Preparing for Success: Readiness Models for Rural Telehealth

Jennett PA, Gagnon MP, Brandstadt HK

ABSTRACT

Background: Readiness is an integral and preliminary step in the successful implementation of telehealth services into existing health systems within rural communities.

Materials and Methods: This paper details and critiques published international peer-reviewed studies that have focused on assessing telehealth readiness for rural and remote health. Background specific to readiness and change theories is provided, followed by a critique of identified telehealth readiness models, including a commentary on their readiness assessment tools.

Results: Four current readiness models resulted from the search process. The four models varied across settings, such as rural outpatient practices, hospice programs, rural communities, as well as government agencies, national associations, and organizations. All models provided frameworks for readiness tools. Two specifically provided a mechanism by which communities could be categorized by their level of telehealth readiness.

Discussion: Common themes across models included: an appreciation of practice context, strong leadership, and a perceived need to improve practice. Broad dissemination of these telehealth readiness models and tools is necessary to promote awareness and assessment of readiness. This will significantly aid organizations to facilitate the implementation of telehealth.

KEY WORDS: Community, E-health, model, readiness, rural, stakeholders, telehealth

R eid defined telehealth as ‘the use of advanced telecommunications technologies to exchange health information and provide health care services across geographic, time, social, and cultural barriers.’ Due to its large geographic barriers, Canada’s rural and remote communities have much to gain from telehealth. Health Canada has stated that rural Canadians experience a lower level of health than their urban counterparts; thus telehealth is increasingly considered an important tool for enhancing health service delivery, particularly in rural and remote regions, where health care resources are often scarce and sometimes nonexistent. Health Canada broadly defines rural and remote communities as those composed of less than a threshold population of 10,000 and removed from many urban services and resources. Statistics Canada defines ‘rural’ as the population living outside census metropolitan areas (population > 100,000) and outside census agglomerations (population > 10,000)—that is, outside the commuting zone of larger urban centers.

In repeated studies looking at telehealth implementation, readiness has been shown to be an important consideration. Telehealth readiness can be defined as the degree to which a community is prepared to participate and succeed in telehealth. It can be measured prior to the implementation of telehealth. The assessment of readiness for an innovation in healthcare can reduce the risk of its failure after introduction. The purpose of this paper is to detail and critique the published international peer-reviewed studies that have focused on assessing telehealth readiness for rural and remote health. Background specific to readiness and change theories is provided, followed by a critique of the four identified telehealth readiness models, including a commentary on their readiness assessment tools.

Materials and Methods

Thirteen electronic databases (MEDLINE, TIE, PubMed, AMED, Google, Web of Science, CINAHL, EMBASE, AARP Ageline, Cochrane Central, PsychInfo, ERIC, and ProQuest) were searched in Spring 2005 to locate English language related studies from 1996 to date. The following search terms were used to identify relevant abstracts: readiness, rural, telemedicine, telehealth, and/or E-health. The three authors assessed retrieved abstracts regarding telehealth readiness to determine suitability. If authors agreed, full articles were pulled for review. Selected articles were critiqued based on the theoretical foundation and methodology used to develop the telehealth readiness model, as well as on the strength of the
associated readiness tools.

Background

Change and adoption of innovation theories
As a precursor to readiness, theorists focused on change and adoption of innovation. As a result, many such theories have been proposed.\(^{[10–22]}\) Rogers\(^{[10]}\) offers that diffusion is the process by which an innovation is communicated among the members of a social system. His classic theory of the diffusion of innovations examines technological, social, and psychological dimensions of innovation adoption, and defines five attributes as being important variables in determining how fast a technology is adopted: (1) relative advantage; (2) compatibility; (3) complexity; (4) trialability; and (5) observability. Further, Rogers’ innovation adoption curve is a model that classifies adopters of innovations into various categories, based on the idea that certain individuals are inevitably more open to adoption than others. Rogers’ five adopter categories, followed by the percentage of individuals in each category, are: (1) innovators (2.5%); (2) early adopters (13.5%); (3) early majority (34%); (4) late majority (34%); and (5) laggards (16%).

Social aspects and human factors continue to appear as core issues in innovation adoption.\(^{[23]}\) Nontechnical organizational factors have been suggested to account for perhaps as much as 30% of technological innovation failures, and surveys of hospitals in the United States have shown that staff resistance and interference may be responsible for more than half of all information system failures.\(^{[24–26]}\) Lewin\(^{[26]}\) suggested a three-phase model for organizational change that focused on individual motivational behavior. The unfreezing phase reduces status quo forces; the moving phase develops new attitudes, values, and behaviors; and the refreezing phase reinforces the new culture. Schein\(^{[21]}\) has argued, ‘the reason so many change efforts run into resistance or outright failure is usually directly traceable to their not providing for an effective unfreezing process before attempting a change induction.’

