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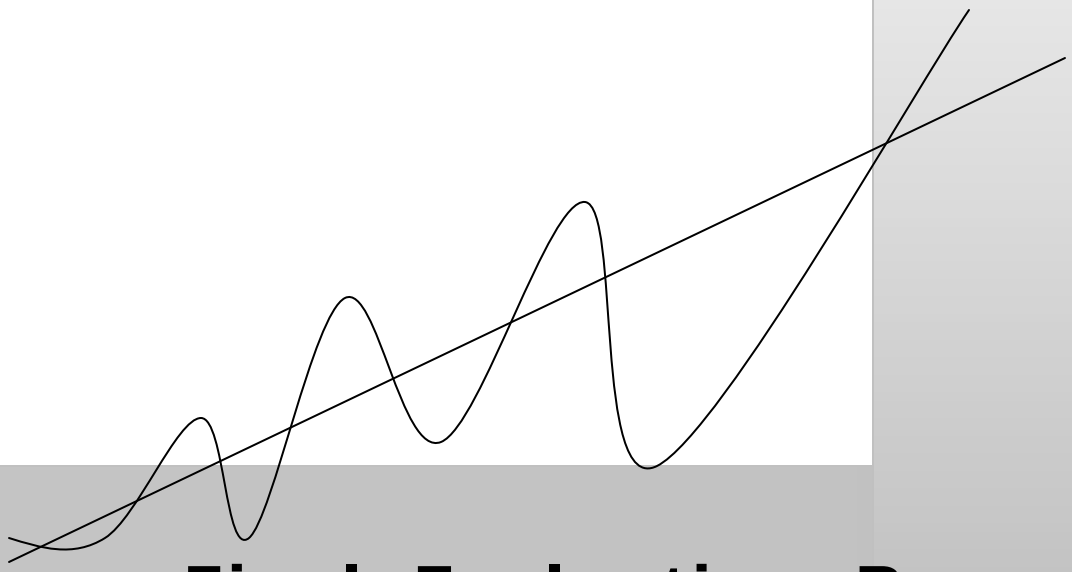
KEEWAYTINOOK OKIMAKANAK
TELEHEALTH NORTH NETWORK

KO Telehealth / North Network Expansion Project



Final Evaluation Report

CRaNHR

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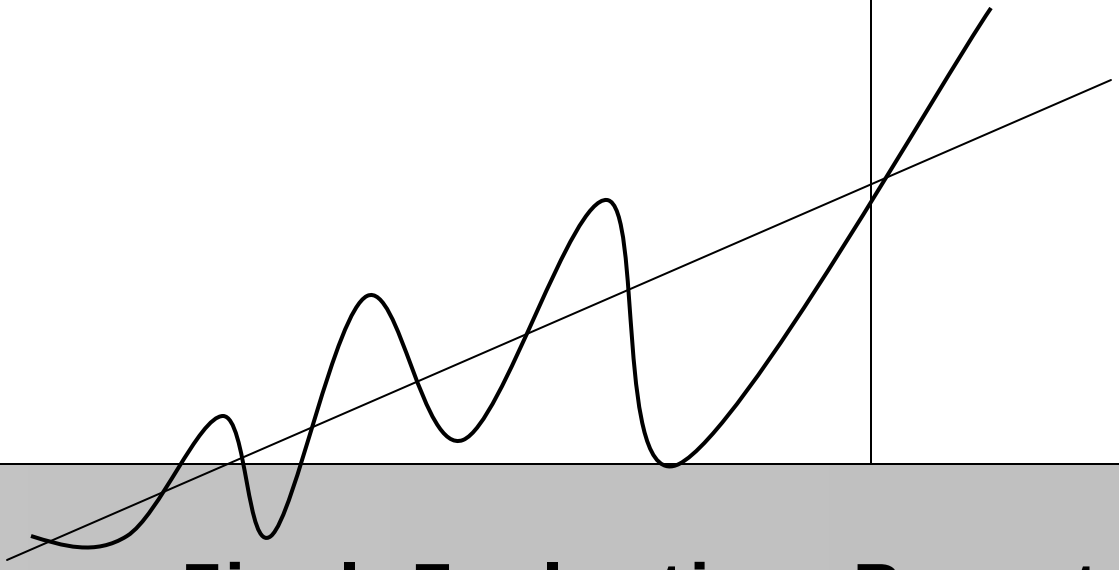
31 March 2006

KO Telehealth / North Network Expansion Project



Final Evaluation Report

This report was prepared by **John C. Hogenbirk**, Centre for Rural and Northern Health Research, Laurentian University, **Ricardo Ramirez** and **Andres Ibanez**, School of Environmental Design and Rural Development, University of Guelph. The authors were assisted by **Raymond W. Pong**, Centre for Rural and Northern Health Research and **Sheila Hardy**, Native Human Services & Centre for Rural and Northern Health Research, Laurentian University. The *Acknowledgement* section of the report gives due credit to the many people who have helped shape this evaluation effort.

CRaNHR

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31 March 2006

Main Messages

The Keewaytinook Okimakanak Telehealth/NORTH Network Expansion Project began with 5 First Nations communities and has since expanded to 19 more First Nations communities located in the Sioux Lookout Zone. Geographically isolated and culturally distinct communities such as these tend to have lower access rates to health services and lower health status relative to the rest of Ontario. The Expansion Project used telecommunications technology to bridge geographic distance. This evaluation represented a comprehensive effort to measure short-term changes in access and sets the stage to measure potential long-term health effects.

Access: From April 2003 to December 2005, KOTH usage varied from 55 to 319 sessions/month (average= 128/month). First Nations communities averaged 12 sessions/month. Clinical consultations comprised 42% of the 2926 sessions, followed by education (19%), training (18%), meetings (13%) and demonstrations/tests/family visits (8%). The number of medical specialties, educational events and health programs offered via telehealth also increased. The stories and the statistics suggest that telehealth has "virtually" decreased the geographic distances that have, in the past, restricted access to health information and health services.

Acceptability: Patients reported that over 90% of clinical sessions were helpful, that they would recommend telehealth to another person after 89% of the sessions and that they would be willing to repeat 95% of the sessions by telehealth. Physician specialists reported that 85% of clinical sessions were "excellent" or "very good" or "good". These sentiments were echoed by many health providers. A frequent qualification was that flying patients or providers in and out of a community might still be necessary.

Integration: Many stakeholders recognized the potential and need for telehealth to integrate the programs and the people involved in health education, prevention, early diagnosis, treatment and follow-up (e.g., diabetes). The benefits of improved continuity of care and greater family involvement were also emphasized.

Quality: Many physicians felt comfortable with using telehealth for follow-up and also for initial consultations provided that there was the option of face-to-face consult. Many stakeholders concluded independently that the role of locally recruited, full-time Community Telehealth Coordinators (CTCs) was of paramount importance to telehealth success and had implications not only for quality of service, but for access, acceptability and integration. Stakeholders advocated for ongoing efforts to educate and retain qualified personnel.

Financial Impact: The Pilot Project demonstrated that the telehealth service could be rolled-out to 24 First Nations communities and provided cost and utilization data that were used to model a fully operational and sustainable telehealth program. Different estimates and monetary values were assigned to network sessions that averted travel versus those that were in addition to travel ("new" telehealth). Costs for the Sustainable Program were estimated at $2.8M/year. Estimated savings were $4.2M/year for averted travel and $7.4M/year if “new” telehealth was assigned a dollar value. Estimates were based on 4866 network sessions/year. The breakeven point was estimated at 3220 network sessions/year. There were 2374 sessions in 2005, suggesting that the breakeven point may soon be attained.

Conclusions: The findings of the evaluation suggest that the KOTH/NORTH Network Expansion Project has increased utilization—more First Nations communities are participating and these communities are using the service more often. The program has the ability to reach the economic breakeven point in the near future. Feedback from stakeholders in the communities and in support centres testified to emerging benefits and significant potential for the future.

KOTH Evaluation Final Report

Executive Summary

The Keewaytinook Okimakanak Telehealth (KOTH)/NORTH Network Expansion Project began in September 2003 and ended in March 2006. The telehealth network was expanded in stages from 5 to 24 First Nations communities located in the Sioux Lookout Zone with additional communities being added. KOTH used ground and satellite links to provide health consultations, educational/training sessions and administrative meetings for people in First Nations communities.

The literature suggests that these geographically isolated and culturally distinct communities tend to have lower rates of access to health care services and lower health status, relative to the rest of Ontario. Improved access to health care services by using telecommunications technology to span geographic distance may be a step towards improved health status of the people in these communities. This evaluation of the Expansion Project represented a comprehensive effort to measure short-term changes in access as well as to set the stage to measure the potential long-term effects on health.

This evaluation used quantitative and qualitative methods to obtain numbers and narratives. Use was also made of administrative data collected by KOTH, NORTH Network and government agencies. Interviews and focus group discussions were used to assess the context and importance of network services to patients, clients, families, community leaders, health professionals and other users. A number of questionnaires and checklist forms were used to obtain information from people who were involved with or affected by the network.

The evaluation framework included five major themes that were based on published telehealth evaluation frameworks: Access, Acceptability, Integration, Quality and Financial Impact. This report is organized into five sections, which reflect these themes.

Access: *the availability of the right care at the right time without undue burden*. From April 2003 to December 2005, total use of KOTH varied from a low of 55 sessions per month to a high of 319, with average use of 128/month. Clinical consultations comprised 42% of the 2926 sessions, followed by education (19%), training (18%), administrative meetings (13%) and demonstrations/systems tests/family visits (8%). The number of First Nations communities using the network rose from 8 in April 2003 to 23 in December 2005, with an average of 12 sessions/First Nations community/month. Average use per community has increased almost 2.5 times from 7 sessions/community/month in the first 12 months (April 2003-March 2004) to 17 sessions/community/month in the last 12 months (January-December 2005). Many stakeholders mentioned that the locally recruited Community Telehealth Coordinators (CTCs) had been instrumental in increasing use and provided an important cultural and linguistic bridge. Telecommunications technology has "virtually" reduced the geographic distances that have, in the past, restricted access to health information and services.

Acceptability: *the degree to which patients, clinicians, or others were satisfied with a service or were willing to use it*. Patients reported that over 90% of the clinical sessions were helpful, that they would recommend telehealth to another person after 89% of the sessions and that they would be willing to repeat 95% of the sessions by telehealth. Physician specialists reported that 85% of clinical sessions were "excellent" or "very good" or "good". These sentiments were echoed by many health providers in communities and in the referral centres. One important caution, emphasized by patients and providers alike, was that flying the patient out of the community or the provider into the community might still be necessary. The literature and some respondents said that the health professional's acceptance of telehealth would be influenced favourably if their work-load was about the same as seeing the patients in their office. Health professionals emphasized the importance of reimbursing physicians for providing telehealth services beyond this pilot project.

Integration: *the degree to which the telehealth network and other health care services worked with one another*. Providers, educators, and some patients, were keen to see how telehealth could be applied to many aspects of health and well-being, from consultation to treatment to education and to prevention. The benefits of improved continuity of care and greater involvement of family were emphasized by many respondents. The issue of telehealth competing for scare resources was raised in some communities—perhaps the resolution lies in ensuring that "competing" programs are allowed to embrace and share in the benefits of telehealth. The potential of the technology to create better relationships between patients, nurses, and doctors was a contributor to integration.

Quality: *the degree to which telehealth provided care that was consistent with current professional knowledge and standards*. Many, if not most of the specialists felt comfortable with the quality of clinical care that they provided by means of telehealth. GPs/FPs were less comfortable and this may be partly due to less telehealth experience. Many of the more experienced specialists said that telehealth was equivalent to most follow-up consultations and could be used for many initial consultations. The advantages or disadvantages are specialty-dependent. One important proviso, mentioned by physicians with a range of telehealth experience, was the need to ensure that a face-to-face consultation remained a viable and workable option to ensure quality of clinical care. The CTCs have a key role to play in ensuring quality of service as well as in improving access, acceptability and integration. The need for training and support of the CTCs was a frequent comment and a request of the CTCs themselves.

Financial Impact: *the monetary cost of providing the service by telehealth compared to other ways of delivering the service*. The Pilot Project demonstrated that the telehealth service could be rolled-out to 24 First Nations communities—communities with an average population of less than 700 people spread out over an area the size of France. The Pilot Project was able to demonstrate how health care, health information and health education services could be delivered by telecommunications technology as compared to delivery of these services by transporting the users. In addition, the Pilot Project provided cost and utilization data that were used to model a fully operational and sustainable telehealth program. Different estimates and monetary values were assigned to network sessions that averted travel versus those that were in addition to travel ("new" telehealth).

Costs for the Sustainable Program were estimated at $2.8M/year. Estimated savings were $4.2M/year for averted travel and $7.4M/year if "new" telehealth was assigned a dollar value. Estimates were based on projected utilization of 4866 network sessions/year. The breakeven point was estimated to occur when there were 3220 network sessions/year. There were 2374 sessions in 2005, suggesting that the breakeven point may soon be attained.

The practical effect of telehealth in averting travel was evident in the following comment: *"[We]…have more people staying in the community and that saves us all this time of [having to worry about] travel, planes that get cancelled, re-bookings, all that kind of thing" (Community Health Nurse).*

Conclusions: The KOTH/NORTH Network Expansion Project is one of a few telehealth projects in Canada that have ventured into geographically remote and culturally distinct communities. It has the potential to realize a significant impact through improved access to health care services, education and information. The findings of the evaluation suggest that the Expansion Project has successfully improved access. The program has the ability to reach the economic breakeven point based solely on averted travel. Other benefits, not included in the model could push the program beyond the breakeven point. Feedback from numerous stakeholders spoke of the many improvements in access and the potential to improve health.

