Wicked Decision Problems in Remote Health Care: Telemedicine as a Tool for Sensemaking

David L. Paul
Division of Accounting and Information Systems, School of Business,
University of Kansas, Lawrence, KS 66045
dpaul@ukans.edu

Abstract
Health care providers often face different types of problems than uncertainty—those involving wicked decision problems. Whereas uncertainty reduction requires increased information processing capabilities, wicked decision problems require both increased information processing and sensemaking capabilities. Sensemaking is about interpreting and deriving meaning from multiple, conflicting cues. Case studies of three teleconsultation projects utilized for both sensemaking and information processing are presented. In addition to impacting the cost and quality of care provided in remote areas, telemedicine networks utilized to reduce uncertainty may experience lower utilization rates, while telemedicine utilized to address wicked decision problems may experience increased utilization rates.

What illness a patient is diagnosed as having, for example, depends on who is making the diagnosis and when—witness the magnitude of inter- and intra-observer variation in the interpretation of supposedly "objective" diagnostic tests [1, p. 180].

Telemedicine, "the use of electronic information and communications technologies to provide and support health care when distance separates the participants" [2, p. 1] can reduce the uncertainty remote health care providers routinely face in their medical decision making by increasing their information processing capabilities. Uncertainty involves structured problems where the probability of the possible states of the world are unknown [3], and can be addressed by increased information and information processing capabilities [4]. Telemedicine makes information available from medical literature and databases more accessible, and improved access to specialists and sub-specialists increases both the information and information processing capabilities available to remote health care providers.

Yet as the opening quote demonstrates, health care providers, including remote health care providers, often face different types of problems than uncertainty—those involving wicked decision problems. Wicked decision problems are unstructured problems where one or a combination of the possible sets of nature, actions, outcomes, or utility of such outcomes are unknown, and where the relationship between actions and outcomes are nonlinear [3]. Wicked decision problems involve equivocality and ambiguity. They involve novel problems, lack clarity and structure, and are difficult to make sense of because there are often multiple, conflicting interpretations of the same problem. Causality is difficult to ascertain because all the possible consequences of potential actions are unknown [5]. While increased information processing capabilities can be useful under such circumstances, wicked decision problems generally require different capabilities: those of sensemaking. Sensemaking is about interpreting and deriving meaning from multiple, often conflicting cues. Sensemaking is more subjective than uncertainty reduction and is more about plausibility and less about accuracy [5]. The purpose of this paper is to illustrate that telemedicine, in addition to being utilized as an information processing tool to reduce uncertainty, can be utilized as a tool for sensemaking to help remote health care providers address the wicked decision problems they commonly face. By being utilized as a tool for sensemaking, telemedicine can have a significant impact on the quality of care provided in remote areas. Drawing on case studies of three teleconsultation projects, the implications for and impact of utilizing telemedicine as a tool for sensemaking are presented.

This paper is organized as follows: The first section defines sensemaking and identifies the need for it in health care delivery. The methodology used in this study is presented, and the following section gives examples of the limitations in remote sensemaking capabilities prior to the advent of telemedicine. Telemedicine as a tool for sensemaking is then presented and examples are given. The paper closes with a discussion of the long-term implications for telemedicine if utilized as a tool for both information processing and sensemaking.
1. Sensemaking in Health Care Delivery

(M)ost medical procedures have multiple and contradictory, as well as uncertain, outcomes and because patients differ widely in their attitudes toward risk and uncertainty and in the values they attach to various outcomes. What we have called medical judgments frequently are not that at all; they are value judgments [1, p. 184].

Physicians often face wicked decision problems—situations where patient symptoms and test results are ambiguous and difficult to make sense of and subject to multiple plausible, but conflicting, interpretations [6][19]. The average primary care patient has six active health problems at the time they seek care [6]. Such comorbidity requires physicians to deal with multiple problems simultaneously, and the interaction between a patient’s health care problems often precludes assignment of causal relationships with any certainty [6]. This leads to significant variation in physician diagnoses of patients’ conditions. The magnitude and pervasiveness of the variation is such that physicians, when examining diagnostic test results, patient histories, and physical examinations, disagreed with one another—or with their own prior interpretation—between ten to fifty percent of the time [1][7][8][9]. These variations cannot be explained on a biomedical basis; rather, they are the result of health care providers interpreting ambiguous information subject to their perceptual and cognitive biases [1].

