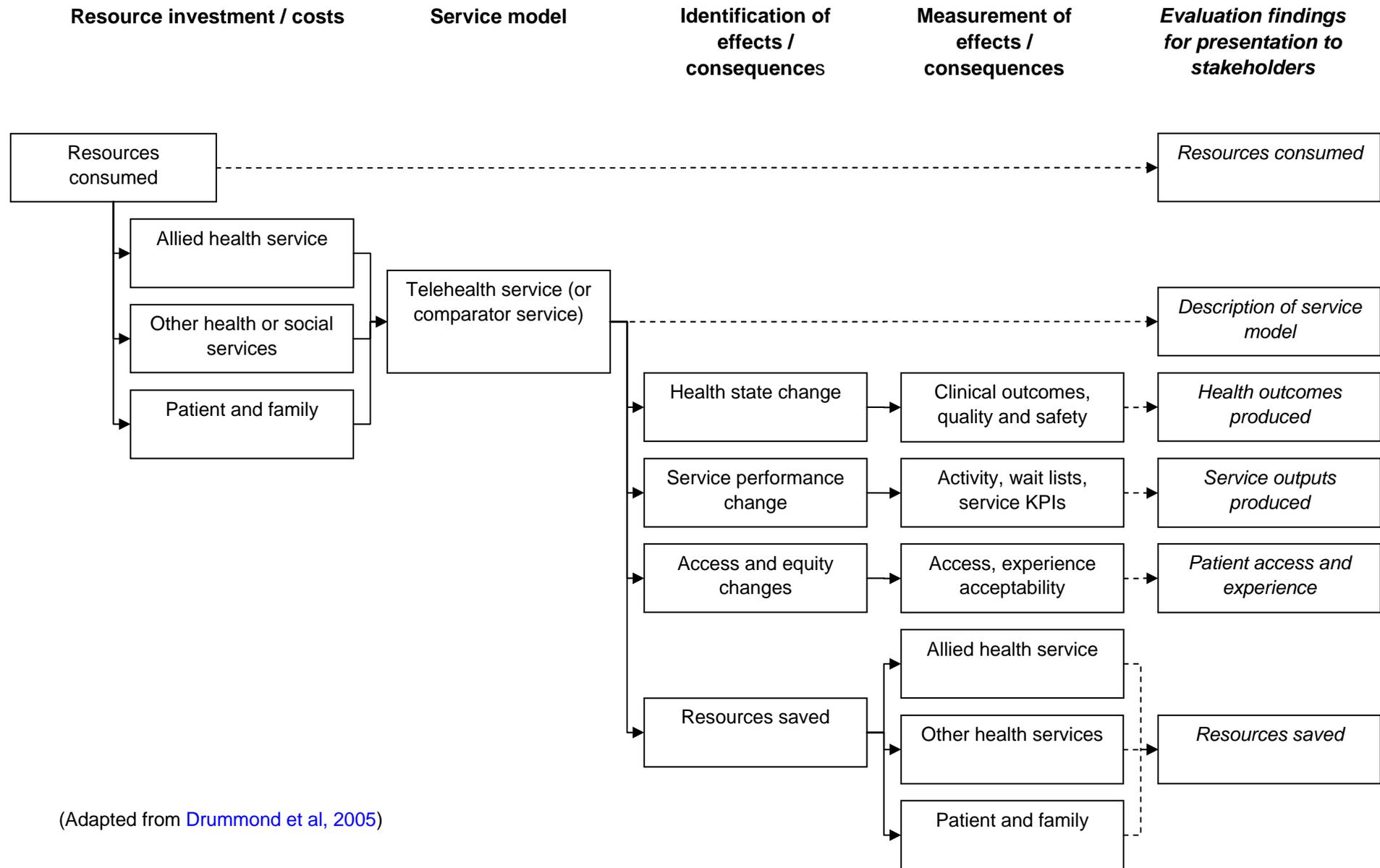
[Section 2](#) of the Evaluation Resource Guide includes a range of questions that may be applicable to the evaluation of telehealth, along with indicators and tools.

Figure 2 Example evaluation questions (clinical outcomes focus)



(Adapted from [Brear, 2006](#))

Figure 3 Example evaluation structure (service efficiency focus)



(Adapted from [Drummond et al, 2005](#))

Key decisions for the evaluation plan or research protocol

The design of the evaluation methods should relate directly to the evaluation project statement and the primary and secondary research questions, or the project aims and objectives. Key decisions for the evaluation are discussed below.

Which telehealth service will be evaluated?

Generally the choice of telehealth service to be evaluated is clear. However, the evaluation plan may limit the scope to a specific section of the service, rather than its entirety. This can make the evaluation easier, faster and less resource intensive to implement, and can improve the ability to identify a valid outcome if uncommon presentations or situations are excluded. However, the evaluation team need to consider the impact of further limiting what is often a small data set for allied health telehealth services; whether the excluded aspect of the service is important for stakeholders and decision-makers and whether excluding an aspect of the telehealth service could be viewed as unjustifiably skewing the evaluation outcome. Examples of limiting the scope of the service to be evaluated include:

- limiting the clinical group in the evaluation by presentation or demographic factors e.g. age range, excluding patients with some co-morbidities, and
- selecting specific sites to be included due to the availability of secondary (routinely collected) data, individuals willing to collect data or other operational factors (although you need to consider what biases are introduced).

Which service will be used as a comparator?

As identified in the [principles of effective evaluation](#), where possible the evaluation should compare the outcomes of the telehealth service with those of a similar clinical service that does not use telehealth. The use of a comparison group improves the strength of the evaluation, particularly when the results will be used to change existing clinical practice or inform resource re-allocation decisions. Options for comparator groups include:

1. “Pre and Post”

A single clinical population (client group) can provide a comparison if data can be collected for a period prior to the telehealth implementation (or is available for that period through secondary data sources like HBCIS, Monthly Activity Collection, PI5, iEMR, standardised clinical outcomes collected by the service etc). The pre-implementation period may lead to a comparison of two service models such as drive-in-drive-out outreach vs. telehealth, or may compare telehealth to no service. Comparing outcomes before and after the implementation of telehealth can be used for the evaluation if there are no major additional changes that occur between the “pre” and “post” measurement stage e.g. commencement / cessation of a related service such as visiting specialist, or other factors that may influence health / clinical outcomes relevant to the evaluation such as a major economic downturn or change in local population (e.g. mining sector boom / bust), change to diagnostic testing procedures leading to greater identification of cases in the population, etc. It should be noted that retrospective collection of health service data may involve an application to the Human Research Ethics Committee to waive consent and require an application for the release of confidential information for the purposes of research under Section 280 of the *Public Health Act 2005* (see Health Innovation, Investment and Research Office at https://www.health.qld.gov.au/ohmr/html/regu/aces_conf_hth_info.asp).

2. Different locations in the same service / staged implementation

Telehealth may be implemented in a staggered way across a service. For example, telehealth may be implemented by a regional podiatry service in one rural location as a trial, with a remaining rural site retaining the existing outreach model. The sites can be compared in the evaluation, assuming there are no major underlying differences between clinical populations in the sites e.g. health / clinical differences such as severity or prevalence of the condition or presence of co-morbidities, client engagement differences such as failure to attend rates, relevant service differences such as a comprehensive diabetes management service available in one location and not in another which would potentially impact a podiatrist's outcome measures, etc.

3. Different service

A service located in a different HHS or other area of your HHS could be used as a comparator if the clinical population and service context are similar. Factors listed above under "different locations" need to be considered, as does the process for obtaining permission to access data from another service.

4. Simultaneous subgroup comparison

A patient group is divided so some people receive the telehealth service and others receive standard care. A randomised controlled trial is one example of this method but less rigorous versions are also possible. The strength of this method is that it addresses potential errors introduced by studying groups in different places or times (as above). The allocation process to the groups needs to be carefully considered along with potential ethical issues associated with providing differing services to the same patient group.

When and for how long will the evaluation occur?

Timing

Factors to be considered in relation to timing an evaluation of telehealth services include:

- The stage of telehealth implementation will appropriately address the question / aim
Collecting data in the early phase of implementation when the team are "working out the bugs" of a new telehealth service can provide a false indication of the potential outcomes from an embedded ongoing service. Although it would be appropriate if the evaluation question relates to the success of the service design and implementation process itself.
- Choice of data collection period
Annual service demand cycles can impact the findings if the period chosen is different to the conditions in the majority of the year. For example service activity data collected during Christmas closures will differ from the rest of the year, and clinical presentations or outcomes data can be affected by seasonal symptom cycles for chronic respiratory conditions like asthma and COPD.
- People factors
Availability or interest of the staff doing the evaluation, or access to backfill or students to assist with data collection / analysis are practical considerations for timing an evaluation.
- Strategic or organisations factors
Opportunities may be generated by a team timing their evaluation planning with the lead up to a research funding round or an emerging organisation focus on telehealth service growth.