Acknowledgments

The Evaluation Team would like to acknowledge Keewaytinook Okimakanak for its financial support of this evaluation of the Keewaytinook Okimakanak Telehealth/NORTH Network expansion project. The expansion project was funded by the Primary Health Care Transition Fund (Health Canada), FedNor (Industry Canada), the Northern Ontario Heritage Fund Corporation (Ontario Ministry of Mines and Northern Development), Health Canada, Sioux Lookout First Nations, K-Net and NORTH Network.

The Evaluation Team would like to thank the following people for their advice on the evaluation framework and tools: Kevin Houghton, Donna Williams, Tina Kakepetum Schultz, Brian Walmark, Donna Roundhead, Penny Carpenter, Orpha McKenzie, Daisy Kabestra, Darrin Potter, as well as members of the Evaluation Advisory and Sustainability Advisory Committees.

We thank the Elders, Chiefs & Councils of the 24 communities involved with this project for their support of this evaluation effort. We thank those First Nations communities who shared administrative data with the Evaluation Team. Our thanks to the many community members and KO personnel who provided their comments to their representatives who then passed along this feedback to the Evaluation Team. The Evaluation Team may not know your name but we have felt your feedback and are grateful for your comments.

The Evaluation Team gratefully acknowledges the assistance of KOTH personnel and others located in Balmertown/Red Lake, Sioux Lookout and in the First Nations communities who helped collect and share the evaluation data.

Numerous people at Health Canada, Ontario Ministry of Health and Long-Term Care, Ontario Air Ambulance Services Corporation, hospitals and other health organizations in Red Lake/Balmertown, Sioux Lookout, Thunder Bay, Winnipeg and in the communities helped the Evaluation Team by providing data or a better understanding of the context of health care in northwestern Ontario and we are grateful for this assistance.

Many others helped inform the context of the evaluation and as such the Evaluation Team gratefully acknowledges the advice and support of Brian Beaton, Dan Pellerin, John Rowlandson and those people behind the scenes who helped along the way.

The Evaluation Team thank their university colleagues, David Robinson (Department of Economics, Laurentian University), Bruce Minore (Centre for Rural and Northern Health Research, Lakehead site) and Al Lauzon (Rural Extension Studies, University of Guelph), for their advice and support. The Centre for Rural and Northern Health Research at Laurentian University would like to thank Linda Liboiron-Grenier, Shaun Macpherson and Vince Guerin for their work in entering and compiling the data, revising the economic model and in preparing this report.

Table of Contents

1 Introduction

1.1 Background

The Keewaytinook Okimakanak (KO) Telehealth/NORTH Network Expansion Project[1] began in September 2003 and ran to March 2006, a period of 31 months. The KO telehealth network (KOTH) was expanded, in stages, from 5 to 24 First Nations communities located in the Sioux Lookout Zone (Exhibit 1).[2] Additional communities continue to be added. KO Telehealth used telemedicine workstations equipped with patient cameras, stethoscopes and otoscopes. The telecommunications backbone used was the K-Net operated wireless ground and satellite network to provide health consultations, educational/training sessions and administrative meetings for people living in First Nations communities. KOTH was designed to be part of the community health system. Its main goals were to improve First Nations access to health professionals, enhance the level and quality of services and to reduce isolation for First Nations health workers.

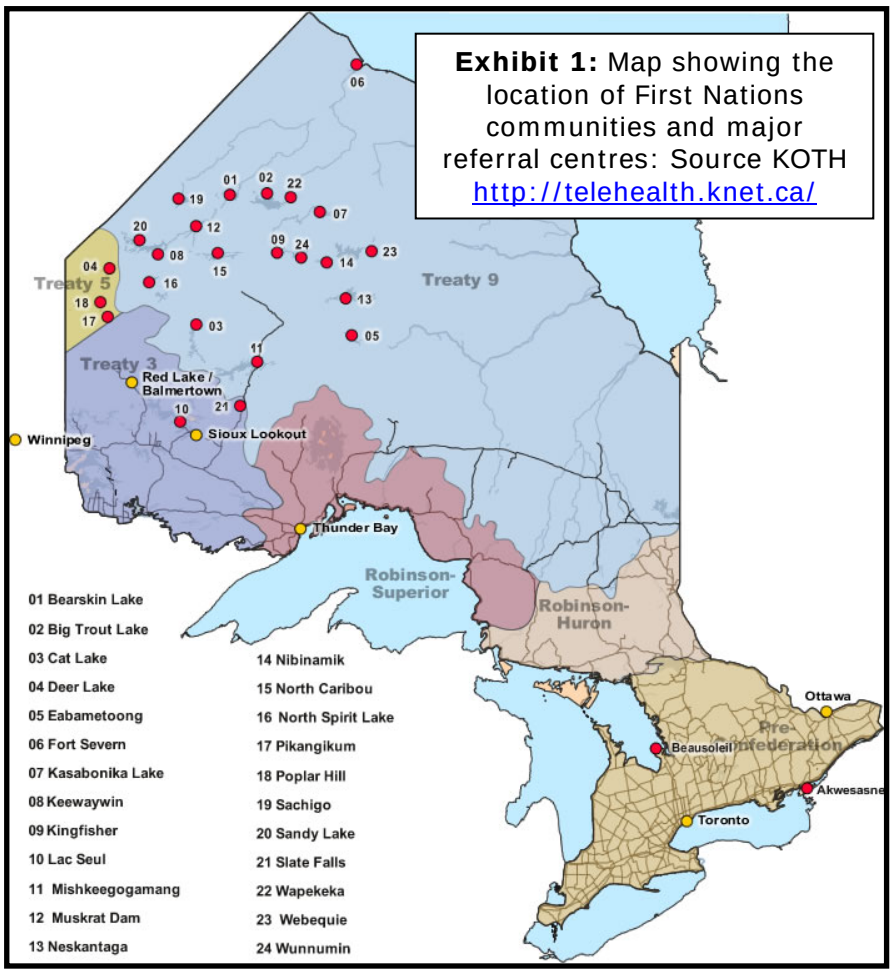

Exhibit 1: Map showing the location of First Nations communities and major referral centres: Source KOTH http://telehealth.knet.ca/

The 24 First Nations communities served by the expansion project have a total of 15,957 community members (Appendix 4, Table 1). The average community size is 665 people (median=482) with a minimum of 153 and a maximum of 1961 people. Twenty-three communities are without year-round road access to the nearest service centre.[3] Sixty-seven percent (16) communities are located 320-480 km by air from the nearest service centre. These are sparsely populated and geographically isolated communities in a land area roughly the size of France, but with only a fraction of France's population.

[1] For more information on KOTH and NORTH Network, see http://telehealth.knet.ca/ and http://www.northnetwork.com/webportal/NorthNetworkPortal

[2] 24 communities were covered as planned, and an additional community outside the health zone was added: Beausoleil First Nation.

[3] Service Centre is defined as the nearest community to which a First Nations can access government services, banks and supplies. (INAC 2004. Band Classification Manual. Corporate Information Management Directorate, Information Management Branch, Indian and Northern Affairs Canada, Ottawa. Available from: http://www.ainc-inac.gc.ca/pr/pub/fnnrg/bcm_e.html).

Shah and colleagues[4] demonstrated that aboriginal peoples had higher rates of health conditions related to insufficient access to primary care than all other Ontarians. In addition to having lower self-reported health status[5], aboriginal people have higher rates of diabetes[5,6] and ischemic heart disease.[7,8] Improved access to health care services by using telecommunications technology to span geographic distance may be a step towards improved health status of people in these communities. Other northerly communities in North America have been exploring the potential of the technology in comparable settings.[9] This evaluation of the Keewaytinook Okimakanak Telehealth/NORTH Network Expansion Project represents a comprehensive effort to measure the short-term changes in access and sets the stage for measurement of potential long-term effects on health.[10] This project builds on earlier achievements in KO communities where local stakeholders were engaged in visioning how to harness information and communication technologies (ICTs) for improved health and suggesting indicators of outcomes and results that were relevant to them.[11]

1.2 Evaluation Requirements

The evaluation of Keewaytinook Okimakanak Telehealth (KOTH) was designed to fulfill three primary requirements. The first requirement was to ensure that the evaluation met the needs of the First Nations communities and their political organizations. To accomplish this goal, we engaged in some elements of participatory research in which the communities and primary stakeholders were able to critique and help define evaluation objectives, framework and tools. At the start of the evaluation we used video to make the evaluation methodology more accessible and seek feedback and as the evaluation drew to a close we used video once again to capture comments on the evaluation findings.

The second requirement, closely related to the first, was for the Evaluation Team to assist First Nations communities, their political organizations, and other stakeholders in the use of the data and results arising from the evaluation. First Nations shared their evaluation needs and cultural knowledge to help put the evaluation into the proper context. The Evaluation Team shared its expertise in telehealth research, evaluation and policy. Fulfilling the first

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[4] Shah B.R., Gunraj, N. & Hux J.E. 2003a. Markers of access to and quality of primary care for aboriginal people in Ontario, Canada. *American Journal of Public Health, 93(5)*:798-802.

[5] Young, T.K., Reading, J., Elias, B. & O'Neil, J.D. 2000. Type 2 diabetes mellitus in Canada's First Nation: status of an epidemic in progress. *Canadian Medical Association Journal, 163(5)*: 561-566.

[6] Shah B.R., Anand S., Zinman B. & Duong-Hua M. 2003b. Diabetes and First Nations People. Chapter 13. pages 13.231-13.247, in J.E. Hux, G.L. Booth, P.M. Slaughter & A. Laupacis, Editors. *Diabetes in Ontario: An ICES Practice Atlas*. Institute for Clinical Evaluative Sciences, Toronto, Ontario.

[7] Shah, B.R., Hux, J.E., & Zinman, B. 2000. Increasing rates of ischemic heart disease in the native population of Ontario, Canada. *Archives of Internal Medicine, 160(12)*: 1862-1866.

[8] Ischemic heart disease occurs as a result of restricted blood supply to the heart.

[9] Hudson, H.E. 2005. Rural telemedicine: Lessons from Alaska for developing regions. *Telemedicine and e-health 11(4)*: 460-467

[10] We focus on short-term activities (e.g., installing telehealth equipment in a nursing station; training staff to use it), and short-term indicators (e.g., number of clinical uses of telehealth in a nursing station). Long-term impacts or outcomes (e.g., a change in the incidence of diabetes) were beyond the reach of this evaluation because of the difficulty in attributing any change in the outcome to the telehealth program. This is consistent with emerging evaluation approaches that are placing emphasis on indicators that are evident during the short-term, in contrast with long-term outcomes that can be affected by other factors beyond the control of the project. See: Earl, S.; Carden, F. & Smutylo, T. 2003. Outcome mapping: Facilitator's Summary Sheets: Workshop process checklist. Ottawa: IDRC. http://web.idrc.ca/en/ev-9330-201-1-DO_TOPIC.html

[11] See examples of community generated plans at http://smart.knet.ca/archive/fsworkshop/step4.html and of community engagement workshops at http://smart.knet.ca/keewaywin/health.html (for the approach leading to indicator definition).

and second requirements was meant to increase the capacity for evaluation within First Nations communities and organizations. An Evaluation Manual (Appendix 2) was developed in line with this capacity development requirement.

The third requirement was to meet the needs of the main funding agencies, principally, the Primary Health Care Transition Fund-Aboriginal Envelope (Health Canada), FedNor (Industry Canada), and the Northern Ontario Heritage Fund. The evaluation included, as much as practical, the evaluation needs of federal and provincial government agencies, such as First Nations and Inuit Health Branch (Health Canada), as well as the needs of partners, such as NORTH Network. Effort was made to ensure that the evaluation could accommodate those needs of the funders and other stakeholders that were aligned with those of the First Nations communities and their political organizations.

1.3 Evaluation Approach

The approach combined quantitative and qualitative methods with the intent that the techniques and methods would be meaningful to the community members and would provide reliable and relevant information for funding agencies for decisions related to long term sustainability.

The evaluation of the Expansion Project attempted to present a balanced picture by combining numbers and narratives. The numbers were intended to show how often the telehealth service was used, for what purpose and at what cost or saving in money and time. The narratives were used to convey the thoughts and feelings of the users in the communities (nurses, community telehealth coordinators, health providers, patients and council members) as well as health providers that travel to the communities or were linked via telehealth (general practitioners/family physicians and specialists). The stories helped make the statistics real and vice versa. Furthermore, the qualitative data revealed factors that contribute to the uptake of the telehealth services in the communities.[12]

The evaluation used a mix of quantitative and qualitative methods to obtain the necessary statistics and stories. Much use was made of administrative data collected by KOTH, NORTH Network and government agencies to provide the numbers for selected questions from each evaluation theme. Interviews and focus group discussions were used to assess the context and importance of the telehealth service to patients, clients, families, communities, health professionals and other users. A number of questionnaires and checklist forms were used to obtain information from people who were affected by the telehealth service. We visited a number of communities including those with recent and longer exposure to telehealth and we sought to get interviews with health providers, patients and community workers.[13]

[12] For more information on uptake or organizational readiness for telehealth, see: Jennett, P.; Yeo, M.; Pauls, M. & Graham, J. 2003. Organizational readiness for telemedicine: Implications for success and failure. *Journal of Telehealth and Telecare 9 (Suppl. 2):* S2 27-39

[13] For an example of a community visit, see: http://telehealth.knet.ca/ (under Telehealth Evaluation).

2 Methods

2.1 Evaluation Themes

The framework[14] included five major themes that were based on telehealth frameworks designed by the Institute of Medicine in Washington, the National Telehealth Outcomes Indicators Project at the University of Calgary and NORTH Network, as well as other sources. Evaluation themes were comprised of groups of evaluation questions that addressed similar issues. The questions in this framework came from the original proposal to the Primary Health Care Transition Fund, feedback from stakeholders (communities, administrators, funders, etc.), published evaluation frameworks (listed above) and the experience of the Evaluation Team. Evaluation findings are presented for each of the five themes, Access, Acceptability, Integration, Quality and Financial Impact. These themes and findings are described in the Results section.