While additional information processing capacities can, to some degree, increase health care providers’ abilities to address wicked decision problems, such processing capacities by themselves are not sufficient. Wicked decision problems require increased sensemaking capabilities. More information may not improve health care providers' ability to understand the problem. Instead, they need the ability to make sense of the often-contradictory information they already have. Health care providers must be able to make sense of rapidly changing, less structured, and unforgiving environments they may not understand or fully recognize, and they must do this in the context of conflicting interpretations of events. Dealing with increased wicked decision problems requires increased sensemaking capabilities [5][10].

Sensemaking is about contextual rationality. It is built out of vague questions, muddy answers, and negotiated agreements that attempt to reduce confusion [11, p. 636].

Sensemaking is a complex, multifaceted, subjective social process of equivocality removal, where environments are created or enacted by identifying certain environmental cues and ignoring or discounting others. Sensemaking is interpreting information about these cues and their connectedness, both of which are subject to multiple interpretations, into knowledge and understanding about the problem. Sensemaking is a subjective process that is about plausibility—not accuracy. It is subjective in that the cues extracted from the environment, determined crucial or tertiary, and the interrelationships assigned them are a function of an individual’s knowledge, cognitive complexity, education, and experience [10]. Sensemaking is social process in that:

A partner makes social construction easier. A partner is a second source of ideas. A partner strengthens independent judgment in the face of a majority. And a partner enlarges the pool of data that are considered [11, p. 642].

Sensemaking is sensitive to the training, experience, and cognitive complexity of the group members. Different people have different sensemaking capabilities and different perspectives of which cues are consequential and which are not, and diversity within the group increases the range of cues and the possible interrelationships identified, and the cognitive maps applied to make sense of these cues [20]. It is also personality-based and requires respect and trust. The lack of respect or trust, or negative attitudes towards another party, may cause the party to discount the other party’s opinions and input.

The telemedicine as a tool for sensemaking perspective has a number of implications for telemedicine projects. The appropriateness of telemedicine is dependent on the type of cues necessary, and the telemedicine technology and setup must facilitate sensemaking. The technology necessary to support sensemaking may be different than the relevant medical technology standards. Telemedicine is sensitive to the variety and quality of expertise and experience, and there may be trade-offs between the partner’s expertise and technology capabilities of the telemedicine system. Finally, telemedicine as a tool for sensemaking is a social phenomenon that is personality based and requires respect and trust.

2. Methodology

Three telemedicine projects, each involving a health sciences center and a rural health facility were studied. Multiple case studies, relying on semi-structured interviews of key informants, were used in this research. The case study method is used when:

A how or why question is being asked about a contemporary set of events over which the investigator has little or no control [12, p. 9].
Case studies are in-depth studies of a few instances of the phenomenon of interest geared towards providing the "thick description" required to understand and explain emerging phenomena [12][13]. Multiple cases can provide the researcher with an even deeper understanding of the phenomenon of interest, and validity and generalizability can be enhanced through the replication of results using multiple cases [12][15][16]. Further, while controlled observations of a control and treatment group may not be possible, the deliberate selection of cases can result in natural controls [12]. Therefore, this research project used the multiple case study design.

Grounded theory, a research method grounded in the data, was also utilized in this study. It is a method of theory generation and testing through the collection and inductive analysis of data by constant comparisons within and across cases. Data are extensively collected and coded to produce a well-constructed theory. The goal of grounded theory is to generate a theory that not only describes but also explains a pattern of behavior relevant to the social phenomenon being studied [14].