Duration

A team should consider the following factors in relation to the duration of the evaluation project, particularly the data collection phase:

- The number of cases / consultations required to develop meaningful findings
Insufficient data to answer the question or address the aim undermines the value of the evaluation. Evaluations using statistical tests (inferential statistics e.g. comparing two groups) to analyse results should consult a quantitative researcher when designing the evaluation to ensure it will have adequate *power* to detect an effect of the telehealth service if one exists.
- Representativeness of the data collection period
Longer data collection periods are less likely to be influenced by the timing of the evaluation (as discussed on the previous page) and provide more robust results.
- Practicalities and the choice of outcome measures
The timeframes required to measure the full anticipated benefits of telehealth may be extensive and so require the evaluators to consider issues of sustainability of the data collection over a long period (e.g. turnover of staff) or the use intermediate measures that can indicate a longer term outcome rather than directly measuring it. Examples of intermediate measures include clinical indicators such as average walking speed or self-reported number of falls in a 3 month period as an indicator for longer term falls risk or number / frequency of foot lesions requiring GP intervention as an indicator of longer term diabetic foot prognosis. These clinical measures are easier and quicker to collect than trying to track patients' falls / foot outcomes in the long term. Crucially, high quality research evidence needs to be identified that link the intermediate measure to the longer term outcome. Without a credible association between the clinical measure and the health outcome of interest, the value of collecting the intermediate measure is relatively limited if the team are trying to identify if telehealth can impact patients' health or future healthcare utilisation.

Which outcome measures will be used?

The outcome measures must assess the evaluation aim/objectives or questions.

Factors to be considered in relation to selecting outcome measures for an evaluation of telehealth services are described broadly below, with further details in [Section 2](#). Information in this section is based on National Health Performance Authority (2012) and Agboola et al. (2006).

- Valid
Validity relates to whether the outcome measure addresses the question or aim of the evaluation. Validated tools have been assessed to ensure they measure the variables they are supposed to. However, validation is specific to the population in which the validation study was conducted. Consequently, the evaluation team should consider the impact of clinical, demographic, cultural, geographic and other factors when deciding on the validity of a tool for their context.
- Reliable
Reliability relates to the accuracy of the measurement (data collection) process. Reliability can be undermined by errors in measurement tools, variations in how the measurements are done over time by the one clinician (intra-rater reliability) or between clinicians (inter-rater reliability), incomplete data sets (e.g. not considering the outcomes of patients who 'failed to attend') or an unrepresentative group of patients selected for the evaluation (e.g. low survey response rate).

- **Attributable**
The outcome measure used needs reflect a plausible and potential effect of the telehealth-delivered service. That is, any observation of the outcome measure should be attributable, at least in part, to the telehealth service. This can be challenging for many allied health interventions. For example an observed health outcome is rarely attributable to just one factor such as the use of telehealth or not.
- **Comparable**
The outcome measure should support a comparison between the groups included in the evaluation. For example, it should allow for meaningful comparison over time for “pre and post” designs, between locations for multi-site comparisons, or between clinical populations. This point underlines the importance of understanding how similar the groups are that are being compared. The evaluation may need to collect basic demographic (e.g. age, sex) and clinical information (e.g. presenting condition, indicators of acuity / severity or clinical complexity such as co-morbidities) to investigate the extent of similarity between the two groups.
- **Sensitive to the intervention being evaluated**
An outcome measure should be selected that has a realistic chance of showing an effect of the telehealth service if one is present. The outcome measure needs to be sensitive to differences between the telehealth service and the comparator service.
- **Feasible to implement**
An outcome measure should be feasible to implement given inevitable limitations of time and resourcing, and recognising the capacity and skills of the team.

Key practical questions to consider when deciding on outcome measures are listed below.

- How much time will the measurement tool require of their patient / family? Is the measurement tool likely to be acceptable to the patient?
- How much staff time will be required to administer the measurement tool for each eligible patient?
- How much time will be required to train clinicians to consistently administer the measurement tool? Is there a cost associated with this training?
- Are there any routinely collected measures that could be used?
A measure that is already collected for other purposes can limit the time required for data collection, can make ethics and research governance approval processes easier (as it is not a test used solely for research), supports sustainability of the evaluation strategy and can provide a pool of retrospective data which may decrease the total time required for the project. However, the measure must assess the question / aim of the evaluation. Choosing outcome measures that are quick and easy to collect can be inefficient if they cannot deliver an answer to your question. Rather than providing efficiencies, a measurement tool chosen just because it is already collected can waste everyone’s time by undermining the findings.
- What resources will be required to analyse the data e.g. system requirements and approvals to use analysis software such as SPSS? Are there any costs associated with analysis such as transcription or software packages?
- Are there any costs associated with purchasing the measurement tool or ongoing costs for its use? Costs may be associated with some outcome measures such as standardised tests or those requiring specialised equipment. These will need to be examined, costed and approved by the financial delegate as part of the quality improvement project plan or research governance application.

- Are there any intellectual property or copyright restrictions on the measurement tool? Some outcome measures, particularly standardised tests and survey instruments, have restrictive intellectual property provisions such as those that prohibit amendment of the tool. Check copyright or creative commons license terms prior to selecting an outcome measure.
- What skills will be required to collate and analyse the data? Does the team possess these skills or will they need to be sourced from elsewhere?

What is a meaningful evaluation outcome?

What evaluation outcome will mean the telehealth service is achieving its goal / purpose?

The design of the evaluation should not just consider the measurement tools, but also what outcomes are relevant to the patient, clinicians, health service, or other relevant stakeholders. If the data and findings generated by the evaluation are considered the “What?” question, then this is the “So what?” question.

So what...

do the findings mean for patients and community members?

do the findings mean for the service or team?

do the findings tell us about the continued use of the telehealth service in its current form?

needs to change to improve outcomes?

This aspect of the evaluation plan requires a team to consider not just the findings from the analysis but what they mean in the context of their service. This is the real outcome of an evaluation of a telehealth service – it is the “headline” in your report. However, often it is not considered adequately in the planning stage and then becomes swamped by pages of pie charts and brightly coloured graphs in a project report. “Burying your headline” on page 23 of the report, or cramming it into the rushed “Conclusions” slide of a presentation undermines the significant efforts an allied health team invests in completing the evaluation. To support its prominence, the evaluation plan should describe the outcomes or level of performance that will indicate that the service is achieving its goal and purpose (Puskin et al, 2010). Organisation / service unit key performance indicators (KPIs), information from the literature, benchmarking with similar services or feedback from key stakeholders such as senior managers can inform these decisions.

Factors to be considered when designing a project to produce meaningful measures of outcomes or performance are:

- Target or goal for outcomes

To what degree and in what way does the telehealth service need to be better than the alternative to indicate success?

As telehealth is often implemented as a partial substitute for an existing service model, the anticipated outcome need not be superiority of all outcome measures used in the evaluation. For example, a telehealth service that achieves an improvement in patient access (e.g. decreased waiting times), but no change in clinical outcomes or service costs, is likely to be seen as a positive outcome. A non-inferior clinical outcome coupled with a positive change in service efficiency, access or patient acceptability is a common goal for telehealth services.

For outcome measures that the team wants to improve by implementing telehealth, a specific target level should be defined before the project commences. For example, a team identifies one objective in their evaluation plan is to “Improve the waiting time for initial dietetics appointments in Ruralton”. If the waiting time decreases from 49 days to 48 days is the telehealth service achieving this objective? Technically yes... but was it really worth the time

investment in redesigning the service and is this outcome really that beneficial for clients? Probably not. The team should have more clearly established an achievement threshold at the start of the project, which would have assisted them to interpret the findings. For example an explicit target of a 15% decrease in waiting times would have allowed them to determine if a meaningful outcome had been achieved, not just a numerical one. Determining a target can be difficult. However, discussing and debating the target is a good way for a team to work out what they really want their use of telehealth to achieve for their patients and the health service.

- Perspective

Who needs to receive a benefit for the telehealth service to be considered a success?

Perspective relates to who is being considered in the scope of the evaluation. Common perspectives are the:

- team / local health service,
- the patient and their family,
- the HHS or wider health system,
- the local community or
- the entire society.

