Report

Telehealth Evaluation Recommendation: Establish an evaluation plan from the outset

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- Each time that a new service is introduced it is important that evaluation is undertaken to help facilitate the spread of best practice.
- Evaluation may range from the pragmatic to more in depth assessments.
- If a Health Board does not have all of the expertise required to undertake the evaluation the Scottish Center for Telehealth can offer an advisory service and identify appropriate experts who can be approached for input.

AN OVERVIEW OF WHAT SHOULD BE EVALUATED

It is recommended that the telehealth business plan includes an evaluation plan which includes the following:

- Safety
- Technology
- Effectiveness
- Economic Impact/Costs
- Accessibility
- Acceptability
- Satisfaction

The evaluation should be undertaken in phases. The evaluation frame-work below gives examples of variables and study design.

SOME EVALUATION PRINCIPLES

- Evaluation should be viewed as an integral part of program design, implementation, and redesign.
- Evaluation should be understood as a cumulative and forward-looking process for building useful knowledge and as guidance for program or policy improvement rather than as an isolated exercise in project assessment.
- The benefits and costs of specific telehealth applications should be compared with those of current practices or reasonable alternatives.
- By focusing on the clinical, financial, social objectives and needs of those who may benefit from telehealth, evaluations can avoid excessive preoccupation with the characteristics and demands of individual technologies.

STEPS FOR EVALUATION PLANNING

- Establish evaluation objectives.
- Set priorities for the selection of specific applications to be evaluated.
- Assess the probable feasibility of an evaluation, including the availability of adequate funding and the likelihood of adequate cooperation from relevant parties.
- Identify the particular intervention to be evaluated, the alternatives to which it will be compared, the outcomes of interest, and the level and timing of evaluation.
- Specify the expected relationships between interventions and outcomes and the other factors that might affect these relationships.
- Develop an evaluation strategy that includes a credible and feasible research design and analysis plan.

POSSIBLE ELEMENTS OF AN EVALUATION

- **Project description and research question(s).** The description identifies the application being evaluated and the alternative to which it is being compared. Evaluation questions are to serve as the link between the program intervention and desired outcomes.
- **Strategic objectives.** State the intended effects of the project on the organization's or sponsor's goals and how the evaluation strategy relates to these goals.

Table 1

Evaluating Characteristics	Variables	Study Design
Technological description	Technical aspects, required infrastructure, hardware, software	Descriptive, reviews, guidelines, evaluation reports
Efficacy/ effectiveness of the system	Transmission time. Safety: risk reduction for patients. Confidentiality of data, image and sound quality, transmission interferences	Systems validation and verification studies
Clinical efficacy/ effectiveness Outcomes about patients	Diagnostic accuracy: sensitivity/ specifity. Is there an improvement of: signs, symptoms, diagnosis, treatment, prognosis. Morbidity/mortality? Differences in the physical mental and social functioning of the patient, changes in health behavior, patient's satisfaction in their health care perception. Health units measures: constraints, life years gained, quality adjusted life years.	Controlled and randomised clinical trials Quasi-experimental studies Health outcomes research: Naturalistic clinical trials Pragmatic clinical trials
Efficacy/ effectiveness outcomes on organizations and professionals	Continuous education, better distribution of tasks, efficiency in resource management, change in the routine of services, acceptability of changes.	Controlled and randomised clinical trials.
Costs	Direct: consultation hour, transfer of personnel. Indirect: lost working hours per patients, expenditures for transfers in ambulance. Capital cost: equipment (purchase, reforms, maintenance). Operational cost: staff training, transmission cost per time unit.	Cost minimisation Cost effectiveness Cost-benefit Cost-utility Cost-opportunity
Accessibility	Easier access to specialists, consultation, lower waiting times, avoiding patients' transfer in order to provide healthcare.	Controlled and randomised clinical trials
Acceptability, satisfaction	Patient: perception of physical and physical improvement, perceived healthcare, satisfaction level, acceptable consultation time. Physician: degree of comfort with new technology, improvement in consultation times, contribution to the improvement in patient care.	Controlled and randomised clinical trials Case studies