Telehealth

Readiness models and approaches
Readiness for change is an integral and preliminary step in the successful adoption of innovation. Readiness has been viewed in the context of Lewin’s model,\(^{[20,27]}\) i.e., frozen, unfreezing, moving, and refreezing stages. Figure 1 pictorially displays the relationship between readiness and the unfreezing, moving, and refreezing factors. Armenakis et al.\(^{[19]}\) defined readiness as “the cognitive precursor to the behaviors of either resistance to, or support for, a change effort.” Readiness for change considers capacity for making change and the extent to which individuals perceive the change as needed. Social information processing models suggest that an individual’s readiness to accept innovation may also be shaped by the readiness of others.\(^{[15,28]}\) This may be one reason for the importance of champions and change agents.\(^{[29]}\) Creating readiness involves proactive attempts by a change agent to influence the beliefs, attitudes, intentions, and behavior of change participants.

Results

Readiness models
Four current telehealth readiness models resulted from the search process. These four readiness models include papers by Campbell et al.,\(^{[30]}\) Demiris et al.,\(^{[31,32]}\) Jennett et al.,\(^{[27,31–35]}\) and Overhage et al.\(^{[36]}\) The four models varied across settings: rural outpatient practices, hospice programs, rural communities, as well as government agencies, national associations, and organizations. Further details of the models are summarized in Table 1 using 12 headings: objectives, application, data collection method, setting, participants, demographics, variables, data analysis, findings, conclusions, limitations, and tools.

1. Critique of Campbell et al. 2001–University of Missouri, USA: a framework to assess the readiness of rural health providers to adopt telehealth was developed by the Departments of Family and Community Medicine and Integrated Technology Services in the School of Medicine at the University of Missouri.\(^{[30]}\) This study was not explicitly based on a theory of readiness, though it involved the development of a framework for telehealth readiness. The sampling method was not described, and the number of refused interviews was not stated. However, the sample size (57 interviews) seemed adequate. Studies have shown that a sample size of 20–25 is adequate when collecting the overall views of a group including a sector (i.e., health).\(^{[37]}\) Six themes were felt to be of relevance to readiness: turf, efficacy, practice context, apprehension, time to learn, and ownership. Three different categories of readiness were outlined: fertile soil, partly fertile soil, and barren soil.

2. Critique of Demiris et al. 2004–University of Missouri, USA: an instrument to assess readiness for, and receptiveness of, the use of telemedicine or other advanced technology in hospice patients’ homes was developed by the School of Social Work and the Health Management and Informatics in the School of Medicine at the University of Missouri.\(^{[31,32]}\) Theory was not mentioned in the design of this telehealth readiness tool, although this tool was based on existing readiness scales.\(^{[38,39]}\)
Table 1: Comparison of telehealth readiness studies

<table>
<thead>
<tr>
<th>First Author &amp; Date</th>
<th>Objectives</th>
<th>Application</th>
<th>Data collection method</th>
<th>Setting</th>
<th>Participants</th>
<th>Demographics measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell [30] 2001</td>
<td>Investigate rural health providers’ perceptions of telemedicine</td>
<td>Computer infrastructure</td>
<td>Qualitative Semi-structured interviews</td>
<td>Missouri, U.S.A.</td>
<td>57 Staff, 13 Physicians, 20 Nurses/nurse practitioners, 24 administrative staff</td>
<td>Age, Sex, Length of practice, Provider status</td>
</tr>
<tr>
<td></td>
<td>Develop a framework for assessing their readiness to adopt telemedicine</td>
<td>Video-conferencing</td>
<td>Six open-ended questions</td>
<td>Outpatient practices Four communities Three rural counties</td>
<td></td>
<td>Internet use, E-mail use</td>
</tr>
<tr>
<td></td>
<td>Offer a guide for its implementation</td>
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<tr>
<td>Demiris [31,32] 2004</td>
<td>Identify current use of ICT by hospice staffAssess their readiness for the use of telemedicine</td>
<td>Telehospice</td>
<td>Questionnaire 19 questions</td>
<td>Missouri, U.S.A.</td>
<td>124 Staff, 59 Nurses, 7 Nurse administrators, 11 Social workers Four physicians, 22 Aids, six chaplains, 15 other</td>
<td>Ethnicity, Gender, Age group, Profession, Length of practice, Participation in professional associations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Expert-reviewed</td>
<td>Seven hospice programs (out of 62) Rural and other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jennett [27,33-35] 2003/2004</td>
<td>Examine rural communities’ readiness for telehealth implementation Generate an understanding of the “essence” of telehealth readiness for organizations providing care Framework can be used by rural communities in telehealth implementation projects</td>
<td>All telehealth applications</td>
<td>Qualitative Semi-structured interviews key informants Community awareness sessions Focus groups</td>
<td>Alberta, Canada One rural community</td>
<td>16 Interviews with expert key informants Two community awareness sessions Five community focus groups Two community in-depth interviews</td>
<td>Profession, Type of organization</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Overhage [34] 2005</td>
<td>Establish determinants of a community’s success in creating a health information exchange</td>
<td>Health information exchange</td>
<td>Questionnaire 37 Questions judged by review panel</td>
<td>Government agencies, national associations &amp; organizations in the USA</td>
<td>134 Responses from 42 states &amp; District of Columbia</td>
<td>Type of organization</td>
</tr>
</tbody>
</table>
Table 1: Comparison of telehealth readiness studies (continued)