Small workplace-based evaluation projects typically focus on the first two. More complex or multi-site projects may include the wider system or society. Perspective is very important for evaluations that have an economic component i.e. an analysis of outputs relative to inputs. The perspective guides decision-making about which inputs (costs) and which outputs (benefits or effects) are counted in the design and how the outcome is interpreted. Perspective should be influenced by the purpose of the telehealth service and the primary audience for the evaluation. In this way it is closely linked to the development of the project statement and the evaluation aim or question.

A note on perspective, transfer costs and the pitfalls of assessing telehealth “efficiency gains”:

Allied health teams often identify the goal of implementing telehealth is “efficiency” (the quantity of outputs relative to the quantity of inputs) and cost savings for the service, particularly with regard to clinician travel time and expenses. However, implementing telehealth can transfer costs and benefits from one group or entity to another. This can complicate evaluations and requires an allied health team to think carefully about perspective when planning their outcome measures and data collection. In particular, to what degree is the flow of costs and benefits between the allied health team and other parts of the health service, other agencies or patients relevant to the research question or evaluation aim? Costs do not just mean out-of pocket expenses but can also include time spent travelling for patients or staff, and the consequent impacts for patients and their families such as needing to take time off work or arrange childcare, etc. These concepts are illustrated in the example on the next page.

For further information on the influence of perspective on outcomes of economic analyses of telehealth services see Wade, Karnon, Elshaug and Hiller (2010).

Note: Some teams in Queensland HHSs are already including an evaluation of costs relative to service outputs in their evaluations, although most are not engaged in a formal economic evaluation such as a cost-effectiveness or cost-utility analysis. Failing to consider the pitfalls of perspective in these workplace-based evaluations is common and introduces errors or limitations in findings that are often not apparent until the final stage of the analysis and report write-up. This can be frustrating for teams that put a lot of effort into collecting and analysing the data. The Evaluation Resource Guide provides some basic information on efficiency and productivity

indicators, potential problems and considerations. However information on conducting an economic evaluation is beyond the scope of this document. Teams interested in more formal or comprehensive economic evaluation of their service should consult with a health economist or researcher with skills in designing robust economic research methods.

Example: keeping track of costs and consequences

A rural hospital occupational therapist implements a fortnightly scheduled telehealth service to a remote primary healthcare centre, which she currently attends eight times a year by drive-in-drive-out outreach visits. Some clients from the remote area drive in to the rural hospital (accruing private transport costs, client/family travel time) to access her service between outreach trips.

The goals of implementing telehealth are to improve the access and timeliness of care for clients in the remote area and the efficiency of the occupational therapy service particularly with regard to travel. The occupational therapist therefore evaluates the service using (a) a clinical outcome measure, (b) the service output measures of occasions of service and time from referral to first appointment for remote area clients, and (c) an analysis of costs for her service and the remote facility (staff time that is directly client attributable and that is allocated to travel and telehealth preparation / operationalisation and vehicle costs foregone).

The occupational therapist is pleased to find a non-inferior clinical outcome and improved occasions of service and average waiting time for remote clients. However, she is disappointed to find that cost savings have not been identified and efficiency gains are quite limited, even with the increase in clinical activity. The data shows that gains in the occupational therapist's time and travel expenses from averted outreach trips have been partially offset by additional time required of her and remote health facility staff to run the telehealth service model including additional time to prepare for appointments, ensure clinical equipment is available in the remote facility etc.

Where are the cost savings and efficiency gains that she understood to be common outcomes of telehealth implementation?

The answer lies in the perspective used for each component of the evaluation. Clinical and access impacts for clients were captured in the data collection, but resourcing changes were solely examined from the health service perspective. Implementation of telehealth has reduced travel costs (time, expenses) for clients but this has not been considered in the analysis. The costs that were previously accrued by clients needing to travel long distances to access the occupational therapist between outreach visits have been partially transferred to the service with the introduction of telehealth. The occupational therapist recognises this and is reassured that this is consistent with her goal of delivering client-centred care. However she remains disappointed that it is not better reflected in the evaluation. To address this, she undertakes a supplementary audit of her remote area clients' records and identifies that the use of telehealth has saved 26 occasions of service that would have been provided in the rural hospital outpatient department if telehealth had not been used. She estimates 4014km travel has been averted for her clients and their families. To illustrate this finding she notes in her presentation to the HHS allied health management team that this is roughly the driving distance from Cairns to Broome. This is a powerful additional piece of information for the occupational therapist and service managers to consider in their assessment of the impact of the telehealth strategy.

Data collection and analysis

Data collection and analysis methods will be driven by the aim or question of the evaluation project and the design including the choice of outcome measures. The methods should be comprehensively scoped as part of the planning stage including considering skill and resource requirements for data collection and analysis. It is beyond the scope of this document to examine these methods. The following resources provide a basic introduction to the topic.

- Flinders University. “Data collection” section of Planning and Evaluation Wizard (PEW) at <http://www.flinders.edu.au/medicine/sites/pew/developing-a-project-and-evaluation-plan/evaluation-zone/data-collection/options.cfm>
- MEASURE Evaluation. Data Analysis training materials at <http://www.cpc.unc.edu/measure/resources/training/materials>

Forms of data, access requirements and availability varies between HHSs and services in Queensland Health. Contact should be made with data custodians and managers early in evaluation planning process to identify access processes and potential barriers, as well as any required training or tools needed to support data extraction.

Support for planning and design of telehealth evaluation

Planning an evaluation, particularly a more detailed or complex evaluation, may require access to skills from outside the clinical team. Consider the skill requirements for your evaluation as part of the planning phase and seek assistance from colleagues to fill gaps. Support may be available locally from positions listed below. Do not discount the willingness of individuals from outside your HHS, or from outside the health sector (e.g. universities or research centres) to support you, particularly if undertaking the evaluation as a workplace-based research project. Potential collaborators / contributors include:

- the [Health Practitioner Research Fellows](#) and other research support positions that can be identified through contacting the [Allied Health Professions' Office of Queensland](#) or through individual HHS allied health executive / workforce support offices such as [Metro North HHS](#), [Darling Downs HHS](#), [Cairns and Hinterland HHS](#), or [Metro South HHS](#).
- Workforce Development Officers, service development, quality improvement or data management positions in HHSs
- HHS [Telehealth Coordinators](#) or the [Telehealth Support Unit](#) (Healthcare Improvement Unit, Department of Health)
- University-based researchers or researchers attached to telehealth research centres such as the [Centre for Online Health](#), [Centre for Research in Telerehabilitation](#) or [Tropical Centre for Telehealth Practice and Research](#) may be interested in research collaborations with allied health professionals.

Section 2. Evaluation resources

Telehealth evaluation frameworks

There are a number of published evaluation frameworks for telehealth that can guide the development of a team's evaluation strategy. The frameworks are particularly useful to assist the team to consider the range of dimensions a telehealth evaluation might include such as technological, clinical / health, socio-economic, service / organisational, and environmental.

- Nepal, Jang-Jaccard and Alem (2014), working with the Commonwealth Scientific and Industrial Research Organization (CSIRO) developed a broad telehealth evaluation framework that covers six domains: health domain, telehealth services, telehealth technologies, communication technologies, environment settings, and socioeconomic. This paper includes mapping of published telehealth trials against these evaluation domains.
- The Institute of Medicine (US) Committee on Evaluating Clinical Applications of Telemedicine produced a Guide to Assessing Telecommunications in Health Care (Field, 1996). Although published some time ago the guide provides practical recommendations for healthcare teams that remain largely applicable to current telehealth services.
- The CHEATS Framework includes six areas of evaluation of information and communication technology in healthcare: clinical, human and organisational, educational, administrative, technical, and social. Each area has sub-categories of evaluation topics. The CHEAT Framework is described in Shaw (2002).
- Chang (2015) provides an overview of a number of telehealth evaluation frameworks including the CHEATS, the Nepal et al model, the logical framework approach (LFA or sometimes called a "Log Frame") and a fishbone diagram approach.
- Use of the RE-AIM Evaluation Framework for telehealth services is described in Agboola et al (2014). The RE-AIM framework is used broadly in health care program evaluation and assesses the implementation of new programs across five domains: reach, effectiveness, adoption, implementation and maintenance.
- Agboola et al. also presents a "real-world" approach to telehealth service implementation including evaluation, reflecting a logical framework approach. The paper outlines a six-stage plan for telehealth implementation that includes an example application of the framework to a remote tele-monitoring program for diabetes.
- The Institute for Broadband-enabled Society (IBES) (2013) published an evaluation framework for telehealth that covers four domains: patient control, clinician quality of care, organisational sustainability, and technology capability. The framework includes an extensive list of outcome measures clustered into these four domains.
- The I2I-A knowledge translation planning tool is a seven-stage guide to support the implementation of evidence in clinical practice. It is not specific to the telehealth but may be a useful framework for moving telehealth models from the pilot to clinical application stage. An example of the use of the framework in dementia care is available through the Australian Government-funded Dementia Collaborative Research Centre (Goodenough & Young, 2014).