2.2 Evaluation Design

The evaluation described the expansion project in terms of indicators developed in the PHCTF application and modified subsequently by the Evaluation Team, KOTH personnel, community representatives and government personnel. A 20-minute video entitled "Evaluating Telehealth" was developed to explain the evaluation methodology.[15]

The evaluation attempted to make some comparisons between what happened before and after telehealth came to the communities. Before telehealth, community members travelled for specialist appointments. With the arrival of telehealth, many appointments were done through the telehealth service. The intent of this part of the evaluation was to establish a baseline on the number and cost of travel before telehealth came to the community. The number and cost of travel after telehealth would be compared to baseline to see if telehealth had had an effect. The evaluation relied on administrative data to provide a glimpse of the Before picture

The use of administrative data to paint the Before and After picture can be problematic. Administrative data may not be able to precisely answer evaluation questions and so we augmented quantitative administrative data with interviews and discussions with patients, clinicians, telehealth service providers and others to get a broader picture of some of the benefits and limitations of telehealth.

[14] The Evaluation Framework (Appendix 1) contains additional details and is also available at: http://telehealth.knet.ca/modules/ContentExpress/img_repository/Evaluation%20framework%20Feb%2010%202005%20Full%20Framework.pdf

[15] Available as streaming video from http://telehealth.knet.ca/

2.3 Evaluation Tools

The questionnaires, checklist forms, interview guides and focus group discussion guides developed for this evaluation are detailed in the Evaluation Manual.[16] The Evaluation Manual was comprised of several tools—accompanied by a explanations of the use and purpose of each tool. The Table of Contents of the Evaluation Manual included:

1. INTRODUCTION
   - 1.1 Purpose and Objectives of this Manual
   - 1.2 Intended users
   - 1.3 How to use this manual
   - 1.4 Scope of evaluation (breadth and depth)
   - 1.5 Evaluation approach and rationale
   - 1.6 Acknowledgements
2. METHODS
   - 2.1 Topics and data collected at the community level
     - 2.1.1 Patient Satisfaction and Feedback
       - 2.1.1.1 Background
       - 2.1.1.2 Approach used in the Evaluation of the Pilot Project
       - 2.1.1.3 Patient Feedback Consent Letter and Patient Feedback Form
       - 2.1.1.4 Analysis of Patient Feedback
     - 2.1.2 Guiding questions for interviews at the community level
       - 2.1.2.1 Organizing and analyzing data from the interviews
   - 2.2 Topics and data collected from health providers
     - 2.2.1 Averted Travel – Clinical
     - 2.2.2 Health Professional Satisfaction Questionnaire - DRAFT
     - 2.2.3 Questions to ask CTCs - DRAFT
     - 2.2.4 A Guide for a Focus Group with FP/GPs
     - 2.2.5 Approach used in the Evaluation of the Pilot Project
     - 2.2.6 Analysis of findings from the Focus Groups with FP/GPs
     - 2.2.7 Cover letter & phone interview guide for specialists
     - 2.2.8 Analysis of findings from the interviews with specialists
   - 2.3 Topics and data collected by KOTH staff not resident in the community
     - 2.3.1 Survey of Educational Needs
     - 2.3.2 CTC Turnover form
     - 2.3.3 KOTH Utilization Data
       - 2.3.3.1 Use by Type of Service or by Location
       - 2.3.3.2 Initial vs. Follow-up Consultations
     - 2.3.4 Data from Government Departments/Agencies
     - 2.3.5 Band Council Resolution Format
   - 2.4 Economic model
3. CONCLUSIONS AND FEEDBACK OPPORTUNITIES

The following paragraphs offer abbreviated explanations of how selected tools and resultant data were incorporated into the economic model.[17] The economic evaluation used a modeling approach that compared the cost of delivering the service by telehealth to the cost of delivering the service by transporting the user (Exhibit 2).

[16] For additional details about the Evaluation Manual, see Appendix 2.
[17] For additional details on the model, please see Appendix 3.

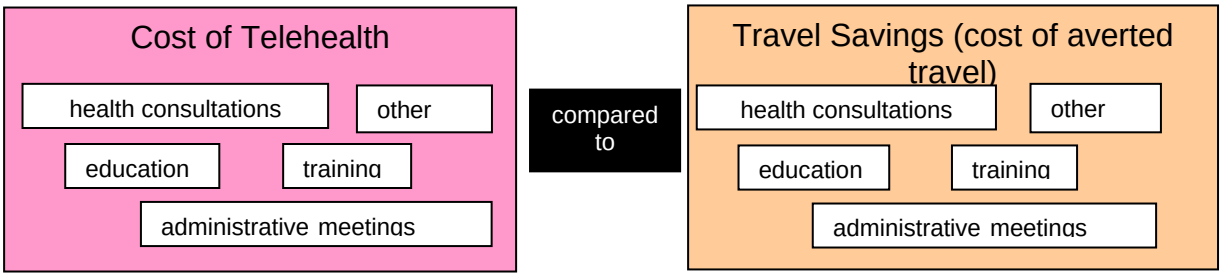

Exhibit 2. Diagram of economic modelling approach with main components

The main steps were to:

(1) Calculate total cost of all network sessions for all major categories of use. Major categories included: health (clinical) consultations, education, training, meetings and other (family visits, equipment testing, demonstrations).

(2) Estimate the percentage of sessions that would have required travel in the past and calculate, for each major category of use, the total cost if the user would have travelled (percent of telehealth that replaced or averted travel).[18]

(3) Apply an appropriate Valuation Factor to the potential savings for the network sessions that represent an expanded service. (In the past, people were less likely to travel for these types of sessions and this represents additional or "new" services.)

(4) Compare network costs to potential savings.

A model was developed for a Sustainable Program, which assumed that all 24 communities were fully operational over 3 years. The model compared average annual costs to average annual savings.

Major findings—combining the statistics and the stories—are presented in the following sections. Each section closes with a visual summary of the main qualitative findings. The reader is referred to Appendices 3-5 for the detailed numeric and narrative data.

[18] The model used estimated utilization for 24 First Nations communities. One network session may have one or more First Nations communities as participants and conversion factors was used to compare between network utilization and First Nations utilization. See Appendix 3 for more details.

3 Results

The findings in the following sub-sections combined quantitative and qualitative data. Quantitative data came from KOTH in the form of utilization numbers grouped by the type of telehealth service or by location. These numbers were also used as input into the economic model along with population figures and cost data. Other quantitative data came from the Patient Feedback Forms and Averted Travel Forms.

Qualitative data came from interviews conducted with community-based stakeholders and medical practitioners. The community-based stakeholders included nurses, community health workers and other stakeholders (such as community leaders). Medical practitioners included general practitioners/family physicians (GPs/FPs) and specialists.[19] Community stakeholder categories were further sub-divided based on the duration of the participants' exposure to telehealth technology and services.[20]

Four out of the twelve communities running a telehealth facility at the time of the interviews (December 2004-January 2005) were represented in the qualitative data. Data came from 9 of the 45 specialists who were involved with the project at the time (July-August 2005) and data from six GPs/FPs came from two focus groups (July-August 2005).

3.1 Access

Access: *the availability of the right care at the right time without undue burden*.[21] Measures included the availability and use of the telehealth service over time and space. Questions included: when could people use the service and when did they use it?

From April 2003 to December 2005 total use of KOTH varied from a low of 55 network sessions per month to a high of 319, with average use of 128/month (Appendix 4, Table 2).[22] The average number of sessions per month has increased 3–fold since 2003. Overall, clinical consultations comprised 42% of the 2926 sessions, followed by education (19%), training (18%), administrative meetings (13%) and demonstrations/systems tests/family visits (8%) (Appendix 4, Figure 1). The percent of network sessions that were clinical consultations have decreased from 49% in 2003 to 38% in 2005. The percent of network sessions that were for administrative meetings increased from 9% in 2003 to 15% in 2005.[23]

Educational sessions averaged 107 minutes and administrative meetings averaged 78 minutes[24] (clinical, training or other sessions 33-35 minutes). Based on total minutes, clinical sessions account for 24% of the total time, training 11%, education 40%, meetings 21%, and other 5%. The differences in percentage based on number of sessions and that

[19] For specific details on the qualitative data collection tools, refer to the Evaluation Manual in Appendix 2.

[20] We used categories of < 6 months (Least exposure), 6-12 months (Mid exposure) and > 12 months (Most exposure) to help group responses based on the stakeholder's exposure to telehealth.

[21] Accessibility is one of the five pillars of the Canada Health Act: "reasonable access by insured persons to medically necessary hospital and physician services must be unimpeded by financial or other barriers" (see: http://www.hc-sc.gc.ca/hcs-sss/medi-assur/fedrole/cha-lcs/index_e.html)

[22] All utilization data were courtesy of KOTH and follow their definitions of session and type of use.

[23] These changes were statistically significant (Pearson's Chi-Squared statistic (χ^2)=63.7, degrees of freedom (df)=8, probability(p) < 0.001)

[24] Based on detailed KOTH telehealth activity tables for 2005, with records for 4441 sessions (including cancellations. Multiple continuous sessions were counted as separate sessions.

based on total time occurred because educational sessions were one-half as frequent and three times as long as clinical sessions.

The number of First Nations communities using telehealth rose from 8 in April 2003 to 23 in December 2005 (Appendix 4, Figure 2). There were a nine First Nations communities involved when the Expansion Project began in September 2003. Average use for those First Nations communities that were connected to KOTH was 12 network sessions/month with a minimum of 5 and a maximum of 25.[25] Average use per community has increased almost 2.5 times from 7 sessions/community/month in the first 12 months (April 2003-March 2004) to 17 sessions/community/month in the last 12 months (January-December 2005).

The total number of sessions in 2005 for nine First Nations communities with the longest running telehealth service was pro-rated to an annual usage rate[26] and expressed on a per capita basis using DIAND 2004 population figures for Registered Indians on the reserve and crown lands.[27] The average rate was 0.538 sessions/person/year (median= 0.541) with a minimum and maximum of 0.110 and 0.778, respectively.

Based on the nine First Nations communities with the longest running telehealth service, annual utilization for a fully operational Sustainable Program of 24 First Nations communities was estimated to be: average=4820, median=4850, minimum=990 and maximum=6975 sessions/year.[28]

A combination of factors that contribute to access and acceptability were listed by medical specialists. These included: funding for network sessions, technical considerations (mostly solved), human considerations (trust, level of skills), coordination, and critical mass (as a leverage for wider adoption).

> *"I think it is working. Key factors involved in that are what NORTH Network has done well: they paid as much attention to the human network as to the technological network. And by doing that they really created the opportunity for people, even non-physicians to say, we really need this, and therefore physicians found it easier to come on-board." (Specialist)*

For clients with special needs, such as the elderly, "access" to information is often a problem. Community health workers are aware of the possibilities and limitations that define the work of meeting such needs. Telehealth, therefore, also needs to meet challenges by finding and adequately supporting its community-based human resources.

> *"Illiterate clients ... ah, here is a person who can't speak English, and even if they use an interpreter, the gap is too great, and sometimes the interpreter*

[25] Total number of telehealth consultations in First Nations communities was higher than the network total because there were occasionally more than one First Nations community connected during a telehealth session, particularly for educational and administrative sessions.

[26] These nine communities had 33 months of data each. We used data for 2005—the last 12 months—because it is believed to be the best estimate of future use.

[27] Source: DIAND 2005. Registered Indian Population by Sex and Residence 2004. First Nations and Northern Statistics Section, Corporate Information Management Directorate, Information Management Branch, Department of Indian Affairs and Northern Development, Ottawa. Available from: http://www.ainc-inac.gc.ca/pr/sts/rip/rip04_e.html

[28] The global or pooled estimate for the nine communities (total number of telehealth sessions/total population) suggests 3645 telehealth sessions/year for a network connected to 24 First Nations communities.

> *[CTC] is too young and their knowledge [of Objibwe or Oji-Cree] is limited" (Community Health Worker – Mid exposure)*

Nurses were aware of the human resources challenges that relate to telehealth, especially given the broad range of applications for telehealth that exist today and may arrive in the near future.

> *"We have visits with confined family members, we've had the paediatrician, we've had gynaecology consults, we've had urology consults, we've had telehealth conferences and in-services, and that's truly marvellous; we've had many cardiology consults, we've had many psychiatric sessions and assessments, as well as – I think – psychology; we've had diabetic follow-up with nurses, with doctors, with educators, I believe with... probably with dieticians as well ... lots of teaching, diabetic teaching, and our doctors, of course, have also talked to us over the [equipment...] The users so far have been community members and patients, nurses and other support staff, the Chief [...] and families for visits with confined family members... so it's been anybody and everybody in the community" (Community Health Nurse – Most exposure)*

> *"It's easier to have a full time person to operate the equipment, to make it more available" (Community Health Nurse – Mid exposure)*

> *"Anytime of day between nine and five it has been on, but we haven't used it in the evening, but I think that probably could expand" (Community Health Nurse – Most exposure)*

GPs/FPs emphasized that face-to-face initial consults are central to their practice. In several cases, they recalled experiences with telehealth in emergency situations:

> *"[I have….] used it twice in emergency. In once case with a patient in a community with no nurse, gave a picture of the situation on the ground." (GP/FP)*

Patient education—namely diabetes education—was one area where telehealth is making an important contribution. In the past, patients would not have had access to such sessions.

> *"Patient education sessions most common. A diagnosis may not be in doubt, but the nuances of treating a chronic disease require a lot of education. This means having contact. Much easier via telehealth than having them coming to Thunder Bay. Before this, contact for follow-up would have been face-to-face, especially for severe cases" (Specialist)*

The level of access to training and educational opportunities through video conferencing/telehealth is seen as one of the most positive changes brought on by the service. Program and capacity development help satisfy a demand for meaningful jobs that remain in the community.