<table>
<thead>
<tr>
<th>First Author &amp; Date</th>
<th>Variables Measured</th>
<th>Data Analysis</th>
<th>Findings</th>
<th>Conclusions</th>
<th>Limitations</th>
<th>Readiness Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell[30] 2001</td>
<td>Perceptions of pros and cons: Barriers and facilitators; Telehealth use; Changing roles; Quality of care; Suggested improvements</td>
<td>Qualitative thematic analysis, Ethnograph software, Researcher bias stated, Demographic information</td>
<td>Six themes: (1) Turf, (2) Efficacy, (3) Practice context, (4) Apprehension, (5) Time to learn, (6) Ownership</td>
<td>Three levels of readiness: (1) Fertile soil, (2) Partly fertile soil, (3) Barren soil</td>
<td>Study results are limited to the recent introduction of telemedicine into rural settings</td>
<td>Yes</td>
</tr>
<tr>
<td>Demiris[31,32] 2004</td>
<td>Methods of receiving new information: Technology use; Staff attitudes to technology</td>
<td>Quantitative summary statistics, regression, ANOVA SPSS software</td>
<td>Significant difference between hospices and between disciplines</td>
<td>Assessment of organizational readiness for an innovation can reduce the risk of failure</td>
<td>Generalization not possible (small sample size &amp; few minorities included); Reliability testing incomplete</td>
<td>Yes</td>
</tr>
<tr>
<td>Jennett[27,33-35] 2003/2004</td>
<td>Factors for success: Factors for failure; Factors for readiness for successful implementation of telehealth</td>
<td>Qualitative phenomenological Program &amp; implementation theory, Data coded and analyzed using a multi-step approach</td>
<td>Six themes: (1) Core readiness, (2) Structural readiness, (3) Projection of benefits, (4) Assessment of risk, (5) Awareness and education, (6) Intra-group and inter-group dynamics</td>
<td>Four types of readiness: (1) Core, (2) Engagement, (3) Structural, (4) Non-readiness</td>
<td>Study results are limited to the recent introduction of telehealth into rural settings</td>
<td>Yes</td>
</tr>
<tr>
<td>Overhage[36] 2005</td>
<td>Leadership, Funding, Technical readiness, Business plans, Data standards, Replicable &amp; scalable tools</td>
<td>Used Excel software for quantitative descriptive statistics, Subjective evaluation</td>
<td>Communities are at different levels of readiness: High level of interest in health information exchange, More than interest required for successful implementation</td>
<td>Not every community responded to RFP overly optimistic responses because attempting to secure funding</td>
<td>Yes</td>
<td></td>
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</table>
The authors mentioned that experts in telehealth and hospice care reviewed the survey and instrument development to ensure readability, yet neither specified qualifications, nor described the review process. A purposive sampling method was used. A total of 124 surveys were completed and returned by staff at the seven hospice programs. A response rate was not calculated, as the individual hospices did not record the number of surveys they distributed. Although certain findings were stratified either by organization (e.g., hospices 1 and 2), community location (e.g., urban vs rural), or professional category (e.g., nurses, physicians, etc.), the main results were combined. Further, similarities and differences found among stratified groupings were not interpreted.