Evaluation of telehealth readiness

The focus of the Evaluation Resource Guide is primarily evaluation of an implemented telehealth service. However, there may be value in the planning phase of a telehealth service to evaluate the telehealth readiness (sometimes called “telereadiness”) of patients, staff, other stakeholders and the organisation.

Telehealth readiness assessment tools and resources

[Focus Group Framework and Key Informant Interviews](#) (instructions and questions) – Public/Community, Patient and Practitioner versions ([Alliance for Building Capacity, 2002](#):p179-188)

[Organisational Telehealth Readiness Assessment Tool](#) based on Jennett P, Health Telematics Unit, University of Calgary, Telehealth Readiness Assessment Tools ([NSW Agency for Clinical Innovation \[ACI\], 2015](#):p17-24)

The Cunningham Centre [Allied Health Telehealth Training Package](#) includes information and assessment tools for telereadiness (Service Redesign module, unit 1.4 – available in 2017)

Evaluation of telehealth implementation

The evaluation resources in this section are presented in themes related to the topic of the evaluation question / aim. The themes have been influenced by the National Health Performance Authority’s Performance and Accountability Framework (2012), and the telehealth evaluation frameworks proposed by Field (1996), Agboola et al. (2014) and Shaw (2002).

Access

Effectiveness

- [Safety and quality](#)
- [Health outcomes](#)
- [Acceptability and appropriateness \(patients\)](#)
- [Acceptability and adoption \(health professionals\)](#)
- [Technology and functionality](#)

Efficiency and service outputs

- Inputs (i.e. costs, resources consumed) per output produced
- Service outputs / value generated for the health of the community

Access

Overview

Access is an important area of telehealth evaluation as it is central to the purpose of telehealth services. Access indicators are used to examine equity and effectiveness of health services (Productivity Commission, 2016). Equity questions relate to whether telehealth is a barrier or enabler of service access for clients, particularly clients in specific target groups. Effectiveness questions focus primarily on the impacts of telehealth on timeliness of care, and any related clinical, health or service outcomes.

Example questions

Access and equity

Compared to the alternative service model, was the use of telehealth associated with differences in utilisation of the allied health / specific profession service

- by specific clinical target groups e.g. high-risk groups relevant to the service?
- by specific social or cultural target groups?

Compared to the alternative service model, was the use of telehealth associated with differences in failure to attend rate for the first appointment and/or subsequent appointments?

Compared to the alternative service model, was the use of telehealth associated with differences in utilisation of health services overall including

- referral rates from the allied health professional to other services e.g. other professions, social services?
- attendance or failure to attend at other services such as specialist appointments?

Access and effectiveness

Compared to the alternative service model, was the use of telehealth associated with differences in

- average waiting time for an initial assessment for all clients referred to the services / for Category 1 (or any nominated category) clients referred to the service?
- the frequency that clients accessed the service?
- the duration of the episode of care?
- waiting list numbers for all referrals or specific category of referrals?
- the number of new OOS relative to review OOS (new:review)?
- average number of OOS per episode of care?

For the questions above, an important supplementary question would be...

To what extent does the difference in access (i.e. OOS/episode of care, OOS frequency etc.) impact clinical or health outcomes?

This could be addressed by collecting clinical or health measures or through modelling based on evidence in the literature or from clinical guidelines or best practice resources.

Outcome measures and evaluation resources: summary points

A range of access indicators are available, many of which are collected as part of routine health service data collection through information management systems such as HBCIS. Telehealth data is captured and reported by HHSs in the Monthly Activity Collection (MAC). For information on telehealth data collection and reporting including business rules, refer to the Telehealth Support Unit, Healthcare Improvement Unit at

<http://qheps.health.qld.gov.au/caru/telehealth/data.htm>.

Refer to [Table 3 Outcome Measures: tools and indicators](#) for evaluation resources and outcome measures relevant to access.

Safety and quality

Overview

Safety and quality are elements of the effectiveness of the telehealth service. Safety relates the “avoidance or reduction to acceptable limits of actual or potential harm from health care management or the environment in which health care is delivered” (AIHW, 2016). Quality is a multi-faceted concept that reflects the extent to which a health service achieves its goal of improving the health of the population (AIHW, 2016).

Example questions

Compared to the alternative service model, was the risk of an adverse event different for the telehealth-delivered service?

Were any clinical or occupational health and safety risks identified for the telehealth service during the trial? If so, what were they?

What aspects of the telehealth service were associated (positively or negatively) with the risk of an adverse event or poor clinical outcome?

What forms of adverse event or poor clinical outcome were associated with the implementation of the telehealth service?

To what extent do the clinical outcomes produced by the telehealth service compare to best practice standards for (this patient group)?

Outcome measures and evaluation resources: summary points

The primary safety and risk data source in Queensland HHSs is PRIME. This may be supplemented by qualitative data collection strategies like interviews with staff or patients.

Quality is a broad, multi-faceted assessment of success of the telehealth service. Consequently, it is linked to other areas of evaluation in this section including health outcomes and acceptability. The measures used to assess quality may include clinical indicators, timeliness or frequency of services or patient satisfaction. Quality evaluation generally uses a best practice standard for performance such as profession-specific clinical standards or relevant telehealth guidelines e.g. A Blueprint for Telerehabilitation Guidelines (American Telemedicine Association, 2010). Quality evaluation can involve comparing outcome measures to a published clinical guideline or clinical standards, or benchmarking against similar services.

Refer to [Table 2 Outcomes Measures: repositories and databases](#) and [Table 3 Outcome Measures: tools and indicators](#) for resources and outcome measures relevant to safety and quality.

Health outcomes

Overview

Health outcomes are an element of health service effectiveness. Health outcome measures include indicators of a person's health status such as life expectancy, likelihood of contracting a disease, risk of lower limb amputation secondary to diabetes, or the extent of disability following a head injury. Improving health is the purpose of a service, but health status is influenced by a range of factors including health behaviours, socio-economic determinants, health beliefs, the environment etc. Limitations of using broad health outcome measures in telehealth evaluation projects are:

- Allied health involvement in patient care can be one of a number of factors that contribute to a health outcome. Allied health services commonly produce intermediate outputs in the complete care pathway. For example, physiotherapy intervention will contribute to a patient's mobility and function following a total knee replacement, but there are other factors including the surgery, risk of infection or prosthesis failure, patient goals and motivation, effective pharmacological management of symptoms, etc. that will also influence the outcome.
- Measuring health outcomes for some conditions often extends beyond the feasible duration of an evaluation project. For example, dietetics interventions related to diet modification education and nutrition counselling for a client with newly diagnosed diabetes may take months or years to manifest in terms of health outcomes e.g. mortality and morbidity indicators such as disease progression to dialysis or amputation. The dietetics service is also only one of many factors influencing these outcomes (as discussed in the point above).

Clinical indicators are often used in service evaluation projects as an alternative to health outcome measures. They provide an intermediate output from a service or intervention that can be more feasible to measure. Clinical indicators are most powerful when the evaluation team can link them through established evidence to risk or prognostic factors for health or service outcomes e.g. association between walking speed ([Quach et al, 2011](#)) and falls risk in older adults, or association between medication adherence and hospitalisation risk and total healthcare costs for patients with diabetes ([Sokol et al., 2005](#)).

Example questions

Compared to the alternative service model, was the use of telehealth associated with a difference in the nominated:

- physical signs or symptoms e.g. pain, range of movement, body weight, biochemistry?
- psychological or behavioural signs and symptoms e.g. anxiety, depression?
- measure of functional performance e.g. mobility, independent self-cares?
- indicator of social function or engagement e.g. participation in work, leisure activities, family engagement?
- health-related behaviours e.g. nutrition choices, adherence to medication or exercise regimens?
- health outcome e.g. mortality, disease progression?
- indicator of quality of life?

Compared to the alternative service model, to what extent does the telehealth service model support compliance with best practice or benchmarking outcomes for... (relevant clinical indicator or health outcome listed above)?