> *"…[In] terms of my connectedness with professional development, it is unbelievable, because if I was in Ottawa I would not be able to access that information. So, personal education, and in terms of patient care, I think it is superb" (Specialist)*

Nurses' feedback demonstrated the role they play in enhancing the diffusion of telehealth, the significant flexibility they exhibit in adapting their work, and their role in enhancing the growth of the system. Convenient access is improving and KOTH/K-Net efforts in this regard were recognized (e.g. Diabetes Office in Sioux Lookout).

Summary-Access

Utilization of KOTH has increased in terms of the number of network sessions, the diversity of services and in the number of participating First Nations communities. The stories behind the statistics suggest that increased awareness and comfort with the telehealth service leads to increased use. Established protocols and permanent positions are need to bridge cultural and linguistic gaps between provider and patient/learner. Continued monitoring and feedback from participants may be needed to encourage new users and maintain existing levels of use. Other factors that may play a role in enhancing access, but were not included in this evaluation, include physician and nurse turn over rates.

Our findings are consistent with other studies on the socio-economic benefit of telemedicine:

> *"The most commonly identified socio-economic benefit of telehealth for First Nation populations…was improved access to appropriate health-care. In addition, the ability to access services in the local community via telehealth may represent a significant benefit in terms of quality of life." (p. 314)*[29]

From an analysis of the qualitative data we summarized key factors that elaborate on the meaning of Access as perceived by community members and medical practitioners: the importance of new educational opportunities was highlighted from diabetes prevention to on-line training opportunities for doctors (see Exhibit 3). The importance of local trust and ownership was highlighted, in this case with direct links to having a local trained operator. For doctors, the technology represents an option and GPs emphasize the importance of the face-to-face initial consultation.

[29] Jennett, P.A.; Hall, L.A.; Hailey, D.; Ohinmaa, A.; Anderson, C.; Thomas, R.; Young, B.; Lorenzetti, D. & Scott, R.E. 2003. The socio-economic impact of telehealth: A systemic review. *Journal of Telemedicine and Telecare 9*: 311-320

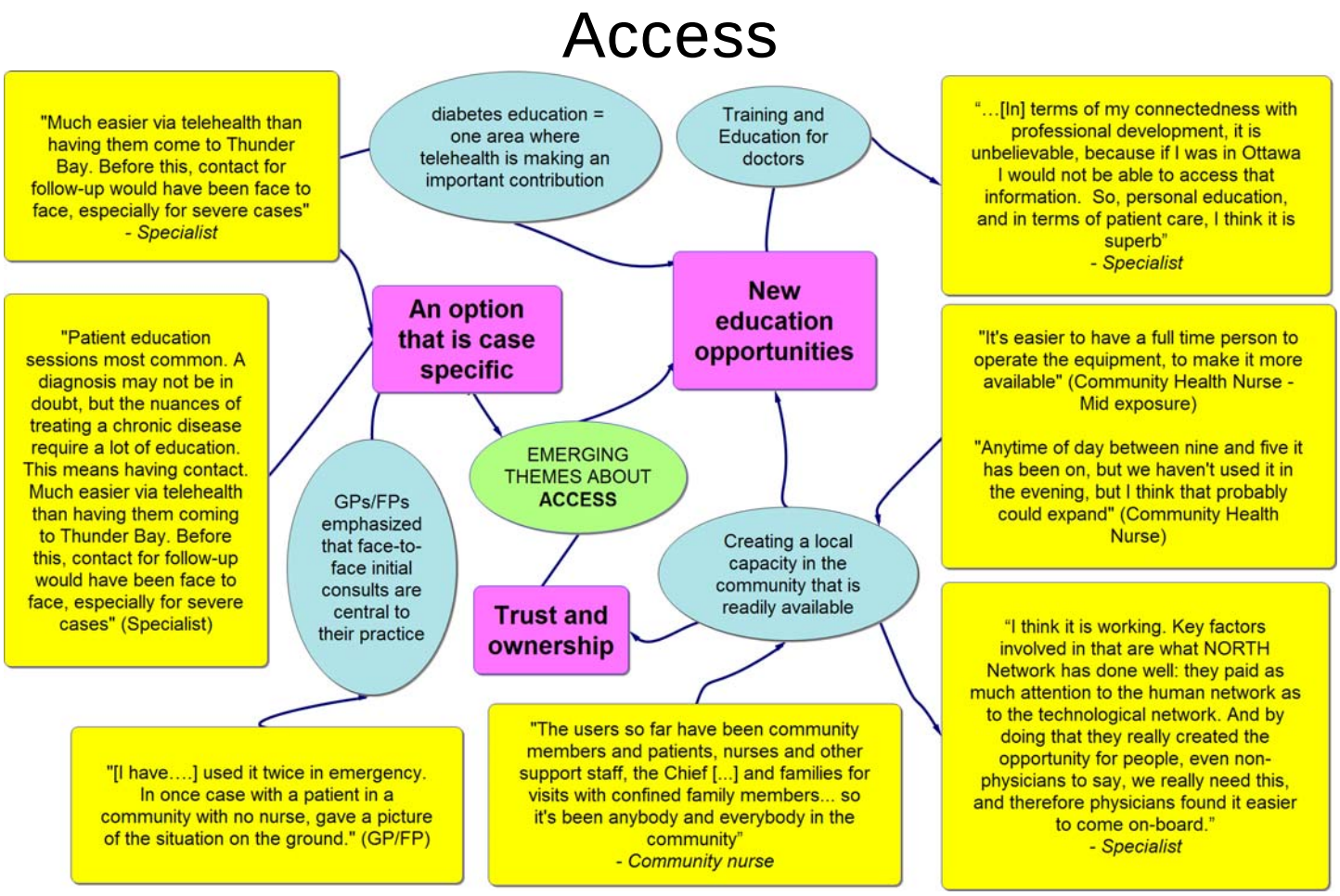

Exhibit 3: Main factors related to Access extracted from stakeholder interviews.

Legend: The factors appear in bold rectangles in dark shade (pink) linked to the central bubble (green) that represents the evaluation theme. Sample quotes are included in light shaded text boxes (yellow-orange) on the outside. The ovals (blue) are summaries of some qualitative findings that support the relationship between quotes and factors.

3.2 Acceptability

Acceptability: *the degree to which patients, clinicians, or others were satisfied with a service or were willing to use it*. Measures of what to expect from the service, satisfaction, knowledge transfer and the use of the service were included in this theme.

Patients were surveyed from August 2005 to February 2006 immediately after their clinical telehealth appointment. Sixty-four percent of 245 sessions[30] involved new patients—it was their first appointment (Appendix 4, Table 3). After 90% of the telehealth appointments, patients said that they found the session "very" or "somewhat helpful" and after 95% of the appointments, patients said that they would repeat the same appointment by telehealth (Appendix 4, Table 4).[31] The main reason for not repeating an appointment by telehealth was dissatisfaction with being on TV or a preference for face-to-face appointments (4 of 13 appointments). Patients said that they would recommend telehealth to another person after 90% of telehealth appointments (Appendix 4, Table 5). No reason was given in 19 cases in which a patient would not recommend telehealth. Interestingly, in 3 of the 16 cases in which the patients were undecided about recommending telehealth, the patient said that it was up to each person to decide.

Medical specialists were surveyed in July, October and November at two hub sites. We received responses from specialists in 10 fields: surgery (8 responses), psychiatry (7 responses) and GI (6 responses) (Appendix 4, Table 6). Eighty-five percent of the sessions were rated as "excellent" or "very good" or "good", while fifteen percent were rated as "poor" or "very poor". (Appendix 4, Table 7). Bad connections or poor image quality were cited in three of the five sessions that were rated poorly.

During interviews conducted December 2004 to January 2005, nurses expressed concern over the volume of critical health issues that exist in the relatively small communities in which they work. They also have a good grasp of what it takes to meet existing health care demands with the resources available to them. The following quote illustrates the context into which telehealth is/was being introduced.

> *"The level of acute care has risen and a lot of it has to do with [...] diabetes [and] rheumatoid arthritis, those are the two main issues in a lot of communities, and they're coming [to a] crisis, and so you have to deal with those things over the public health portion [of the daily schedule]. And it's recognised, in the [Sioux Lookout] Zone, and in the region, and in Ottawa, but there's not a lot they can do about it..." (Community Health Nurse – Least exposure)*

With respect to telehealth, Community Health Nurses share satisfaction about both the appropriateness of the tool and the human resources available for its operation. This comfort with the use of telehealth is evident at the other end of the connection.

> *"I am becoming comfortable with the nurses who are at the other end, and they are more comfortable with me, with the kinds of things I order so we are actually developing a good rapport, and I feel that together there is a therapeutic alliance with the nurse at the other end and the patient and I know that the nurse will make sure that the things I am asking for and going to get done. [When you say 'getting more comfortable with the nurses', is*

[30] There were 262 responses including 17-22 incomplete responses that could not be used.
[31] The majority of patients (n=164) completed one form and some may have completed several forms.

> *this a two-way thing?] Absolutely, what is interesting is that there is a relationship that develops, in the same way as with the nurses who work in the clinic every day, and it is not just a two-dimensional thing, it is a vivid part of my practice." (Specialist)*

Nurses tend to keep regular phone contact with their counterparts across communities to discuss matters of contingency and health care. Nurses working as the "Nurse-in-Charge" attend periodic teleconferences put on by the Sioux Lookout Zone[32] where they receive information specifically on the telehealth project from the "Zone" liaison with KOTH. Telehealth has been a subject of discussion among nurses since the start of KOTH's expansion into most First Nations communities of Northwestern Ontario. Success stories with telehealth technology make their way into communication among nurses even across provinces. Nurses tend to be keen supporters of the technology and an important factor in its early integration into regular medical consults.

As nurses share their experiences using telehealth with others not yet familiar with it in practice (most nurses have heard about telehealth from other nurses), they may play a part in its promotion among health workers in their own clinics/nursing stations, but this form of promotion is not guaranteed if left only to the nurses.

Specialists have echoed nurses' enthusiasm for telehealth:

> *"I put patients on medication who are living out near [community] and I am following their blood work weekly and I can contact them by telephone, but when I see them on telehealth for their follow-up, [the patient] was describing some swelling in [the patient's] ankles and I was able to –because of the telehealth- zoom in on [the patient's] ankles and see that [the patient] had an ulceration, that is a side effect that is reported with the drug that I was treating [the patient] with. So, you know, without seeing that I wouldn't know for sure that it was drug related, very useful.*
>
> *"[If you had not had the technology in that situation, what would have been the other alternative treatment?] Then I would have had to have [the patient] come and let me see [the patient's] ankles to determine whether this was just swelling that can be caused by many other reasons, or if it was more likely the drug effect, which it turned out it was, so [the patient] would have had to travel to Thunder Bay to see me." (Specialist)*

Like nurses and specialists, community-based health workers (CHWs) believe that ensuring face-to-face consults continue to be an option is vital to making telehealth attractive to community members.

> *"We need two times per year of face-to-face contact with the clients before people are okay with the telehealth sessions" (CHW – Most exposure)*

This front-line medical professional perspective confirms what we have heard about patients wanting the face-to-face visit with doctors. GPs appreciate the counselling and follow-up potential that telehealth offers to them and their patients.

[32] Sioux Lookout Zone (SLZ) is the administrative authority that oversees nursing and other federal health care services in Northwestern Ontario.

CHWs are able to see first hand the advantages of telehealth over the alternative, particularly in reducing the anxiety older clients experience, for example, when forced to get on a plane to see their doctor in another community.

> *"[...] especially when there is an elder who is sick and cannot be flown out right away if [the patient's] really in critical condition. [The patient] could just go to the telehealth and get checked up right away, instead of being flown out..." (CHW – Mid exposure)*

Other community stakeholders (those not in regular contact with telehealth) tend to agree that telehealth is an important improvement to access to care, but they also raise conditions to their acceptance of telehealth that go beyond the guarantee of a basic level of comfort for the client.

> *"It will be easier for people to use this. Especially [as] the nurse was saying [...] instead of people going out, you know, like they can come here [to the nursing station/clinic]. The doctor can just see them over this thing here" (Councillor – Least exposure)*

> *"Clinic...has to be [...] renovated or make an addition to it, because of the limited [space for] staff and concerns over privacy" (Chief – Mid exposure)*

Specialists were very positive about four facets of telehealth: (1) Education; (2) Follow-up; (3) Trouble shooting problems during treatment; and (4) Communicating with family.

The most dramatic educational examples were in diabetes and psychiatry. In several cases, specialists indicated that telehealth improved relationships with other care providers:

> *"Well, for example in haematology some of the things that we order in terms of blood work, will be things that those laboratories in [location], for example, which is a consult I did last week, they never even see someone ordering that blood work, so they are going to have to track down where to send it to, how it has to be processed and sent, they have to ask me to spell what it is that I am wanting them to order*

> *"So, in a video communication, someone is having to, a nurse professional, is having to write down words that she has not heard before, so it is very important that she be comfortable with me, and not feel intimidated by me, and sort of be able to ask me questions and joke, and learn, right? So, it is astonishing to me that there are personalities that can do that and that works really well and now over time they are learning and becoming more comfortable with the tools in my specialty" (Specialist)*

The need to have a policy and funding to cover a fee for telehealth consults was raised by GPs/FPs and several specialists; in more than one instance they suggested the fee needs to be higher than that for a face-to-face.