- **Clinical objectives.** State the intended effects of the project on the individual or population health by changing the quality, accessibility, or cost of care.
- **Level and perspective of evaluation.** Perspectives may be clinical, institutional, or system/societal.
- **Research design and analysis plan.**

EVALUATION QUESTIONS

- Evaluating Quality of Care and Health Outcomes
  - What were the effects of the telehealth application on the clinical process of care compared to the alternative(s)?
  - What were the effects of the telehealth application on immediate, intermediate, or long-term health outcomes compared to the alternative(s)?
- Evaluating Access to Care
  - Did telehealth affect the use of services or the level or appropriateness of care compared to the alternative(s)?
  - Did the application affect the timeliness of care or the burden of obtaining care compared to the alternative(s)?
- Evaluating Health Care Costs and Cost-Effectiveness
  - What were the costs of the telehealth application for participating health care providers or health plans compared to the alternative(s)?
  - What were the costs of the telehealth application for patients and families compared to the alternative(s)?
  - What were the costs for society overall compared to the alternative(s)?
  - How did the cost of the application relate to the benefits of the telehealth application compared to the alternative(s)?
- Evaluating Patient Perceptions

- Were patients satisfied with the telehealth service compared to the alternative(s)?
- Evaluating Clinician Perceptions
  - Were attending and/or consulting clinicians satisfied with the telehealth application compared to the alternative(s)?

EQUITY OF ACCESS TO CARE

In evaluating telehealth, it is not sufficient to compare its effectiveness against conventional care. It also is important to identify ways in which telehealth provides care that would not be available through conventional means. For example, telehealth may improve access by coordinating care in a way that would otherwise not have occurred.

TECHNICAL PROPERTIES

Evaluation of telehealth systems can focus on a variety of technical properties, including data transmission speed or bandwidth, data quality (e.g., resolution), system functions and features, ease of use, reliability, and service or maintenance requirements. Technical properties such as bandwidth and resolution are steadily improving, while the costs to achieve given levels of technical performance are decreasing.

SAFETY

Safety is a judgment of the acceptability of the health risk (e.g., due to complications or adverse effects) associated with using a technology. When addressed, safety may be defined more as a function of clinician judgment (in deciding whether to use the telemedicine technology for a particular case) than with the technology itself.

COST AND OTHER ECONOMIC IMPACTS

To analyze benefits of a technology for particular applications through such analyses as cost-minimization analysis, cost-effectiveness analysis, cost-utility analysis, or cost-benefit analyses. Some of the commonly recognized types of economic impact of telemedicine applications are costs associated with: patient time and productivity; transportation; capital (equipment, space, etc.), maintenance, and communications; utilization of health care services; and staffing levels and productivity of health professionals. As is the case for other types of technology, introduction of telemedicine can prompt various cost tradeoffs. For example, changes in utilization of health care services may appear in different forms. By lowering barriers to access, telemedicine may increase near-term utilisation of services and related health care costs. However, costs of earlier care for patients who otherwise may have delayed care in the absence of telemedicine may be offset by savings from reducing or obviating the need for downstream medical costs for treating what would have been progressively worse conditions. More well-designed longer-term studies of these cost tradeoffs are needed to demonstrate the health and economic value of telemedicine. Even so, as described below, the shorter-term costs may be overestimated because of the start-up costs associated with establishing a telemedicine program, particularly if these are determined based on per-patient costs where patient utilization is low for start-up programs.

The main types of cost analysis used in technology assessment are included in the evaluation table

Evaluations should identify **direct costs** and **indirect costs** of telemedicine applications. Direct costs including direct medical care costs for clinicians and other staff, capital equipment, facilities costs, communications, maintenance, etc. Direct non-medical costs include care provided by family members and transportation to and from the site of care. Indirect costs usually include the cost of time lost from work and decreased productivity for patients.