Outcome measures and evaluation resources: summary points

There are hundreds of clinical outcome measures covering every aspect of practice of the allied health professions. It is beyond the scope of this document to examine these outcome measures in detail. There are a number of good quality online resource repositories that can assist an evaluation team to identify an outcome measure that meets their needs (see [Table 2 Outcomes Measures: repositories and databases](#)). A search of published studies or clinical guidelines in the area can also assist a team identify an outcome measure.

Acceptability, appropriateness and adoption

Overview

Acceptance, utilisation or adoption, preferences, perception of risks and benefits, and even perceived effectiveness and efficiency may influence an individual patient or clinician's satisfaction with a telehealth service (Whitten & Love, 2005).

Collection of basic data on acceptability and satisfaction is often included in telehealth evaluation plans. This is usually done through a satisfaction survey or short interviews. Examining this aspect of the telehealth implementation is logical and appropriate as healthcare is about people and a health service that is not acceptable to its users cannot be successful. However, when designing the evaluation plan an allied health team should consider the likely output from a satisfaction survey. Satisfaction with allied health services in Queensland HHSs is generally high. A number of evaluations of telehealth-delivered allied health services in Queensland have also demonstrated high overall satisfaction. This is a good outcome in relation to valuing the service, but can be problematic if the allied health team is trying to assess whether the implementation of telehealth produces a change that is worth continuing, needs revision or needs to be scrapped completely. Essentially, there is often little difference between one allied health service model and another in terms of the overall patient satisfaction rating. So this does not assist decision-making if satisfaction is used as the only or primary element of the evaluation. Patient and staff satisfaction is generally more appropriate as a secondary question or objective of a telehealth service evaluation project. It can be highly instructive for a team in terms of interpreting a primary evaluation outcome related to clinical effectiveness or service outputs. Qualitative data can also assist with generating actions and solutions, and planning improvements to the service.

Agboola and associates (2010) identified key themes demonstrated in the research literature that relate to patient and health professional satisfaction and acceptance of telehealth for clinical services. The themes indicate potential focus areas for research questions or evaluation aim. For patients, the themes included technological literacy, intrusiveness of the technology in the clinical session, user interface design, simplicity, and usability of the technology. For health professionals the themes included integration of telehealth with existing workflow, appropriateness of delegation (where relevant to the model), electronic medical record integration, and ease of healthcare program implementation using telehealth, and readiness to change. Agboola et al. also recommended using both qualitative and quantitative data to investigate acceptability and satisfaction. That is, asking relevant stakeholders for their views and perceptions, and also measuring behaviours that may indicate a lack of acceptance such as failure to attend rates for patients and an audit of telehealth use for clinicians.

"Patient experience" differs from satisfaction. It provides a more detailed evaluation of the service from the patient's perspective than a simple satisfaction survey. Associations have been demonstrated between patient experience and clinical safety and effectiveness (Doyle, Lennox & Bell, 2013). Patient experience can be assessed by using validated tools that examine multiple facets of the healthcare experience, or through in depth interviews. The Doyle et al paper includes information on a range of evaluation tools. Advice or collaboration with an experienced qualitative researcher is recommended for evaluations that include patient experience.

Example questions

Acceptability, perceptions, satisfaction, experience - patients

How satisfied were patients with the service provided by telehealth?

What aspects of the telehealth service did patients regard positively? Negatively?

To what extent did patients regard the technical aspects of telehealth (sound quality, picture quality) as adequate and acceptable for the clinical session? What aspect needs improvement to increase the value and acceptability of the telehealth service?

To what extent did patients regard the administrative and operational aspects of telehealth (scheduling and rebooking, patient reception, instructions/assistance for use of the technology) as adequate and acceptable for the clinical session? How should it be changed to improve the patient's experience of the telehealth service?

To what extent and in what ways do patients feel the use of telehealth impacted on their health / ability to achieve their health goals / patient-health professional interactions (e.g. communication and collaboration, rapport)?

To what extent did patients feel their privacy and confidentiality was adequately addressed?

When offered the telehealth service, how many clients declined or requested an alternative option for accessing the service?

Compared to the alternative service model, was the use of telehealth associated with differences in failure to attend rate for the first appointment and/or subsequent appointments for the allied health service? Were FTA rates different for different groups (e.g. different clinical presentations, cultural or demographic groups)?

What do patients and their families regard as the barriers / enablers / advantages / disadvantages to using telehealth for their healthcare?

What improvements do patients regard as necessary to make the telehealth service more acceptable or appropriate?

What was the patient's experience of accessing allied health care through telehealth? What were the positive aspects and negative aspects?

What was the patient's experience of accessing allied health care through telehealth with regard to ... (individual aspects such as clinician-patient collaboration or trust; capacity to actively participate in care; confidence in the service and perception of outcomes; or the degree to which the service met expectations etc.)?

(some questions adapted from [Agboola et al. 2014](#); patient experience questions influenced by [Doyle, Lennox & Bell, 2013](#))

Adoption, acceptance, engagement, perceptions – health professionals / staff

How satisfied were staff with the service provided by telehealth?

What aspects of the telehealth service did staff regard positively? Negatively?

To what extent did clinical staff regard the technical aspects of telehealth (sound quality, picture quality, set-up and ease of use, connectivity) as adequate and acceptable for the clinical session? What needs to change to improve the clinical appropriateness and value of telehealth for this service / client group?

To what extent did staff regard the administrative and operational aspects of telehealth (scheduling and rebooking, patient reception and assistance to set-up and connect) as adequate and acceptable for the clinical session? What needs to change to improve the acceptability / adoption of telehealth in this team?

To what extent and in what ways did clinical staff view the use of telehealth impacted on patient-health professional interactions (e.g. communication and collaboration, rapport)?

To what extent and in what ways did clinical staff view the use of telehealth impacted on the ability to achieve client goals / clinical outcomes?

Outcome measures and evaluation resources: summary points

Most measurement tools used in this area elicit subjective views from participants. The methods and tools can vary considerably in terms of structure and complexity. Qualitative data collection with limited structure (e.g. unstructured in-depth interview) can be time-consuming and methodologically complex to rigorously analyse. Highly structured tools (e.g. multiple-choice surveys) can provide data that is relatively quick and simple to aggregate, although it may need some quantitative analysis skills to generate the findings. Time investment for a highly structured survey is required in the design and testing stage. Poorly developed tools can fail to collect some relevant data if it was not considered in the design stage. They can also be a poor option for patients with English as a second language or for culturally or linguistically diverse groups as it is difficult to design an appropriate survey tool. The team may need to engage with cultural or linguistic experts in this circumstance such as Indigenous Health Workers for evaluations in Aboriginal or Torres Strait Islander communities.

A recent systematic review identified that tools to assess patient satisfaction with telehealth generally lack rigorous testing. The authors encouraged health professionals to carefully consider the application and relevance of available tools for their purpose and clinical population (Iseli et al, 2013). The availability of tools for assessing staff satisfaction is more limited.

Table 1 Examples of acceptability, adoption, satisfaction evaluation tools for telehealth services

Tool	Validation	Administration & Analysis	Comment
Survey of patient satisfaction (Lopez, 2011)	Columbia (rural area), phone survey	8 questions, can be completed verbally	
Telemedicine Satisfaction and Usefulness Questionnaire (TSUQ) (Bakken et al, 2006 – see Table 1)	New York state (rural and urban), diabetic patients over 55 years.	28 item discrete choice.	Requires revision for use in other clinical populations.
Patient Evaluation Survey (ACI NSW Health, 2015: p29)	No information	7 item discrete choice, 2 item short response.	
Telehealth Sample Patient Survey (Nursing & Midwifery Telehealth Consortia)	No information	6 questions, mix of discrete choice and short free text responses.	Includes patient-reported travel averted

Tool	Validation	Administration & Analysis	Comment
Telehealth Consumer Survey Template (Nursing & Midwifery Telehealth Consortia)	No information	20 questions, approximately 10 minutes, most questions are discrete choice.	Designed for Survey Monkey®
User Satisfaction with Asynchronous Telemedicine (patient and staff questionnaires) (Von Wangenheim, et al, 2012)	Brazil (rural, urban). Questionnaire validation limited. Tele-echocardiology service.	Patient: 7 item discrete choice. Staff: 4 item discrete choice	Appendix 1 includes the questionnaires
Telehealth Patient Satisfaction Survey (Darling Downs HHS)	No information	17 item, mostly discrete choice	
Telehealth Clinical Satisfaction Survey (Darling Downs HHS)	No information	17 item, mostly discrete choice	For health professionals
Survey and interview instruments based on the Technology Acceptance Model (health professionals). Examples of instruments: Chismar & Wiley-Patton, 2002 ; Gagnon et al, 2012 or Asua et al, 2012 – see electronic supplementary material for copy of survey.	Different populations depending on tool - see review in Holden & Karsh, 2010 . TAM is not specific to telehealth but has demonstrated applicability.	Various tools based on the Technology Acceptance Model (TAM)	TAM is not specific to telehealth so criticised for lack of health focus/content
Patient experience data collection methods NSW Agency for Clinical Innovation, 2013 .	N/A	Various methods	

Technology and functionality

Overview

The success of telehealth as a service enabler is inextricably linked to the functionality and usability of the technology. Evaluation of the technological aspects of telehealth generally relate to its “fitness for purpose”.