> *"Huge concern is physician funding for telehealth, we need a strategy to address it. This thing will take off like wildfire and there will not be many doctors willing to do it for nothing. From an administrative position, where to get resources to provide telehealth? The pilot … is fine, but if we are looking at implications, … it will mushroom and how will we pay for doctors' time?" (GP/FP)*

Some specialists emphasized the importance of the human element in improving and maintaining acceptability and this once again confirms statements from nurses about the importance of community-based, skilled coordinators:

> *"Some sites have well trained people, nurses or people who understand the technology and cameras and have an understanding of what has to be achieved. You have to have someone there, you cannot direct the patient via telehealth, there has to be someone taking an active role. You cannot have someone do it for a week or two, and then another [person]. I have had experience with very good people on the site and with some people who are brand new and don't understand the camera - it doesn't work, I am looking at the ceiling half the time. It just makes it all much more effective if everyone is on board. [The specialist confirms:] the human component is the number one issue to make it more appealing. Efficiency means having someone at the other side who can make it efficient. Continuity of the person at the other end is what matters. In one site, for a telehealth consult they call the emergency nurse, which means [the nurse] leaves the [other] patient alone." (Specialist)*

Improved access to care specialists has been noticeable to the communities and this has had implications on the acceptability of telehealth and the expectation of a new level of access to health care in general.

> *"... We used to be satisfied with a visit from the nurse once a month" (CHW – Mid exposure)*

> *"...Our level of satisfaction [with the quality of care] is improving compared to twenty years ago... just a visiting doctor once a year... Now, we have nurses all year round, with some problems, but they are here... and a visiting doctor every month... we have different health workers, like the diabetes nutritionist, dental hygienist" (CHW – Mid exposure)*

Summary-Acceptability

Telehealth was well received by the vast majority of patients and by many, perhaps most, of the health providers. Those providers that were least exposed to telehealth were the most doubtful (the case of some of the General Practitioners), which is consistent with the literature on ICT adoption. The potential of telehealth is somewhat specialty-dependent. In the prevention area, its educational potential is unprecedented. The fee-for-service issue is worth exploring further in terms of its impact on acceptability and on sustainability. It is also worth emphasizing that the introduction of modern broadband technologies is occurring in communities that less than a decade ago had limited or no access to telephones. This contrasts with the mainstream literature on the introduction of telehealth into communities that do not face the cross-cultural and physical isolation of this region.[33]

Key factors that elaborate on the meaning of Acceptability as perceived by community members and medical practitioners included: confidentiality, enhancing and enabling family visits, the importance of education, the attention to the introduction of telehealth, and the importance of ownership (Exhibit 4).

[33] Jennett, P.; Yeo, M.; Pauls, M. & Graham, J. 2002. Organizational readiness for telemedicine: Implications for success and failure. *Journal of Telehealth and Telecare* 9, (Suppl. 2), S2: 27-39.

Accessibility

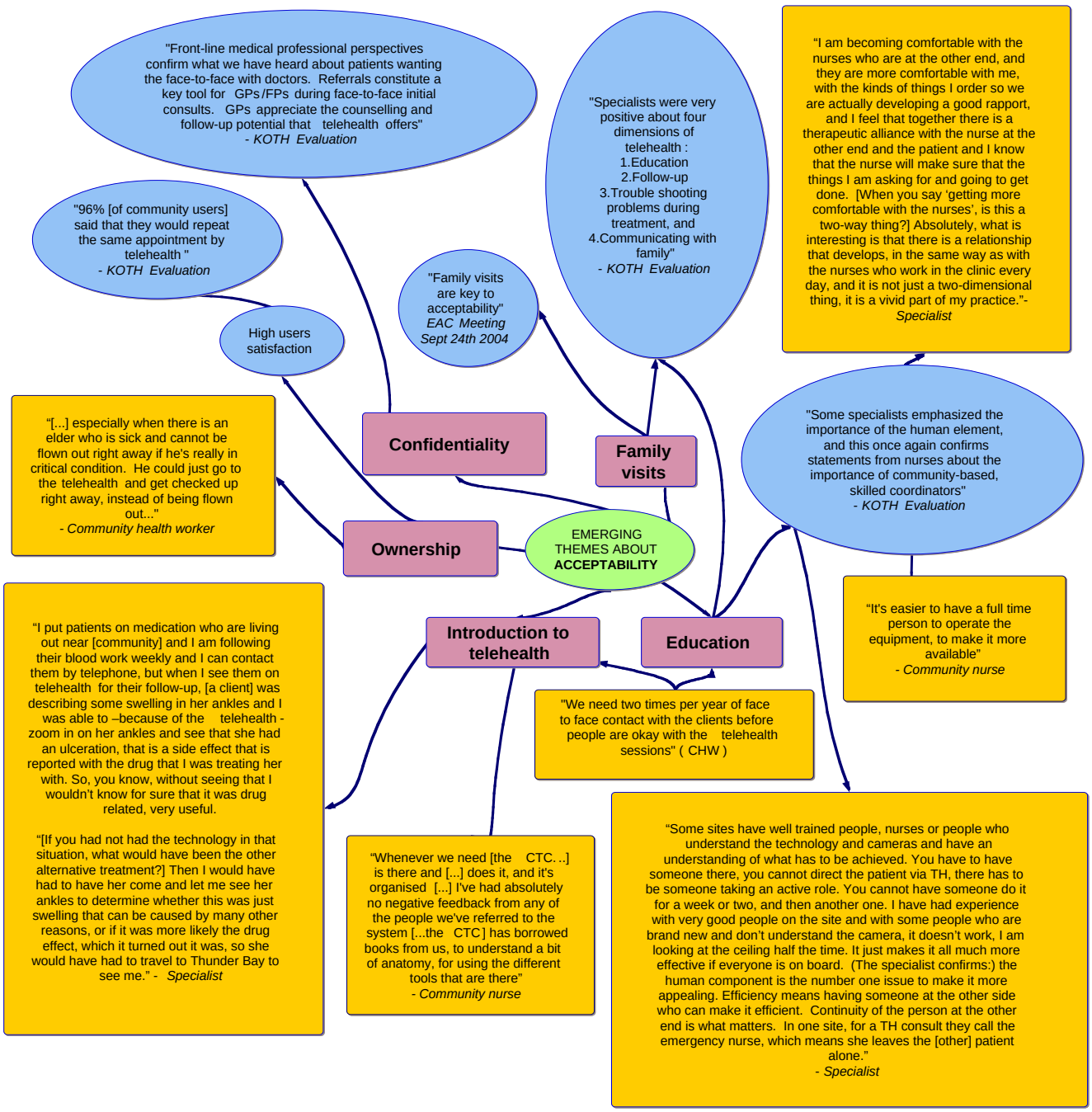

Exhibit 4: Main factors related to Acceptability extracted from stakeholder interviews.

Legend: The factors appear in bold rectangles in dark shade (pink) linked to the central bubble (green) that represents the evaluation theme. Sample quotes are included in light shaded text boxes (yellow-orange) on the outside. The ovals (blue) are summaries of some qualitative findings that support the relationship between quotes and factors.

3.3 Integration

Integration: *the degree to which the telehealth service and other health care services worked with one another*. This theme combined aspects of other themes such as continuity of care (*Quality of Care*), ease of use (*Quality of Technical Service*) and willingness to use (*Acceptability*), but with a focus on the way in which telehealth and other services interacted. **Capacity**, a sub-theme, included knowledge and skills, willingness to use (*Acceptability*), as well as community ownership of equipment and services.

Nurses' perspectives about the integration dimension emphasized how telehealth enhances trust, contributes to a sense of ownership, and enhances service efficiency. Nurses shared the desire to expand services offered through telehealth as a way to achieve that efficiency: better continuity of care and prevention of health issues. The idea was to relieve pressure on the clinic and its staff in order to allow for public health work to be done more consistently.

> *...[The] acute care is so big and so vast [...] your day is completely taken up with it. There are certain programs, immunization, prenatal, whatever... but, because of all the acute care and chronic problems, the public care and health prevention is not feasible [...] So, I think with the integration of telehealth, because there might be a little bit more teaching in that respect, I think that'll allow the nurses to be able to take on more of that public health role with prevention..." (Community Health Nurse – Least exposure)*

> *"[How often do you go?] we travel once a month to a different community; so each community will get [to see one of us] 2-3 times / year, in total up to 4 times. Follow-ups in between [take place] via TH, we have started to build that rapport, and then following up via VC is what we would do next, within a couple of weeks." (Specialist – diabetes education.)*

The technology can also enhance the integration of patient, therapist, nurse and specialists, as illustrated in the following example:

> *"I get clients on the other end and they have never seen anything like this, they are just giggling, there a real level of feeling uncomfortable for the client as well. Working with Dr. [ ] He is a rheumatologist based in [ ], he does a lot of his assessments and follow-ups via VC. So the person will come in and be assessed by me, it takes about an hour to do the full rheumatology assessment, and then they are assessed by a nurse which takes about 15 minutes, and then they see Dr. [ ], so the nurse and I would give him our information for the physical findings via VC. He wants to know how the arthritis is progressing, and whether the medications are working, so he needs the joint counts, he needs us to do strength and he needs to hear the heart, and stuff like that." (Specialist – occupational therapist.)*

Nurses in the "mid" and "most" exposure range view telehealth as an advantage for clients in that they are able to bring family members to a session, which ensures a greater acceptability, comfort, and client awareness about the importance of continuity of care (clients are more willing to continue treatments, attend follow up sessions, etc.).

> *"It means more open access to medical specialists and decreased travel time, which translates into a decreased disturbance of family life for clients, less confusion because of language barriers [...] a relationship between the*

> *patient and the doctor, which makes my job easier" (Community Health Nurse – Mid exposure)*

Nurses in the higher exposure categories (of telehealth use) value telehealth as a way to facilitate a more constant communication with specialists, which in turn allows for "relationships" based on trust to form and, consequently, for continuity of care to be effectively delivered to the client.

An important emerging concept, also related to the question of integration of telehealth, is that of ownership over the service and the decisions affecting it. One example is that both nurses and clients appreciate having the doctor "visit" through telehealth—the physician is coming to their community. Ownership begins to play a role as a selling point for promotion and adoption of the technology; nurses have heard a strong and clear interest in telehealth from clients, even in communities where it has only just arrived.

> *"They are asking specifically about telehealth, so I mean, they know it means no trips out, they can see their specialist..." (Community Health Nurse–Least exposure)*

The specialists' perspective on integration was overwhelmingly positive, with examples ranging from: patients for whom a trip is impractical; staying in touch; follow-ups; and coordination of care across provinces and with GPs. The continuity of care dimension is an important example of integration; when asked whether specialists were pleased with the continuity of care provided by telehealth, they responded:

> *"Telehealth actually led to improved management, family support, I was able to have the full family communicating, at various points – a daughter came. I also supported and managed several nurses who were involved in the case so that they were familiar with what was going on. It was a large group of people over a fairly lengthy number of appointments. And then, by virtue of that I could actually follow the illness over time, watch its improvement and then see [if it] required a reanalysis" (Specialist)*

> *"I will tell you another example of continuity at the other site, often if I want something biopsied, the local doctor will biopsy it and send it to the pathologist of my choice, and I consider that the best case scenario so I think that is also an example where the continuity of care has worked very very well for me. It is like the right people looking at the right thing but I do not need to bring the patient in necessarily. And then I follow them up and I get the results and we discuss it" (Specialist)*

In a number of clinics and nursing stations, the arrival of telehealth has crated a "space sharing" issue that has often been resolved through the intervention of the local Nurse-in-Charge, sometimes with no input from the CTC. However, in all communities visited, health workers have made an effort to give telehealth adequate space in which to function.

Some community health workers (CHWs) point to this problem as a mere inconvenience. Those with less exposure to telehealth, especially out-of-clinic health workers who would like, but are often not centrally located (in the clinic with all other health services) highlight what they perceive as competition for limited resources.

> *"We were supposed to be located at the nursing station, but there is no room there. The other problem is we don't have storage space [for our equipment]" (CHW – Least exposure)*
>
> *"We work with Healthy Babies, Early Years, Head Start, CPNP, and Regional Diabetes... we work together with all the resources here" (CHW – Least exposure)*

As observers of the integration process that occurs after the arrival of telehealth, other community members offer a very clear understanding of what the technology and the service are meant to achieve.

> *"...Health workers [are] communicating with each other, they're sharing ideas for the betterment of the client or whatever crisis there is" (Councillor – Mid exposure)*
>
> *"What it did that I saw was that it connected the communities, the health departments together, whether it was the nursing, the medical; where it was really strong was in the mental health resource workers, they were connected together and able to see each other" (Resource Worker – Mid exposure)*

Summary-Integration

Telehealth has created opportunities for improved continuity of care involving local care providers, including family members. It has allowed other services to be added, particularly in the area of education and prevention. There is, however, some concern that resources allocated to telehealth are unavailable for other programs and services. One solution may be to promote the delivery of these services through telehealth, where feasible and appropriate. Telehealth provides an unprecedented opportunity for preventive/early attention to diabetes education, particularly with children.

> *"It has really helped the continuity of care for diabetes. If we are up north and do an "initial" and have a plan, then we can follow-up, there is a lot of information. Anybody at the start is in denial, but it takes a while, a couple of visits, to get a real grasp of diabetes and the implications. Helps us make plans and help the client follow those plans, and to adapt them as needed."(Specialist - diabetes education.)*

From an analysis of the qualitative data we summarized key factors that elaborate on the meaning of Integration as perceived by community members and medical practitioners (Exhibit 5). Enhanced communication is a key factor that is evident in the new relationships of trust that emerged between nurses, patients and specialists. This is the social side of the technology which other research has reported on in the literature. Another relevant factor is the enhancement to the continuity of care that was not possible without telemedicine.