3. Critique of Jennett et al. 2003/2004—University of Calgary, Canada: a readiness model specific to telehealth implementation in rural and remote communities was developed by the Health Telematics Unit at the University of Calgary (see http://www.fp.ucalgary.ca/telehealth/Readiness_Tools.htm).[27,31–35] This research was based on change management and diffusion of innovation theories[10,12,15,20] as well as previous work at Harvard University.[16] A snowball sampling method was used. Sixteen expert key informant interviews, two-community awareness session, five community focus groups, and two community in-depth interviews were conducted. The number of refusals to participate was not stated. A separate readiness tool was developed for each of the following groups: public, patient, practitioner, and organization. Strengths of this research include the repeated application and modification in rural communities; the development of the readiness model through the process of participatory action research and the triangulation of results; and the completion of the qualitative data analysis by an independent qualitative research expert. Six themes were felt to be of relevance to readiness: core readiness, structural readiness, projection of benefits, assessment of risk, awareness and education, and intra-group and inter-group dynamics. Four different types of readiness were outlined: core, engagement, structural, and nonreadiness.

4. Critique of Overhage et al. 2005 – University of Indiana and the e-Health Initiative and Foundation, Washington, DC, USA: the national Connecting Communities for Better Health Program staff created a request for capabilities (RFC) instrument by developing questions to explore seven dimensions that an expert Review Panel had judged to be important determinants of a community’s success in creating a health information exchange (see Appendix B at http://www.jamia.org).[10] Readiness for telemedicine at the system level was assessed. Objectives of the study were not explicitly stated, and the purpose was only vaguely described. Lorenzi’s[10] model of organizational developmental stages was discussed in this paper; however, the full implications and relationships between this model and the study results were not fully explored. The sampling method was not fully explained. The tool was widely disseminated, although, the total number of individuals receiving it was not detailed. The number of returned surveys by individuals was large (n = 134); the number who refused to complete the survey was not stated. The researchers did not differentiate results between urban and rural settings.

### Readiness tools

The most studied component within each of the telehealth readiness models was provider readiness. Demiris et al.[31,32] developed the most basic readiness tool, whereas Jennett et al.[27,31–35] included the greatest number of components in their readiness tool. The components of readiness that the tool(s) assessed are detailed by study in Table 2. The strengths and limitations of each readiness tool are detailed in Table 3.

### Discussion

Despite the extensive literature on change, the concept of ‘readiness’ is fairly new. Testing for readiness prior to the implementation of telehealth saves time, money, and energy by determining which communities are not able to successfully support immediate implementation. This paper details and critiques the peer-reviewed studies of four international teams that focused on telehealth readiness for rural and remote health. Each of the readiness models has merit, as well as limitations. Participants included in two of the studies (Campbell et al.[30] and Demiris et al.[31,32]) were staff. Jennett et al.[27,31–35] included staff, as well as patients, public, and the health organization. Jennett et al.’s readiness research was completed at a time when organizational readiness was of prime interest. Since that time, the assessment of system readiness has been recognized as critical as well. Overhage et al.[10] included system readiness in their model. Although, Overhage et al. looked at the highest level, system readiness, their main focus was information exchange, a much broader topic than readiness alone.

Each of the models discussed various themes essential for telehealth readiness. Three themes common to each of the discussions were: (1) an appreciation of practice context; (2) strong leadership; and (3) a perceived need to improve practice. Practice context involves clear awareness of both the benefits and risks of telehealth, particularly in rural settings. Barriers to implementation include resistance to change, sense of risk, demands on time, inefficient technology, funding, etc. Other terms used to denote the theme of leadership include ownership, ‘early adopters’ of technology, innovators, and champions. Leaders are professionally and emotionally invested in telehealth; they enthusiastically promote telehealth and aid

### Table 2: Telehealth readiness tool components

<table>
<thead>
<tr>
<th>First author and date</th>
<th>Patient readiness</th>
<th>Public readiness</th>
<th>Provider/staff readiness</th>
<th>Organizational readiness</th>
<th>System readiness</th>
</tr>
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<tbody>
<tr>
<td>Demiris[31,32] 2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overhage[34] 2005</td>
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in increasing awareness and education within their organization. Users indicated that bringing more information and tools (e.g., human resources, technical training, policy, and funding) to providers will fulfill a functional need and will increase the effectiveness and efficiency of health care.