Example questions

How many scheduled appointments were adversely affected by technological failure or problems?

How frequently were scheduled appointments abandoned and rescheduled due to technological failure?

How frequently were assessments / interventions found by the health professional to be inadequate when delivered by telehealth, requiring duplication or follow-up face-to-face?

To what extent did patients regard the technical aspects of telehealth (sound quality, picture quality) as adequate and acceptable for the clinical session? What aspect needs improvement to increase the value and acceptability of the telehealth service?

To what extent did clinical staff regard the technical aspects of telehealth (sound quality, picture quality, set-up and ease of use, connectivity) as adequate and acceptable for the clinical session? What needs to change to improve the clinical appropriateness and value of telehealth for this service / client group?

Outcome measures and evaluation resources: summary points

Outcome measures relevant to this area may overlap with those in the [acceptability / appropriateness / adoption](#) area discussed earlier in this section. Descriptive data may be sourced in a survey, focus group or interview format that covers a number of aspects of patient / clinician satisfaction, including technological aspects. Technical capabilities and functionality of the telehealth system, applications and hardware that impact clinical tasks may also be assessed through measures collected to assess the clinical or health outcomes.

Technical aspects of this evaluation topic such as assessing bandwidth requirements for adequate image transmission, are outside the scope of the Evaluation Resource Guide to examine. They are specific to the technology being tested and the clinical application. Telehealth support staff in HHSs or the [Telehealth Support Unit](#) (Healthcare Improvement Unit, Department of Health) can provide guidance on this aspect of an evaluation.

Refer to [Table 2 Outcomes Measures: repositories and databases](#) and [Table 3 Outcome Measures: tools and indicators](#) for some resources and outcome measures relevant to technology and functionality.

Efficiency and service outputs

Overview

“An efficient health system achieves much relative to the resources at its disposal” (World Health Organisation, 2000). The concept of efficiency is sometimes confused with cost minimisation and viewed negatively by clinicians as merely a strategy to achieve budget targets. However, efficiency is a means to maximise health service quality and clinical outcomes. Evaluation that includes an efficiency element supports decision-making on how resources should be allocated and expended to achieve the greatest possible outputs from the service (health gains for patients and the community). Efficiency evaluation involves sourcing information on the output/s that the telehealth and comparator service produce relative to their respective resource inputs.

Inputs can include funding, clinician time or salary, capital costs such as equipment and infrastructure, staff or patient travel direct costs or time, and other out of pocket expenses for the patient and their family. Inputs can be collected as direct financial units (expenses associated with purchasing telehealth equipment, travel expenses for an alternative outreach model) or in other units such as staff time or travel distance. Staff time can be used for the comparison between the telehealth service and comparison service or could be translated to monetary units. The latter is particularly useful for telehealth models that include some form of workforce redesign such as delegation to an allied health professional at the recipient site.

Service outputs for a telehealth and comparator service model can include [access](#), [quality](#), [health outcomes](#) and [acceptability / satisfaction](#) measures already discussed. Outputs relevant to this evaluation topic can also include service activity (occasions of service, procedures performed etc.), revenue or savings generated, and other measures of productivity of a team. Several examples of input and output questions are listed below, although would need to be made more specific with the addition of relevant timeframes and details of the clinical group and the telehealth and comparator service model. Perspective is an important consideration for capturing inputs and outputs (see [Section 1](#) for discussion of perspective).

Efficiency and the related concept of cost-effectiveness require questions that include a comparison of outputs relative to inputs (i.e. unit output per unit input). Remember, the alternative service model in the evaluation questions below may be ‘no service’ where one does not currently exist.

Example questions

Inputs

What is the average out of pocket cost per consultation associated with patients accessing the telehealth and comparator service and to what degree do patients regard costs as acceptable?

What are the total monthly costs (or cost per consultation or episode of care) incurred by the allied health team delivering the (specified) service using the new telehealth model compared to current outreach model in terms of staff time allocation, travel, equipment and data/connection costs?

Compared to the alternative service model, what is the average allocation of HHS staff time (administration, allied health, nursing) in the Ruralton Primary Health Care Centre and Metrocity Speech Pathology Department required to implement the telehealth service?

A note on the question above: the majority of “costs” in a health system relate to workforce, primarily wages and oncosts. A basic evaluation of resource inputs into a telehealth service could

be confined to comparing staff time allocation between telehealth and the alternative service model, particularly where telehealth equipment already exists (i.e. the cost has been incurred by the health system irrespective of the allied health team's decision to use the equipment) and there are little or no existing travel costs (i.e. no or very limited service currently offered). This can simplify the approach to collecting input costs.

Service outputs

Compared to the alternative service model, what is the average clinical activity (and/or revenue) generated per month for the telehealth service?

Is there an association between the implementation of telehealth in (location) for (profession and clinical group) and GP presentations / ED presentations / hospital readmissions / length of stay / (other service indicator)?

Efficiency and cost-effectiveness

Compared to the alternative service model, what is the average net cost per consultation / episode of care incurred by the allied health team (or health service) of the telehealth service in terms of travel costs, staff time/salary and equipment and data/connection?

A note on the question above: 'average net costs' would consider input costs and savings or revenue offsets.

Compared to the alternative service model, what is the average net cost per consultation / episode of care incurred by the patient and family of the telehealth service in terms of travel costs, time and equipment and data/connection?

Compared to the alternative service model, what is the average health professional and administration hours per month / episode of care / consultation allocated to the telehealth service?

Compared to the alternative service model, what is the average cost to the allied health team (defined in relevant terms as per previous questions e.g. staff time, travel expenses, telehealth equipment and data etc.) required to produce a 20% improvement in (clinical outcome e.g. average walking speed, reduction in falls risk as assessed by the FROP-Com, adherence to newly prescribed medication regimen, lower limb oedema on circumferential measures, DASH score, etc.)?

Outcome measures and evaluation resources

Refer to [Table 2 Outcomes Measures: repositories and databases](#) and [Table 3 Outcome Measures: tools and indicators](#) for resources relevant to efficiency and service outputs.

Outcome measures

Table 2 Outcome measures: repositories and databases

Database or resource	Publication details	Tools for....
National Quality Measures Clearinghouse Measures Matrix	Agency for Healthcare Research and Quality (US) http://www.qualitymeasures.ahrq.gov/matrix.aspx	Quality and safety; Access; Clinical / Health outcomes; Service efficiency and process; Acceptability and patient experience; Health economic evaluation.
Australian Centre on Quality of Life Directory of Instruments	Australian Centre on Quality of Life http://www.acqol.com.au/instruments/instrument.php	Health outcomes; Quality of life
Rehabilitation Outcome Measures Database	Rehabilitation Institute of Chicago, Centre for Rehabilitation Outcomes Research, North-western University Feinberg School of Medicine Department of Medical Social Sciences Informatics group. http://www.rehabmeasures.org/	Clinical / Health outcomes (physical, functional, psycho-social, cognitive); Quality of life.
RAND Health Surveys	Rand Corporation http://www.rand.org/health/surveys_tools.html	Clinical / Health outcomes; Patient experience.
Meta-synthesis of outcome measures used in telehealth studies	Institute for a Broadband-enabled society (IBES), 2013. Note: unlike the sites above this publication is a list of available tools and measures, rather than a repository.	Clinical / Health outcomes, Acceptability and Satisfaction, Technological capability, Service / Organisational sustainability.