Integration

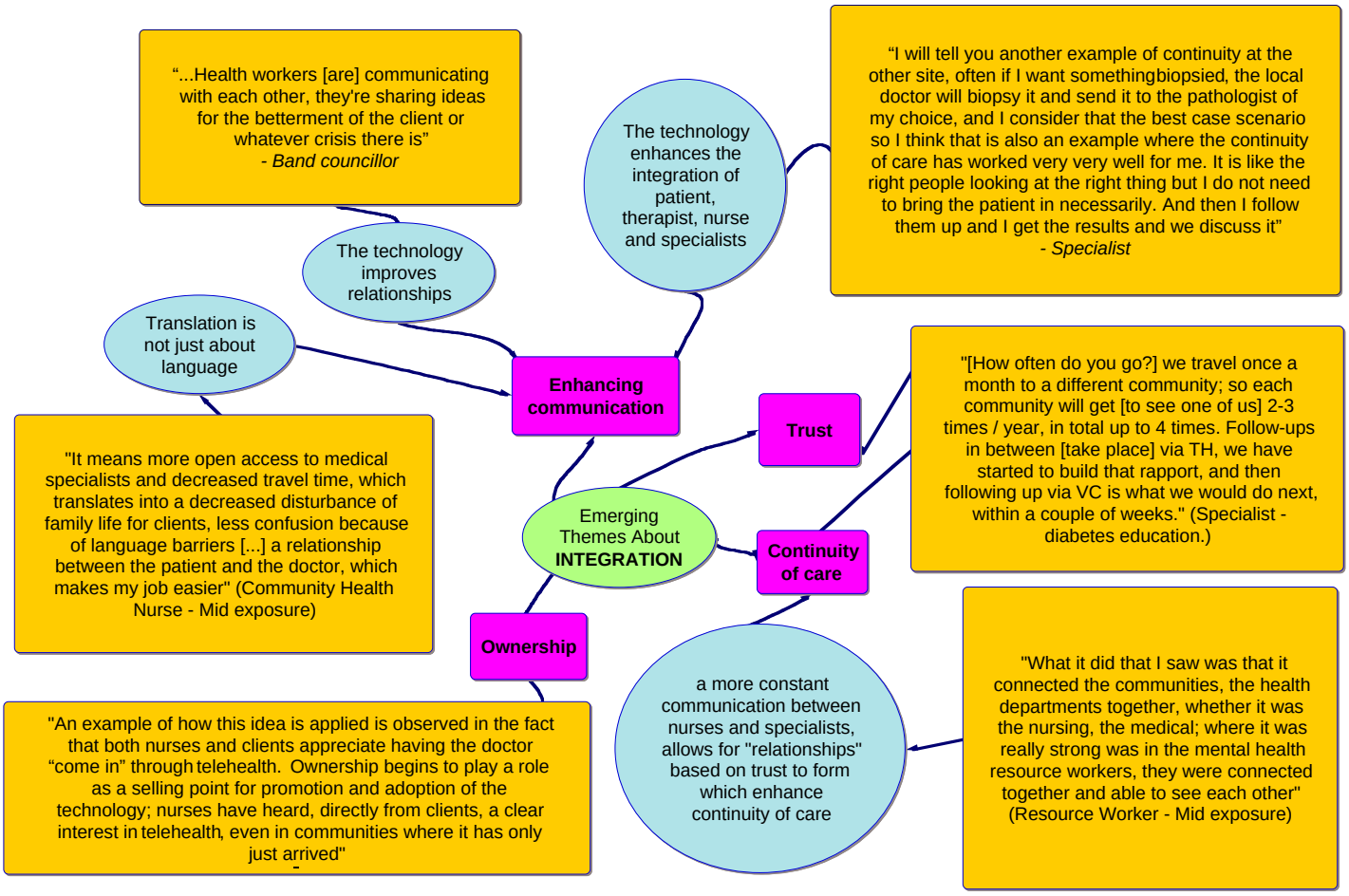

Exhibit 5: Main factors related to Integration extracted from stakeholder interviews.

Legend: The factors appear in bold rectangles in dark shade (pink) linked to the central bubble (green) that represents the evaluation theme. Sample quotes are included in light shaded text boxes (yellow-orange) on the outside. The ovals (blue) are summaries of some qualitative findings that support the relationship between quotes and factors.

3.4 Quality

Quality: has three sub-themes. The Final Report focussed on the first and second sub-themes.
Quality of Care*: the degree to which telehealth provided care that was consistent with current professional knowledge and standards*. The assessment of the **quality of clinical care** was the responsibility of the individual health care professional. The evaluation examined how the Community Telehealth Coordinators (CTCs) helped provide **quality of service**.

Quality of Technical Service: *the performance of telehealth equipment (hardware and software) and support services, plus measures of site preparation/readiness*. These were technical measures related to service delivery.

Quality of Outcomes: *the degree to which the telehealth service improved health outcomes for individuals and populations*. Typical measures included health status and disability adjusted life years that were compared before and after telehealth was implemented. It may take several years, even decades, before the impact on health status is observed. The Evaluation Team helped to identify medical conditions for which early detection and intervention have proven long-term benefits—one example would be diabetes and complications. The measurement of these conditions and outcomes are the responsibility of future research and evaluation programs.

Quality of Clinical Care – Comments from Health Providers

The extent to which telehealth provides an alternative to face-to-face consultations was somewhat specialty dependent. Diabetes educators, dermatologists, psychiatrists, and haematologists were unanimous in its potential, while others—for example oncologists—emphasized the importance of the initial consultation being done face-to-face and the follow-up by telehealth.

> *"… I do use telehealth, I think it is better than nothing if the patient really cannot get to the centre, but it is definitely a distant second to having the patient in your office. Things I don't really like about it is the distance of it on the video, it is a bit impersonal, it is slightly better than a phone call in my opinion. I don't really know if there is anything that can really make it better, there is no substitute for having the patient in your office." (Specialist)*

Specialists signalled that some of the limitations have to do with diagnosis of cases where physical contact is needed, or where delicate nuances could not be appreciated via the camera.

> *"And I think that the determining factor again is how the team issues are managed. I think that as a specialist I can provide that care but remember I am a psychiatrist, so yes I think I can make an adequate assessment – I have been doing it long enough to develop an understanding of the different nuances than if seen face-to-face. I don't know if that would be true for some of the physical assessments." (Specialist)*

For some specialists, telehealth provides opportunities to improve and follow-up care; for others, it constitutes a full alternative to face-to-face.

> *"I don't do anything by telehealth that I don't do in clinic. So I use the telehealth for follow-up appointments, and sometimes, occasionally for new patient consults." (Specialist)*

> *"As long as, if I make the decision that I need to see the patient in person, as long as that is easy to facilitate, then the answer is yes. And it has only happened once that I wanted that." (Specialist)*

> *"So it is equivalent to face-to-face with the only caveat that if I decide somebody needs to come down as long as the patient and the family are able to arrange it, then I think it is equivalent to face-to-face consult." (Specialist)*

> *"…if I were to do an initial insulin start, to show someone how to actually give themselves insulin, I wouldn't think that would be nearly as good as fact to face. But generally, routine follow-ups, definitely, as just as if not better because it makes the individual a lot more comfortable when they can stay in their community. I find that it does provide the same level of care for routine follow-ups, definitely, there is no difference, in fact I believe telehealth may even be better especially for those individuals who do not want to come out of the north. But for doing initial teaching of insulin, yes, using the technology, very difficult to show over a TV, especially if communication, you know you need a translator as well, it makes it all the more difficult." (Specialist – diabetes education.)*

GPs/FPs had a more cautioned message. They feel it is too early to tell what the impact will be in that they do not feel it is rolled out enough. One added:

> *"I thought I would be using it a lot more, magic would happen, everyone would be presenting patients on telehealth. I realize it has to be physician-driven for us to use it. No one is pushing it." (GP/FP)*

Notwithstanding the hesitation, the feeling was that "hands down that it helps improve quality because of improved access". One physician reported that there has not been a single case where a network session has been a failure.[34] They added that the lack of specialists remains a barrier, with waiting times (for face-to-face and for network sessions) remaining a concern. The need for dedicated people "at the other end" was mentioned often.

After some exposure to the service, community health workers appreciate the need to have more, not less, human resources available in the community, as they clearly understand client needs in a professional and at times a personal level. At the same time, they see a need to make explicit recognition of the value represented by the CTC position by facilitating training opportunities that incorporate unmediated interaction (team building/learning in "face-to-face" encounters).

[34] However, there was one report by a physician specialist that the telehealth session was a failure. "Telehealth connection with [First Nation community] was very poor. [I had] to terminate session and call in by phone because I could not communicate with the patient."

> *"[...In] First Nations communities [CTCs] don't have those skills [organisational skills], they just learn on the job. This is one of my biggest concerns [...] I know that there are training sessions taking place through teleconferences and some through telehealth [videoconference...] Training over the phone is not really good training, so what you try to do is to try to visualize, which is the closest thing to watching and learning ... but, over the phone, [CTCs] don't grasp it, and I think my biggest complaint, I'd like to have the CTCs come together, train, practice, learn how to promote, how to motivate others [...] sharing ideas together in the same room, showing each other... Over the phone training... it goes in one ear and out the other" (CHW – Most exposure)*

The adequate preparation of the CTC is seen as a pending requirement for quality of service, but an adequate supply of qualified human resources for care is seen as a priority that goes beyond telehealth. In other words, telehealth has made its "splash", but it has not replaced or changed perceptions about what communities "really" need to improve the quality of their health care. Telehealth is not seen in isolation from other improvements in this direction.

It is noteworthy that one GP/FP spoke for many about the overall purpose of telehealth—a comment that will resonate with many of the users at the community level:

> *"Communities' resistance to telehealth has to do with their fear of losing face-to-face visits by physicians, and they come to appreciate that this is not necessarily the case. A concern is that the system not be under-funded as telehealth is about augmenting health care." (GP/FP)*

Quality of Service – The Role of the CTC

The importance of the role of the community telehealth coordinators (CTCs) makes itself present in the statements made by nurses and other care providers. The CTC has earned legitimacy in all communities.[35] Nurses in all exposure categories agreed that CTCs are helping to provide quality of care and there is continuing talk about the ability of the CTC to help nurses gain more time to spend on other tasks.

A workshop/focus group[36] was conducted with CTCs in November 2004 in Sioux Lookout to collaboratively identify and assign value to the day-to-day tasks they perform on the job (Exhibit 6). This exercise helped produce a rich picture of the challenges and opportunities that characterize this telehealth position (Exhibit 7). It also allowed insight into the contributions CTCs make to their communities as telehealth workers.

[35] For recent videos reporting on the roles of the CTC, refer to:
http://streaming.knet.ca/telehealth/intro_part1_300k.wmv
http://streaming.knet.ca/telehealth/supporting_part2_300k.wmv
http://streaming.knet.ca/telehealth/consultarion_part3_300k.wmv
http://streaming.knet.ca/telehealth/roles_part4_300k.wmv
http://streaming.knet.ca/telehealth/public_education_part5_300k.wmv

[36] See CTC workshop report at:
http://telehealth.knet.ca/index.php?module=ContentExpress&func=display&ceid=240

Top Ranked Tasks	
Weekly reports	Translation
Keep workplace tidy	Using peripheral equipment
Contacting other CTCs for help	Learning about new equipment
Encouraging individual users	Organizational educational sessions

Exhibit 6: Top Ranked Job Tasks – CTCs (Source: CTC Workshop Report – November 2004)

Investing in People	Equipment	Basic Skills
Promote	Phone	Certification
Research	Support	Training
Communicate	Office space	Writing and word processing
Translate	Office materials	Typing
People skills		Challenges
More conferences		Up to date information/technology

Exhibit 7: Tasks and initiatives where further support is requested by CTCs. (Source: CTC Workshop Report – November 2004)

Community telehealth coordinators place highest value on their role as an additional human resource at the service of clients with diverse needs. They also see their jobs as key to the promotion of the telehealth service in their own communities

> *"Participants understand their work as, first and foremost, building the community's acceptance of the technology, but acknowledge that this represents a difficult challenge considering that some or many of the skills and other needs are not always [present in the community]. CTCs value the opportunity to help each other on day-to-day matters, but also see a need for a greater investment by the organization in its front-line community workers" (CTC Workshop Report)*

CTCs are very interested in continuing to improve, innovate, and make the best of this employment opportunity for both their community and themselves. The "promotion" task is accomplished through a combination of "word of mouth" and demonstrations, which are the best illustration of the collaborative approach CTCs bring to their job. CTCs placed great importance on "contacting each other" to deal with challenges and reinforce their on-the-job learning experience. Community demonstrations of the technology are often initiated by CTCs themselves, and encouraged by KOTH supervisors during bi-weekly conferences (video and/or teleconferences).

Nurses, in particular Nurses-in-Charge, advocated for the role of the CTC in technical matters. In fact, very few nurses, even those in the "most" exposed category, were involved directly in the technical or planning tasks that the CTC does to make a consult possible.

> *[Who helps you with the technology?] "It's just exclusively the CTC [...] there were a lot of glitches only in the beginning, before the CTC was trained" (Community Health Nurse – Mid exposure)*

Aside from their high level of confidence in the training and capacity of CTCs to resolve technical issues, nurses also find CTCs accessible and keen on helping with any initiative meant to improve the scope and quality of care.

> *"[...] if we could get a Community Health Nurse/educator to talk to our girls, that's what I want to talk to [the CTC] about, to make it part of the program..." (Community Health Nurse – Mid exposure)*

> *"Whenever we need [the CTC...] is there and [...] does it, and it's organised [...] I've had absolutely no negative feedback from any of the people we've referred to the system [...the CTC] has borrowed books from us, to understand a bit of anatomy, for using the different tools that are there" (Community Health Nurse – Least exposure)*

> *"And I've seen that in other communities, too, like the one [...CTC] who was like: "here's our manual, I want you to read it, and this is what's going on, if you have a chance to come in, we have this thing on depression coming on, if you have time to come in..." I was really impressed" (Community Health Nurse – Least exposure)*

> *"[...] they do their best [...] they are certainly helping" (Community Health Nurse – Most exposure)*

A constructive criticism, coming from a nurse in a community with a long exposure to the technology, was that CTCs should be reinforced in their roles with more training on organizational and communication tasks, given that the CTC position helps the program to run effectively. The CTC is the only person in the community with the skill-set to run the program locally: the CTC serves as a technical, educational, and organizational resource that is valued by the nursing community of Northwestern Ontario. In several cases, there were reports of the CTCs' achievements in convincing community members to come to the clinic and this may have to do with the CTCs ability to transcend cultural and linguistic barriers.