Given the different ways in which costs and outcomes may be determined, all studies should make clear their methodology with respect to economic perspective, accounting for direct and indirect costs, and the other aspects noted above.

At issue in cost evaluation for telemedicine is determining which of the various types of cost analysis are most appropriate for the telemedicine program or application being evaluated.

CLINICIAN ACCEPTANCE

Acceptance of telehealth by physicians, nurses, and other healthcare professionals is important in telehealth evaluation. If clinicians are not comfortable with the technology or judge that the technology decreases their control over patient care, they may avoid using it, thereby precluding other benefits of telehealth. Clinical acceptance of a telehealth application may depend on the degree of confi-

dence the clinician has in his or her clinical findings (e.g., diagnosis) from using the application as well as the clinician's satisfaction with the encounter in the absence of proximate, tactile interaction with the patient.

Evaluation instruments used to measure physician satisfaction with telemedicine have asked questions such as the following:

- How would this situation have been handled without telemedicine?
- How was the patient's care affected by this encounter?
- What is the next step for the patient in terms of future care for this problem (e.g., continue with current care, referral, admission)?
- Did current experience make it more or less likely that you would use telemedicine in the future?

Five-point Likert scales or Semantic Differential Scoring Technique may be used for the following questions:

- Overall, how satisfied were you with this telemedicine session?
- How essential was visual contact with the other site?
- How essential was it to have full-motion video (as opposed to still images) in this encounter?
- How well did the telemedicine equipment work?

Attempts to gauge clinician satisfaction can be confounded by selection bias. Clinicians who are asked about their satisfaction with a telemedicine application are most likely to be those who are currently using it, including those who may have volunteered to participate in a demonstration project. This excludes those clinicians who may have used the application but are no longer doing so, as well as those who did not choose to participate at all. Furthermore, even among clinicians who are current users, those who choose to respond to inquiries about satisfaction may have different perceptions from those that chose not to respond. Evaluations that do not account for selection bias can provide misleading findings. By not tapping the perceptions of clinicians who no longer use the technology or who have decided not to use it at all, evaluators miss out on learning what aspects of acceptance affect the diffusion of the technology into broader, mainstream practice.

Clinician acceptance may depend on factors that extend beyond the clinical aspects of individual patient interactions, to practice patterns and broader delivery and financing issues. For example, the acceptance of telemedicine may depend upon the patient load and capacity of a clinician, and whether the clinician is a generalist or a specialist. For an overextended local GP, it may remain preferable simply to refer a patient to a specialist rather than to take up appointment slots with telemedical consultations with the specialist. Further, the local GP provider may feel less confident performing procedures onsite or otherwise managing a patient when these functions might be better performed by an offsite specialist. On the other hand, a specialist who requires a large population base to stay viable (e.g., a hand surgeon) may welcome the opportunity to expand access to a larger population pool. Other types of users whose acceptance may affect the success of a telemedicine program are administrative and business staff, instructors, and students. Evaluation of clinician satisfaction with telemedicine must account for selection bias and must consider the broader professional, delivery, and financial context of health care.

PATIENT SATISFACTION

Aspects of patient satisfaction that typically are evaluated are: convenience, comfort during a consultation, comparison to in-person consultation, privacy concerns, and willingness to use telemedicine in the future. Past patient satisfaction instruments have rated patient responses to such questions such as:

- Overall, how satisfied are you with today's telemedicine session?
- How easy was it to talk with the provider on the other end of the telemedicine connection?
- Are you comfortable that the provider was able to understand what your health problem was?
- How much did the telemedicine provider seem to care about you as a person?
- Did you feel relaxed or tense during the telemedicine session?
- Did the telemedicine make it easier for you to get care today?
- Do you think telemedicine improves your medical care?
- Do you think your telemedicine session was as good as a regular in-person visit?
- How well did the telemedicine equipment work today?
- Would you use telemedicine again?