Table 3 Outcome measures: indicators and tools

Outcome measure / indicator / resource	Details	Data sources <small>(See Table 4 for more information of data systems)</small>	Relevance	Assumptions, limitations or considerations
Occasions of service (OOS)	Total telehealth OOS, telehealth relative to face-to-face or total OOS (irrespective of mode of OOS delivery)	Clinical data systems e.g. HBCIS, Monthly Activity Collection (MAC)	Access Efficiency and service outputs	Can be sensitive to casemix (presenting conditions, complexity, severity) so may require analysis in cohorts defined by presenting condition (e.g. DRG, ICD codes), acuity/severity (e.g. service category) or other criteria. Can be sensitive to differences in clinicians or service pathways / practices, or to timing of data collection (e.g. holiday periods)
New:review OOS	Increased new OOS relative to review OOS can indicate greater access (as more new clients can attend) and also an overall change in workforce or service model.	As above	Access Quality Efficiency and service outputs	Quality can be evaluated if benchmarked to an evidence-based standard with information on the clinical impacts of meeting/not meeting standards.
OOS per episode of care (EOC) or frequency of OOS		As above	Access Quality Efficiency and service outputs	Quality and efficiency require careful interpretation – what does an increase or decrease in OOS/EOC mean for the patient, service? For example, more care does not mean better care. Need further evidence to show clinical value of a change in OOS/EOC. Quality can be evaluated if benchmarked to an evidence-based standard with information on the clinical impacts of meeting / not meeting frequency / timeliness of care standards.
OOS by clinical category or condition (e.g. DRG codes)		As above +/- chart audit	Access Efficiency and service outputs	

Outcome measure / indicator / resource	Details	Data sources (See Table 4 for more information of data systems)	Relevance	Assumptions, limitations or considerations
Waiting time: days elapsed between referral and initial OOS	Examines changes in timeliness of assessment. If best practice standards / research evidence are available, can be used to model the impact on clinical outcomes if relevant.	HBCIS / other outpatient information system, chart audit, or spreadsheet	Access Quality Efficiency and service outputs	Quality can be evaluated if benchmarked to an evidence-based standard with information on the clinical impacts of meeting / not meeting standards. Sensitive to timing of data collection especially “snapshot” or serial snapshot collection.
Waiting list	Number of clients on waiting list in total, by clinical prioritisation category, presenting condition or other criteria.	As above	Access	Sensitive to timing of data collection especially “snapshot” or serial snapshot collection.
Fail to attend (FTA) outpatient appointment	FTA rate can indicate barriers to accessing the service or patients dissatisfaction with the service. Useful to compare telehealth versus face-to-face / outreach. FTA rate can be useful to examine differences between populations in a service e.g. Indigenous / non-Indigenous patients, town / rural clients, aged / working adults / children.	As above	Access Acceptability Efficiency and service outputs	Can indicate a potential access barrier exists but will require qualitative data collection to explore the nature of the barrier. Can be sensitive to timing of data collection if examined as a trend e.g. affects of holiday periods.
Patient transport costs (private)	Out of pocket costs (petrol, parking, bus ticket). Can do cost modelling of ‘wear and tear’ based on per/km etc. For basic evaluations out of pocket costs are generally adequate.	Sourced directly from patient (survey) or audit of clients’ home addresses with modelling of travel averted and associated costs	Access Acceptability Efficiency and service outputs	Relevant to efficiency evaluation if the patient perspective is included in the question. If self-reported data is sourced, this can be difficult to obtain and will generally require HREC review of project protocol. Note: The ATO has a vehicle cost calculator.

Outcome measure / indicator / resource	Details	Data sources (See Table 4 for more information of data systems)	Relevance	Assumptions, limitations or considerations
Patient transport costs (health service)	Retrievals, Patient Transport Subsidy Scheme (PTSS costs)	Cost centre reports	Efficiency and service outputs	Allocation of costs can be difficult as patients may attend the allied health service when travelling to see another service e.g. medical specialist visit.
Patient travel distance / time to access service	Also consider time allocated by family members if relevant. If sourcing data from patient/ family consider capturing information on impacts too such as need to take time off work, arrange childcare.	Sourced directly from patient (survey) or audit of clients' home addresses and location the service was provided with modelling of travel time / distance	Access Acceptability Efficiency and service outputs	Relevant to efficiency evaluation if the patient perspective is included in the question. If self-reported data is sourced, this can be difficult to obtain and will generally require HREC review of project protocol.
Adverse events and clinical incidents	Audit of events associated with telehealth service and the alternative service model	PRIME	Safety	Generally useful as a secondary outcome measure due to low frequency of PRIMEs for allied health services i.e. can be difficult to register a change/trend.
Patient / carer costs (other than travel)	Includes capturing, calculating and valuing costs including time off work, child care etc.	Sourced directly from patient / carer or modelled using population-level data.	Access Acceptability Efficiency (economic evaluation)	Technically complex measure with decisions required regarding valuing time lost to healthcare. Requires input of a health economist or experienced researcher.
Patient satisfaction (direct / primary data)	Elicit information directly from the patient (and family is relevant) on satisfaction with service.	Survey, interview, focus group See Acceptability, Appropriateness and Adoption section for examples of satisfaction tools	Acceptability	Can have limited value as a sole/primary evaluation measure as average satisfaction with allied health services is often high for telehealth or face-to-face. Generally more useful as a secondary outcome measure to interpret whether changes in access, efficiency or quality were accompanied by changes to acceptability (see "trade-offs" discussion)

Outcome measure / indicator / resource	Details	Data sources (See Table 4 for more information of data systems)	Relevance	Assumptions, limitations or considerations
Patient satisfaction (indirect / secondary data)	Audit of data collected for purposes other than the evaluation project to identify specific reference to telehealth service or trend of satisfaction	Patient compliments and complaints register e.g. PRIME Consumer Feedback	Acceptability	Generally not useful as a primary outcome measure due to generally low reporting for allied health services and selection bias i.e. only highly motivated individuals will submit a complaint or compliment.
Avoidable hospital admissions	Audit of existing data captured by HHS or primary data collected for evaluation. Can capture admissions by clinical group e.g. ambulatory care-sensitive conditions	Ambulatory care-sensitive conditions described in Katterl (2012) and Page (2007) .	Quality and health outcomes Efficiency and service outputs	May be insensitive to allied health telehealth interventions or relationship between the allied health intervention to the outcome can be unclear. Need clear definition particularly for comparison across sites.
Waiting time at appointment (i.e. in waiting room)	Time patient waits for their appointment in a face-to-face clinic appointment vs telehealth appointment	Patient survey; manual data collection by clinician (observation & audit of clinical records)	Efficiency and service outputs Acceptability	Self-reported time measures are prone to errors. Assumes that time spent waiting for allied health appointment is not productive but patients may be seen by other team members or being undergoing investigations (e.g. having height, weight and BMI measures done by the AHA).
Home visits	Number or frequency of home visits for team per month; or average number of home visits per patient	PI5, HBCIS, other activity data collection; chart audit, manual collection with spreadsheet	Efficiency and service outputs Quality	If frequency of home visits is relatively low in comparator service model, may need a long data collection period to demonstrate if there is a difference. Sensitive to variations in casemix over time.
Referrals	Number, frequency of referrals for telehealth service can indicate changes in perceived acceptability or value (quality) of the telehealth service	HBCIS or other system	Acceptability (patient / referrer) Quality	Sensitive to changes / differences in referrers (i.e. GPs perception of value of allied health); and changes in incidence of presenting condition (e.g. seasonal variation in asthma)

Outcome measure / indicator / resource	Details	Data sources (See Table 4 for more information of data systems)	Relevance	Assumptions, limitations or considerations
General Practitioner (GP) presentations	Number or frequency of GP visits for patients receiving telehealth service. Indicator of effect of telehealth service on health outcomes and service utilisation of patients.	Patient self-reported. Medicare data (complicated to obtain)	Health outcomes Efficiency and service outputs	May be insensitive to allied health telehealth interventions or relationship between the allied health intervention and the outcome can be unclear or marginal.
Emergency department presentations	Number or frequency of emergency department / primary care clinic visits for patients receiving telehealth service. Indicator of effect of telehealth service on health outcomes and service utilisation of patients.	Chart audit, EDIS or other HHS reporting system	Health outcomes Efficiency and service outputs	May be insensitive to allied health telehealth interventions or relationship between the allied health intervention and the outcome can be unclear or marginal.
Admitted patient length of stay or bed days	The number of days per hospital inpatient stay for a specific clinical group accessing telehealth as an inpatient or where the telehealth service is delivered to patients in the community and potentially supports earlier discharge	Data system linked to Queensland Hospital Admitted Patient Data Collection	Health outcomes Efficiency and service outputs	May be insensitive to allied health telehealth interventions or relationship between the allied health intervention and the outcome can be unclear. Sensitive to variation in presentations (e.g. annual cycles of respiratory disease presentations) and service factors (e.g. weekends, holiday periods).
Unit costs of healthcare resources	Costs of healthcare equipment, aids, consumables, drugs etc. related to the allied health telehealth service e.g. custom vs ready-to-wear compression garments, medication dispensed but not used.	Cost center reports, FAMMIS	Efficiency and service outputs	Sensitive to variation in clinical presentations so may require a large data set. Important data for business case and cost modeling.