> *"Sometimes the elderly can't get any support or they're not approved for an escort. Not everybody speaks English, so it's hard for them to go out for their appointment and understand" (CHW – Least exposure)*

Quality of Technical Service

Data to assess technical quality were provided by NORTH Network for all KOTH sites for April 2003 to August 2005. First Nations communities started the telehealth service at different times during the expansion project (Appendix 4, Table 8). Once the telehealth service became operational at a site, it was available for an average of 93% of the time. There was no difference between the seven communities that had just started telehealth operations and eight communities with the longest-running telehealth service: both groups had an average availability of 96-97%.

From April 2003 to August 2005 the total number of technical issues reported by the First Nations communities was 422 (Appendix 4, Table 9). Problems with the network comprised 69% of the issues, followed by hardware problems at 28% and software and miscellaneous incidents at 3%. The eight communities with the longest running telehealth services averaged 14 incidents per year—a little more than 1 per month.

Summary-Quality

Many, if not most, of the specialists felt comfortable with the quality of clinical care that they were able to provide via telehealth. One important proviso, mentioned by physicians with a range of telehealth experience, was the need to ensure that a face-to-face consultation remained a viable and workable option, should it be required by the circumstances.

Many stakeholders concluded independently that the role of locally recruited, full-time CTCs was of paramount importance to telehealth success and had implications not only for quality of service, but for access, acceptability and integration. Many stakeholders advocated for ongoing efforts to educate and retain qualified personnel, especially CTCs. While the qualitative data suggests that the presence of a full-time CTC is a key contributor to the utilization of the telehealth system, we did not find a direct relationship between the number of clinical sessions per month per community and the complete absence of a CTC, or the presence of a temporary CTC. The relationship is influenced by several additional factors including size of community, length of presence of the telehealth services and health status of the population and deserves further study.

We summarized the factors that elaborate on the meaning of Quality as perceived by community members and medical practitioners. Telemedicine options for follow-up are particularly important for specialists (Exhibit 8). GPs and community members agreed on the importance of face-to-face for initial diagnosis. The role of the CTCs was reported as important with calls for further capacity development.

Quality

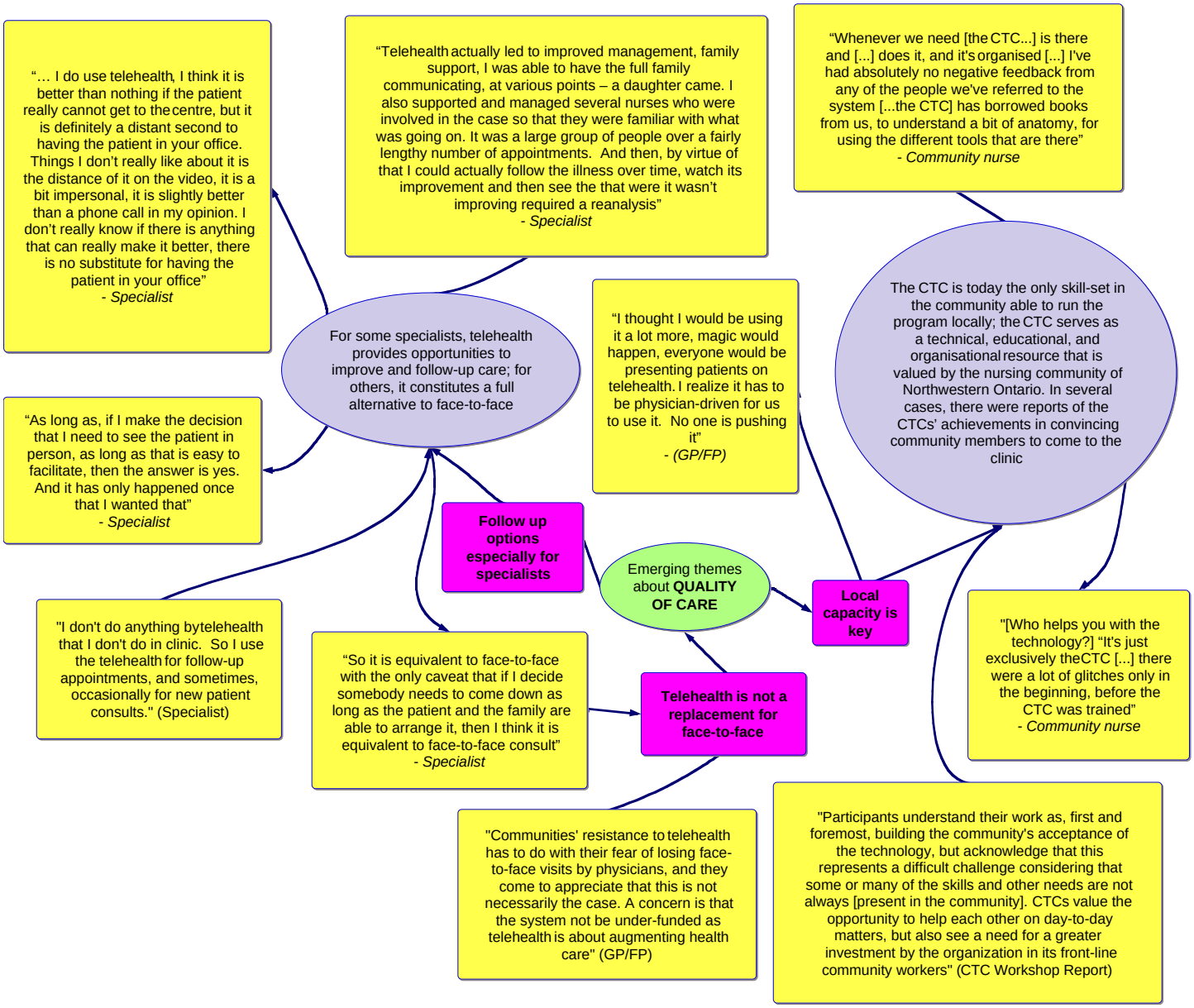

Exhibit 8: Main factors related to Quality of Care extracted from stakeholder interviews.

Legend: The factors appear in bold rectangles in dark shade (pink) linked to the central bubble (green) that represents the evaluation theme. Sample quotes are included in light shaded text boxes (yellow-orange) on the outside. The ovals (blue) are summaries of some qualitative findings that support the relationship between quotes and factors.

3.5 Financial Impact

Financial Impact: *the monetary cost of providing the service by telehealth compared to other ways of delivering the service*. This theme measured the dollar costs and savings to individuals (patients, clients, professionals, workers, etc.) and to organizations (communities, KOTH, Health Canada, Government of Ontario, etc.). The dollar cost or savings of providing services by telehealth was compared to the cost of travelling to receive services.

3.5.1 Comparing Telehealth to Travel

Due to the large geographic distances involved, the main cost-savings would be due to averted travel. Other benefits and savings, such as potential improvements to health and well-being, are not included directly in the model. However, the model does allow potential benefits to be included indirectly, as described later in this section.

It was assumed that network sessions would avert a trip for those situations that would have required a trip in the past (or would have required travel in the absence of telehealth). For these trips, averted travel costs equal estimated savings.

The survey of medical specialists, described earlier, also asked the specialist whether the network clinical session would have required an in-person consultation in the past. Sixty-eight percent of the 34 network clinical sessions would have required a face-to-face consultation in the past and another 15% were considered as possibly requiring face-to-face in the past for a total of 83%. Specialists indicated that a follow-up was required or optional in 29 of 34 cases. These specialists suggested that telehealth could be used for 69% of these follow-ups.

If it is assumed that most follow-up consults currently done by telehealth would have required a face-to-face consult in the past, then the percentage of network clinical sessions conducted for follow-up consults can be used as estimate of averted travel.[37] Data from 34 network clinical sessions suggest that 56% were for follow-up and the remainder were for initial consults.

Another estimate of initial consults was obtained from KOTH-NORTH Network telehealth referral sheets. Over 400 referral sheets were examined for seven First Nations communities for April 2003 to June 2005. These data suggest that on average, 48% of the network clinical sessions were for follow-up (Appendix 4, Table 10). The pooled value (all communities combined) was 53%.

The evaluation has three estimates of the percentage of network clinical sessions that averted travel: 68% (would have required travel in the past), 56% (follow-up consults) (based on 35 specialist consults) and 48-53% (follow-up consults based on 402 referral sheets). In the economic model, we used 60% as the default estimate for percent averted travel for network clinical sessions. Estimates of averted travel for educational, training, administrative and other uses of telehealth were educated guesses based on expert opinion—we currently do not have any numerical data to support or refute these best guesses.

[37] This estimate of averted travel would be a minimum, because some of the telehealth sessions conducted as initial assessments may also have averted travel.

The remaining network sessions may not avert a trip. This is because telehealth may be more convenient in time and dollars to the user as compared to travel. Thus some of these network sessions were in addition to what would have occurred in the past and, from an economic point of view, these "new" sessions have lower value—community members, band councils, charitable organizations, government agencies, etc., did not place the same value on these sessions in the past. For these "new" sessions, the full cost of telehealth was compared against an adjusted cost of travel, to reflect the historically lower value placed on travel for this type of session.

This adjustment, called the Valuation Factor in this model, was estimated as the percent of the travel cost that was assumed to represent a real savings. It was set at 100% for network clinical sessions that averted a trip. It was set at some other percent for network sessions that were in addition to what would have required travel in the past. This factor would be expected to change depending on the stakeholder's perspective. Changing the valuation factor for "new" telehealth can be used to indirectly include other possible benefits in the economic model.

3.5.2 Pilot Project

Funding for the Pilot Project, less unspent monies and excluding the cost of this evaluation, totalled $6.72M over 31 months for an annualized cost of $2.60M (Appendix 3). Designing a similar program, with equipment and connectivity purchases, personnel costs and other project expenses resulted in an estimated annualized cost of $3.50M.[38]

The Pilot Project demonstrated that the telehealth service could be rolled-out to 24 First Nations communities. The Pilot Project was able to demonstrate how health care services, health information and health education could be delivered by telecommunications technology as compared to delivery of the service by transporting the users (e.g., patient, client, learner, provider, educator). In addition, the Pilot Project provided cost and utilization data that were used to model a fully operational and sustainable telehealth program.

3.5.3 Sustainable Program

Costs for a fully sustainable program, with modest replacement/upgrading of equipment, were estimated at $2.8M/year (details in Appendix 3, summary in Appendix 4, Table 11). Utilization was estimated to be 4866 network sessions/year, (details in Appendix 3, summary in Appendix 4, Table 12).[39] It was assumed that a certain percentage of network sessions would have replaced (averted) travel and that the remaining network sessions represented "new" telehealth.

Estimated savings for the Sustainable Program were $4.2M/year for averted travel[40] only and $7.4M/year if “new” telehealth was assigned a dollar value (details in Appendix 3,

[38] Some of the differences in total cost were due to equipment and infrastructure purchased prior to the expansion project—these costs were not included in the funded amounts. These equipment costs were, however, included in the designed costs as they represent the cost of establishing a similar network from scratch (in the absence of a network of the magnitude developed by K-Net).

[39] Median per capita annual utilization rate of the 9 First Nations communities with the longest running telehealth service was applied to the total population of the 24 First Nations communities involved in the expansion project to estimate utilization in the Sustainable Program.

[40] Travel costs include transportation, accommodation, food and miscellaneous expenses.

summary in Appendix 4, Table 13). Thus the economic model estimated a net savings of $1.4M/year, based on averted travel only. The value of "new" telehealth, by itself, was estimated as an additional $3.2M/year (net savings). Estimates were based on a total of 4866 network sessions/year for a fully operational sustainable program involving 24 First Nations communities. The breakeven point was estimated to occur for approximately 3220 network sessions using the default values for cost and averted travel.

3.5.4 Participants' Perspectives

The practical effect of telehealth in averting travel is evidenced by several comments for clinical and educational sessions.

> *"I actually just came from my telehealth clinic, I saw a patient today from very far away with a lesion that was probably not diagnosed correctly, and they wanted a dermatology opinion on that and I was able to completely diagnose the problem with a history and with the camera being able to see the lesion, diagnose it and organize the follow-up without having to bring the patient down, so I mean, that probably represents most of the sessions that I run" (Specialist)*
>
> *"[We]…have more people staying in the community and that saves us all this time of [having to worry about] travel, planes that get cancelled, re-bookings, all that kind of thing" (Community Health Nurse – Mid exposure)*
>
> *"With telehealth, my specialist can see me here" (Client – Mid exposure)*
>
> *"[...] Education is very convenient now, because [we] have a chance to learn new skills, not like before, because we don't have any funds to travel to educational sessions and there are now mental health and all that, so whenever it is available we can now attend" (CHW – Most exposure)*

Summary-Financial Impact

The Pilot Project demonstrated that the telehealth service could be rolled-out to 24 First Nations communities. The Pilot Project was able to demonstrate how health care services, health information and health education could be delivered by telecommunications technology as compared to delivery of the service by transporting the users. In addition, the Pilot Project provided cost and utilization data that were used to model a fully operational and sustainable telehealth program. Different estimates and monetary values were assigned to network sessions that averted travel versus those that were in addition to travel ("new" telehealth).

Costs for the Sustainable Program were estimated at $2.8M/year. Estimated savings were $4.2M/year for averted travel and $7.4M/year if "new" telehealth was assigned a dollar value. Estimates were based on 4866 network sessions/year. The breakeven point would occur at approximately 3220 network sessions/year.

Numerous comments from a variety of stakeholders spoke convincingly of the benefits in time and money due to improved access (Exhibit 9). Today, throughout the region, the technology and human resources involved represent a legitimate alternative to flying for hours to see a doctor. Moreover, all users realize the advantages, especially for clients with special needs, to having the consultation take place on local turf.