All of the models and tools were developed in rural settings and may be adapted to other rural communities. They can, however, be modified to any community, rural or otherwise. The self-completion aspect of some of these multi-purpose tools provides ownership to the local community, thereby increasing their commitment to the successful implementation of telehealth. Broad dissemination of these telehealth readiness tools is necessary to promote awareness of readiness and to provide organizations with the tools to assist communities with the implementation of telehealth. Of the four readiness models, the authors found evidence of dissemination to other work from only one team, i.e., Jennett et al.\textsuperscript{[27,31–35]} Specifically, proponents of Jennett et al.’s organizational readiness tool have been expanded to include special groups, such as home care.\textsuperscript{[31]} There are also plans to use aspects of Jennett et al.’s readiness tools within Canada, as well as in other countries.\textsuperscript{[32–45]} Further, the concept of readiness and telehealth readiness tools could be introduced into healthcare education through graduate, medical, and nursing program curriculums with the goal of promoting readiness and readiness tools, as well as improving the odds of successful telehealth implementation.

A limitation of this study was that some readiness models may not have been captured by the search techniques, as this study only searched peer-reviewed literature and focused on the provided search terms. Other researchers may have used terms

Table 3: Summary of strengths and limitations of the telehealth readiness tools

<table>
<thead>
<tr>
<th>First author and date</th>
<th>Strengths</th>
<th>Limitations</th>
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<tbody>
<tr>
<td>Campbell\textsuperscript{[27] 2001}</td>
<td>- Provides a mechanism for dealing with three different levels of readiness for implementing telehealth: fertile soil, partly fertile soil, and barren soil - Suggests a method to determine readiness category placement - Recommends further work to prepare barren soil communities before attempting implementation</td>
<td>- Does not assess organizational, public, or patient readiness for telehealth (only assesses physicians, nurses, and healthcare administrators) - Does not test framework (i.e., no further publications)</td>
</tr>
<tr>
<td>Demiris\textsuperscript{[31,32] 2004}</td>
<td>- Rapid and simple to administer (i.e., 19 multiple choice questions) - Previous instruments\textsuperscript{[28,29]} (upon which this instrument was based) captured organizational readiness for telehealth (e.g., information regarding motivation and personality attributes of program leaders and staff, institutional resources, and organizational climate) - Previous instruments\textsuperscript{[28,29]} tested for reliability and validity</td>
<td>- Refers to itself as a tool that assesses organizational readiness, yet seems to focus solely on assessing practitioner readiness - Cannot assume that the few questions on this tool (taken from previous instruments)\textsuperscript{[28,29]} remain valid after restructuring - Focuses primarily on staff profiles, prior exposure to technology, and institutional resources - Only 4 of 19 questions (21%) address readiness directly</td>
</tr>
<tr>
<td>Jennett\textsuperscript{[27,33–35] 2003/2004}</td>
<td>- Tailors to communities and is administered by communities themselves - Assesses face and content validity - Suggests a method to determine readiness category placement - Recommends further work to prepare communities in the ‘nonreadiness’ category prior to implementation - Assesses organizational, provider, public, and patient readiness for telehealth - Stresses importance of end-user groups’ ownership of adoption of innovation - Recognizes that telehealth readiness is a dynamic and fluid process</td>
<td>- Not standardized (although the process of standardization would contradict the intent of the tool, which is adaptation to and adoption by rural communities, i.e., participatory action research) - Tool reliability is not assessed - Initially only tested in a single community, although subsequent projects continue to validate the tool - Provides little information regarding demographics or current technological practices</td>
</tr>
<tr>
<td>Overhage\textsuperscript{[26] 2005}</td>
<td>- Most specific regarding information gathered - Fully discloses review panel members (by name and affiliation) - Aims to assess system readiness</td>
<td>- Main objective is funding allocation, rather than assessment of readiness - Provides little information regarding the readiness of technical interoperability, collaboration between organizations, etc. - Discrepancies exist between the description of the tool in the published paper and the actual tool located as an appendix at <a href="http://www.jamia.org">http://www.jamia.org</a> - Tool reliability or validity were not assessed - Does not provide scoring mechanism to determine readiness</td>
</tr>
</tbody>
</table>
other than readiness to denote the same issue, e.g., "preparedness." The assessment of readiness is based on the perception of participants, rather than on the reality of telehealth readiness in their community. Today, the financial burden of implementing telehealth has decreased, but the priority to mainstream telehealth and broader E-health applications continues to reinforce the need for continued work.

Future research into readiness models is now needed in the field of E-health—the combination of telehealth with health informatics. Theories of change and the diffusion of innovations, as well as the components of the telehealth readiness tools (e.g., patient, public, provider, organization, and system), could be reviewed and refined for application to e-health. Indeed, the general level of readiness for telehealth within the health sector culture appears relatively high compared to the time period of data collection for these four telehealth readiness models. The need now has expanded to include e-health.

Acknowledgments

We would like to acknowledge the work of the four international teams that have investigated the concept of telehealth readiness for rural health, and express our appreciation to those who continue to work in this field.

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