Outcome measure / indicator / resource	Details	Data sources (See Table 4 for more information of data systems)	Relevance	Assumptions, limitations or considerations
Tests or assessments ordered / completed for patient	Changes in number, frequency, type or duplication of tests or assessments (can also capture / model costs of tests from this data)	Chart audit, electronic records systems for some tests e.g. PACS for imaging, Auslab for pathology.	Efficiency and service outputs	Can be difficult to determine the meaning of a change in tests i.e. assuming duplication is inefficient fails to account for clinically indicated repeat testing. More likely to be a secondary objective or question used to check resource impacts.
Clinician time allocation clinical vs non-clinical tasks	Share of total clinical worker time spent on non-clinical tasks e.g. administration, scheduling for telehealth compared to other service model	Time or task in motion audit; PI5 or other activity data system (though generally do not have the specificity to capture time per task).	Efficiency and service outputs	Self-reported data (usually) so subject to errors. Can imply all non-clinical time is unproductive. Sensitive to differences between clinicians and work practices so can be difficult to identify a valid comparator.
Clinical hours per episode of care (delivered by telehealth or total).	The number of hours per episode of care (adjusted for clinical condition and/or disease stage / severity e.g. DRG.) Relevant to telehealth services targeting earlier intervention, timeliness of assessment or patient flow.	PI5 or similar clinical activity data system that includes patient attribution and the quantum of time; audit.	Efficiency and service outputs	Sensitive to variation in presentations (e.g. annual cycles of respiratory disease presentations) and service factors (e.g. weekends, holiday periods). Definitions require agreement and understanding of team and consistent application – use Allied Health Data Specifications as a guide.
Revenue generated through telehealth activity	HHS “revenue” from telehealth services can be modeled from activity and telehealth funding business rules. Note: this is not funding that comes to the clinician or team directly.	HBCIS, MAC or other systems capturing activity can model the revenue (see note in limitations)	Efficiency and service outputs	For information on this topic see the Allied Health Telehealth Training Package (Service Redesign module, unit 1.6 Finance – available in 2017)

Outcome measure / indicator / resource	Details	Data sources (See Table 4 for more information of data systems)	Relevance	Assumptions, limitations or considerations
Cost of telehealth service (health service) - fixed	Telehealth equipment and infrastructure; staffing costs if specifically allocated to telehealth service	Cost center reports	Efficiency and service outputs	Costs may be borne by units other than allied health (e.g. the facility, other service unit). Need to consider whether these are included in the evaluation.
Cost of telehealth service (health service) - variable	Data and connectivity costs, staff training.	Cost center reports	Efficiency and service outputs	Costs may be borne by units other than allied health (e.g. the facility, other service unit). Need to consider whether these are included in the evaluation.
Cost of telehealth service (patient)	Data and connectivity costs, equipment costs borne by patient	Self-report; modelled / estimated through standard costs for data / time	Acceptability Efficiency and service outputs	Difficult to accurately quantify if trying to collect directly.
Cost per QALY	Quality Adjusted Life Year (QALY) is an overall measure of health incorporating morbidity and mortality.	Requires calculation from standardised health outcome measures such as SF-36.	Efficiency (health economic research)	The QALY is a measure used commonly in health economic evaluations. It is complex to calculate and requires input from an experienced researcher and so is unlikely to be used outside a research trial.
Paid / unpaid overtime or TOIL balance related to travel	Relevant if telehealth partially substituting for travel and TOIL / overtime currently used to manage travel commitments	Timesheets	Efficiency	
Unscheduled leave	Unscheduled leave trends can indicate changes in job satisfaction for team members	DSS	Acceptability (staff)	Limited relevance to telehealth service directly but can be relevant to monitoring major change in a team or changes to roles such as implementation of delegation-supported telehealth

Outcome measure / indicator / resource	Details	Data sources (See Table 4 for more information of data systems)	Relevance	Assumptions, limitations or considerations
Clinical measures – trend data for one site (e.g. pre-post comparison)	See outcomes section	Source from routinely collected clinical data or undertake primary data collection using chosen measure	Health outcomes / clinical outputs	Effect size of telehealth intervention needs to be considered, with small effect sizes generally requiring large samples (lots of data collection) Sensitive to timing of data collection e.g. annual cycles of presentations / severity.
Clinical measures – comparison between two or more sites	See outcomes section	Source from routinely collected clinical data or undertake primary data collection using chosen measure	Health outcomes / clinical outputs	Effect size considerations as above. Sensitive to differences between the sites (clinical presentations, demographics, service differences, staffing differences etc.). May be addressed statistically and/or through descriptive comparison of services.
Clinical measures – comparison with published norms or standards	See outcomes section	Source from routinely collected clinical data or undertake primary data collection using chosen measure	Health outcomes / clinical outputs	Effect size considerations as above. Sensitive to differences between the study population (clinical, cultural, geographic factors) and the population the norms / standards were generated / validated for.
Diagnostic accuracy and reliability	Accuracy and reliability of diagnostic testing conducted by telehealth vs face-to-face	Objective measurement of accuracy or agreement; through peer review; self-report by clinicians; chart audit.	Health outcomes / clinical outputs Quality Safety	Sensitive to clinicians experience and skills with task and with telehealth. Should include qualitative aspect to identify cause e.g. camera position, visual / audio quality or limitations of telehealth necessitating a different clinical approach to be used.
Clinical management consistency or concordance	Level of consistency between management (intervention) decisions and clinical tasks/strategies employed using telehealth vs face-to-face service	Objective measurement of accuracy or consistency; peer review; self-report by clinicians; chart audit.	Health outcomes / clinical outputs Quality Safety	Sensitive to clinicians experience and skills with task and with telehealth. Should include qualitative data collection to identify a cause e.g. camera position, visual / audio quality or limitations of telehealth necessitating a different clinical approach to be used.

Outcome measure / indicator / resource	Details	Data sources <small>(See Table 4 for more information of data systems)</small>	Relevance	Assumptions, limitations or considerations
Technical: network transmission	File or data transfer rate, video latency (real-time VC), missing or interrupted data transmission	Liaise with Integrated Telecommunications regarding technical outcome measures	Technological	
Technology failure	Number / proportion of sessions negatively impacted by technology failure, description of failures	Audit of telehealth sessions	Technological Service outputs	

(some measures adapted from [Smith, 2012](#) and [IBES, 2013](#))

Table 4 Data systems and reports relevant to outcome measures

Acronym	System / report	Information
HBCIS	Hospital Based Corporate Information System	http://qheps.health.qld.gov.au/ehealth/html/operational/ehealth-systems/hbcis-online.htm
CIMHA	Consumer Integrated Mental Health Applications	http://qheps.health.qld.gov.au/mentalhealth/cimha/home.htm
EDIS	Emergency Department Information System	http://qheps.health.qld.gov.au/edis/home.htm
Firstnet	Emergency Department Information System	
MAC	Monthly Activity Collection	http://qheps.health.qld.gov.au/hsu/datacollections.htm#mac
QHAPDC	Queensland Admitted Patient Data Collection	http://qheps.health.qld.gov.au/hsu/datacollections.htm#qhapdc
QHNAPDC	Queensland Health non-admitted patient data collection	http://qheps.health.qld.gov.au/hsu/datacollections.htm#QHNAPDC
PI5	Performance Indicators Version 5.0 NOTE: some services use other systems to collect allied health activity (e.g. Allied One, AHIS)	http://qheps.health.qld.gov.au/pi5/
PRIME	Patient related incident management	http://qheps.health.qld.gov.au/psu/prime/default.htm
DSS	Decision Support Systems	http://qheps.health.qld.gov.au/finance/systems/dss/home.htm
FAMMIS	Finance And Materials Management Information System	http://qheps.health.qld.gov.au/fammis/

There are many information systems used by allied health professionals in HHSs. Common ones have been listed in the tables above but allied health professionals designing an evaluation project will require local advice on which systems contain the information they require and the access procedure. For more information on data systems go to eHealth Queensland at <http://qheps.health.qld.gov.au/ehealth/html/operational/systems.htm>.

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