Financial Impact

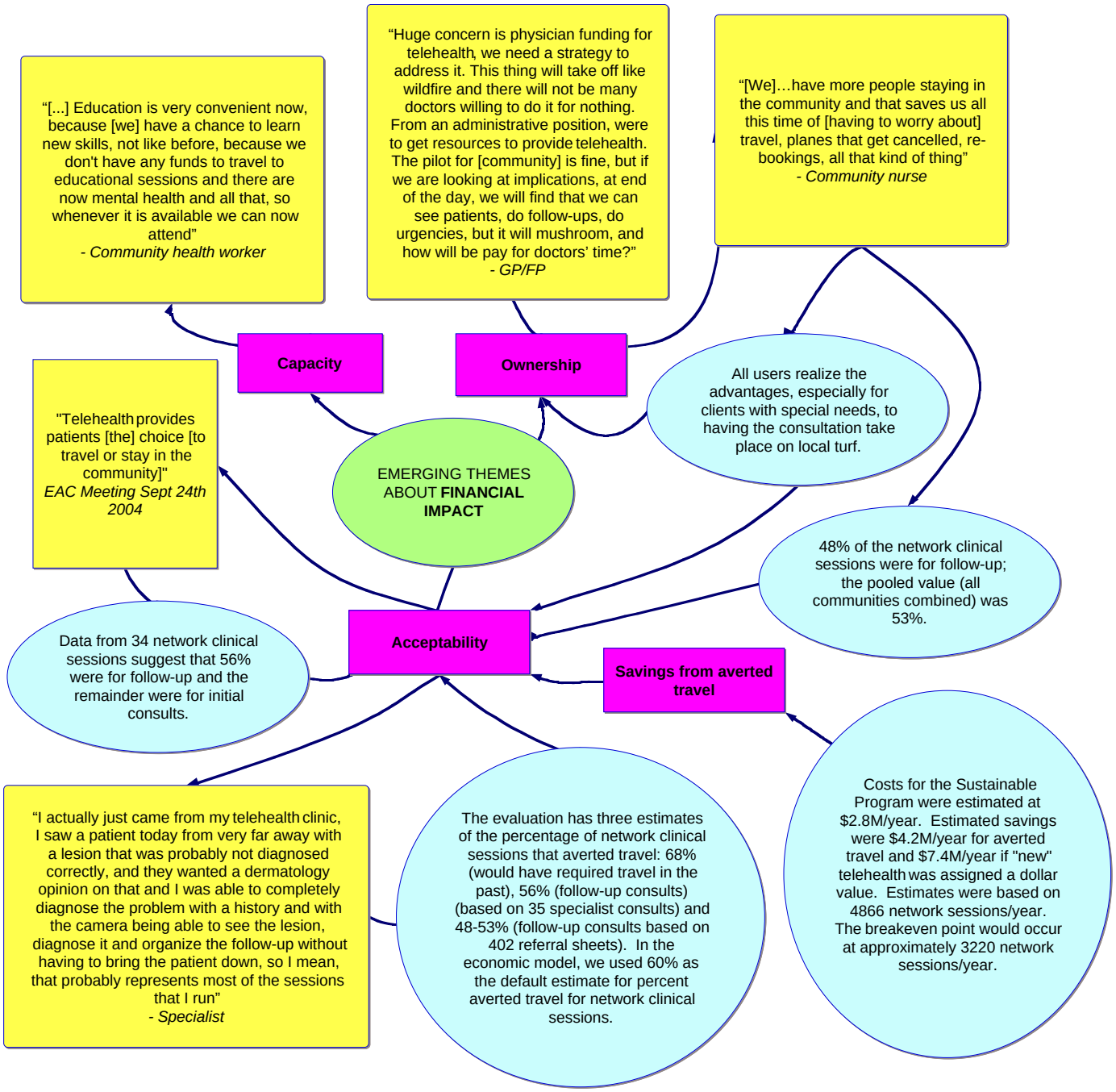

Exhibit 9: Main factors related to Financial Impact extracted from stakeholder interviews.

Legend: The factors appear in bold rectangles in dark shade (pink) linked to the central bubble (green) that represents the evaluation theme. Sample quotes are included in light shaded text boxes (yellow-orange) on the outside. The ovals (blue) are summaries of some qualitative findings that support the relationship between quotes and factors.

4 Discussion

The evaluation of KOTH/NORTH Network Expansion Project used a descriptive design to assess the project in terms of Access, Acceptability, Integration, Quality and Financial Impact. The evaluation combined administrative data from various sources with quantitative and qualitative data from patients, providers and other stakeholders to assess the impact and importance of the telehealth service. The statistics and the stories helped to paint a comprehensive picture of the service, the people and the context.

The number of patients, providers and communities who used KOTH has increased since April 2003. The diversity of the service has increased as evidenced by the increased number of medical specialties, educational events and health programs. Telecommunications technology has "virtually" reduced the geographic distances that have, in the past, restricted access to health information and services. This finding is consistent with the literature on information and communication technologies (ICTs) that talks about overcoming the "friction of distance".

The use of administrative data for purposes of evaluation had certain limitations. Most of the limitations arose because the reasons for data collection often differ between administration and evaluation. Future research and evaluations would benefit from a standard, explicit, definition of what constitutes a session. For example, is one patient equal to one session? What about education sessions with many patients? Similarly, it would be useful to have a standard, mutually exclusive definition of the type of use. For instance, is a session between a physician and a patient always a clinical session? What about if it involves a large educational component? Is a case management session a clinical or an administrative session? Recent work by Telemedicine Networks of Ontario, Clinical Working Group and Evaluation Working Group may offer a solution that could be adopted.

A logistical concern was that many of the records were paper-based and required manual extraction to generate electronic records in text format. One alternative would be to put as much of the process on-line, using standard forms created with a spreadsheet program (e.g., Microsoft Excel, QuatroPro) or database software (e.g., Microsoft Access, Borland dBase, Oracle). Other forms and checklists, such as the Patient Feedback Form and Averted Travel Form, could be placed on-line, to be completed immediately after the session.

It is important to note, however, that there was sufficient overlap in purpose to allow the evaluation to use the administrative data to describe, in broad terms, the use of the Pilot Project and estimate use for the Sustainable Program.

"Access" is a term that requires qualification when referring to new information and communication technology. One analyst[41] indicates that there are four stages of adoption. (1) Mental access, when we decide whether we want to try to use a technology. (2) Material access, which refers to the common notion of getting the equipment installed and running. (3) Skills access, which refers to three levels of skills needed to use the equipment, instrumental or digital (basic controls), informational (finding, using and storing data), and strategic (linking the information to one's immediate needs). Lastly, there is (4) Usage access, which refers to the delivery of relevant services. It is important to consider that the telehealth project has a combination of technologies (e.g., computers, medical devices, A/V equipment, connections). In addition, consider that previous exposure to adoption of

[41] van Dijk, J. (2001) The ideology behind "closing digital divides": Applying static analysis to dynamic gaps. Paper presented at the IAMCR/ICA Symposium on the Digital Divide. Austin, Texas: University of Texas, 15-17 November.

technological innovations is not evenly spread in First Nations communities. All of this to qualify that the adoption of telehealth technology in remote First Nations may not follow the same pattern as in urban or less isolated rural areas.

The factors that are conducive to the adoption of telehealth are consistent with the components described by Jennett and colleagues (2002[33]; 2003[29]) in their telehealth readiness framework. The major thrust of the factors identified in this study emphasize the importance of human resources and adequate support for all users and providers. The planning readiness focuses on the preparatory phases as well as the business plan development: KOTH has advanced these components during the last six months of project implementation.[42]

The vast majority of patients seen by telehealth stated that the sessions were very helpful. Health providers were, in general, supportive of telehealth (many in fact were enthusiastic champions), but were also more likely to identify some of the limitations. A frequent comment, related also to issues of access and quality, was that flying patients or providers in and out of a community was still needed as a viable, workable option.

The enthusiasm of users and providers with more telehealth experience and the wariness of providers with less telehealth experience were typical of pilot projects in general and telehealth pilot projects in particular. One should not put too much weight on patient satisfaction scores. This is because telehealth patients tend to self-select, so that patients who were not receptive to telehealth or may have been unsuitable do not complete the form. Monitoring the changes in satisfaction over time may be more important than the absolute score. In addition, the real merit to the patient feedback form and other feedback forms may be in stimulating discussion of the questions and possible answers among community members, educators and providers, particularly as they relate to quality of service.

The potential for telehealth to help integrate existing services—to act as a conduit for new and old programs—was recognized by many stakeholders. KOTH, NORTH Network and K-Net are to be applauded for their continued efforts to fill the telecommunications "pipe" with as much information, programs and services that can fit, while remaining sensitive to the needs and desires of the communities, agencies and providers.

Scheduling issues would be expected to rise in importance. The theoretical maximum number of network sessions is over 20,000/year and is unlikely to be reached any time soon.[43] It is more likely that availability of specialists, physicians, educators and other service providers will continue to be the limiting factor. A policy to prioritize use, if not already developed, may be needed soon. Simultaneous use or alternative means of delivering some of the services so as to free-up bandwidth may become more of an issue if demand for services continues to rise. In addition, some of the care and education services, first introduced via telehealth, may need to be moved off to other networks and accessed by users at other locations (e.g., community centre) at off-peak times. It may seem premature for this discussion, but unmet demand could imperil the telehealth service.

[42] See for example: KOTH, 2005. Position Paper: Turning the Corner with First Nations Telehealth; and KOTH, 2006. Staying the course: A business case summary for continuation of First Nations telehealth services in the Sioux Lookout Zone.

[43] Assuming 30 hours/week X 48 weeks/year X 1 session/hour = 1,440 sessions/year/site X 14 First Nations communities = 20,160 sessions/year. All 13 First Nations communities with ground links can be connected simultaneously, but current bandwidth allows only 1 of the 11 communities with satellite links to be connected for a total of 14 First nations communities.

Many physicians felt comfortable with using telehealth for almost all follow-up and for many initial consultations provided that face-to-face was available. Many stakeholders concluded independently that the role of locally recruited, full-time CTCs was of paramount importance to telehealth success and had implications not only for quality of service, but for access, acceptability and integration. Stakeholders advocated for ongoing efforts to educate and retain qualified personnel.

The Pilot Project provided proof of concept as the telehealth service was rolled-out to 22 First Nations communities and provided cost and utilization data that were used to model a fully operational and sustainable telehealth program. For the Sustainable Program, the economic model estimated a net savings of $1.4M/year for 4866 network sessions/year (based on averted travel only) and a breakeven point of approximately 3220 network sessions/year. Numerous comments from patients, CTCs, community health workers, health care professionals, administrators and other stakeholders spoke convincingly of the benefits in time and money due to improved access to health education, information and care services.

Concerns have been voiced my several stakeholders about what will happen to the savings that might be realized from the introduction of the telehealth service. Addressing these concerns is beyond the scope of this evaluation. However, it is interesting to note that there is precedence in other jurisdictions where new health programs have been introduced. In some cases, the stakeholders have entered into agreements that any savings due to the new program (e.g., averted travel due to telehealth) would be reinvested into existing or additional health services (including the telehealth service). For instance, travel savings could be used to pay for more health providers in the First Nations communities or could be used to develop more distance education opportunities for staff and community members. Additionally, savings could be used to help recruit and retain health professionals, providers and educators in the communities. It may be prudent to pursue discussion and agreements among the various stakeholders as the pilot project evolves into a sustainable program.

The economic model was sound, but, as with any model, values and assumptions need to be compared against actual data as the Pilot Project evolves into a Sustainable Program. An examination of the Sustainable Program model suggested that the results were sensitive to estimates of connection and personnel costs, number of clinical sessions, averted travel and cost/trip. When empirical data were lacking, the model used conservative assumptions for costs, potential savings, estimated utilization, etc. It is promising that the economic model showed that telehealth could reach the economic breakeven point based on conservative estimates of averted travel.

It is worth noting that the following costs/savings were not included in the model: lost/gained time (e.g., due to delays, cancellations, changes in productivity); increase/decrease in patient health status, anxiety, quality of life or well-being; increase/decrease in risks associated with increase/decrease in travel; delayed/timely intervention; and re-direction to the inappropriate/appropriate health care service. The monetary value placed on these benefits and other benefits due to improved access and additional services or the value of prevention, early detection and early intervention is explored in the economic model by assigning a value to "new" telehealth". One estimate of the value of "new" telehealth is $3.2M/year. This estimated value does not explicitly model the present-day value[44] and so more work is needed in this regard.

[44] Present-day value is used in economic evaluation to reflect the fact that "dollars spent or saved in the future should not weigh as heavily in programme decisions as dollars spent or saved today."

The KOTH/NORTH Network Expansion Project is one of a few telehealth projects that have ventured into geographically remote and culturally distinct communities. The Expansion Project has the potential to realize a huge impact through improved access to health care services, education and information. The preliminary findings of the evaluation suggest that the Expansion Project has successfully improved access. The Sustainable Program has the ability to reach the economic breakeven point in the near future. Feedback from stakeholders in the communities and in support centres attest to this potential. There were a few respondents who expressed concern over practical issues, which were often traced back to expected challenges during the early stages of introducing a new technology. Many others, however, spoke convincingly of emerging benefits and significant potential for the future.

Page 39 in Drummond, M. F., O'Brien, B., Stoddart, G. L. & Torrance, G. W. 1997. Methods for the Economic Evaluation of Health Care Programmes.2nd Edition. Oxford University Press, Oxford, UK

5 Appendices

Appendix 1. Evaluation framework
Appendix 2. Evaluation manual
Appendix 3. Details of the economic model and modelling results
Appendix 4. Detailed data tables and figures
Appendix 5. Summaries of interviews and focus group discussions