2.1. Case Description

Three teleconsultation projects were studied. Each project involved a telemedicine relationship between a health sciences center (HSC) and a rural hospital, with the rural hospital receiving specialized care from the HSC. Telemedicine projects involving health sciences centers were selected to be part of the study because they are involved in the majority of non-military telemedicine projects [2][17], and they provide a means of natural control of non-technological barriers to teleconsultations. Health sciences centers had the benefit of not having a number of the legal, cultural, and financial barriers associated with teleconsultations. Licensure was not an issue as our sample included only intrastate telemedicine, and liability issues were minimized because the physicians were covered by the health sciences centers' umbrella liability policies, and they were engaging in HSC sanctioned telemedicine projects, minimizing their personal risk. The health sciences centers in this study had embraced telemedicine, and physician participation in these telemedicine projects was voluntary, reducing cultural issues. The cost of the systems and the telecommunications link had already been funded, usually through grants, eliminating cost considerations as a barrier to utilization during the time these projects were studied. The physicians at the HSCs were not reimbursed for their teleconsultations; rather, they were employed by the state and paid a salary. Further, each HSC was charged in its charter to improve the access and quality of care of the rural population in their respective states.

Each of the telemedicine projects had been operational for a minimum of six months. This allowed the inevitable technological and procedural bugs to be addressed and allowed the novelty of telemedicine to pass. Each of the sites was connected by a T1 line. Site I used VTEL equipment, and the primarily clinical activities involved pediatric oncology and infectious diseases. Site II used PictureTel equipment to initially screen and follow-up oncology patients undergoing bone marrow transplants. Site III used a system it designed and built itself to provide access to multiple medical specialties. Table 1 provides a summary of information about each site and its teleconsultation activity.

<table>
<thead>
<tr>
<th>Table 1. Site Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE I</td>
</tr>
<tr>
<td>Date Started</td>
</tr>
<tr>
<td>Clinical Activity</td>
</tr>
<tr>
<td>Site Location</td>
</tr>
<tr>
<td>Distance To HSC</td>
</tr>
<tr>
<td>HSC Equipment Location</td>
</tr>
<tr>
<td>Telecom Link</td>
</tr>
<tr>
<td>Rural Facility Type</td>
</tr>
<tr>
<td>Rural Telemedicine Equipment Type</td>
</tr>
<tr>
<td>Rural Telemedicine Equipment Location</td>
</tr>
<tr>
<td>Rural Telemedicine Equipment</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>System Utilization</td>
</tr>
</tbody>
</table>

Site I was located in the southwestern United States. The telemedicine project began in 1995, and involved a local hospital approximately 200 miles from HSC I. The teleconsults initially focused on monitoring pediatric oncology patients. An infectious disease specialist was located at another facility and initially once a week drove forty-five minutes to the main HSC I campus for telemedicine consultations. A VTEL desktop videoconferencing unit was installed in the specialist's office in 1996. The telemedicine equipment at the rural hospital was located in the hospital's conference room, which was used for activities other than telemedicine. The rural hospital had recently received another telemedicine unit, which it had installed in the clinical
area of the hospital. This equipment was not connected to the network at the time of this research.

Site II was located in the western United States. The telemedicine project became operational in Fall 1996. It involved a private oncology clinic approximately 300 miles from HSC II, and the bone marrow transplant unit at HSC II. Bone marrow transplant procedures require a one to three month stay in isolation at a hospital and cost between $40,000 and $120,000 per patient (depending on the type of transplant performed). Prior to this telemedicine project, the clinic sent approximately half its bone marrow transplant patients to HSC II, and the rest to a facility in another state that was equidistant from the clinic. In addition, once a month a bone marrow transplant specialist from HSC II would drive or fly down to the clinic to monitor patients and determine which patients were candidates for a bone marrow transplant. Both geography and weather often made such travel difficult. In Fall, 1996, HSC II installed at their cost a telemedicine system at the clinic, with the agreement that HSC II would have first referral of the clinic’s future bone marrow transplant candidates, which averaged roughly twelve per year. The telemedicine equipment was in the bone marrow transplant conference room at HSC II. At the clinic, the equipment was initially in its waiting room, but was later moved to an administrative area when the clinic expanded. Teleconsults occurred roughly three to four times per month on Thursday afternoons.

Site III was located in the southwestern United States. The local hospital was approximately 400 miles from HSC III, and 200 miles from the nearest health sciences center (which was affiliated with HSC III). The telemedical relationship began in 1989, and involved multiple specialties, including but not limited to neonatology, surgery, orthopedics, nephrology, and physical therapy. The equipment at HSC III was located in a special telemedical broadcast setting, while the equipment at the local hospital was located in an administrative conference room. Consultations were usually held on an as-needed basis, approximately twice a week, and were scheduled two to three days in advance.

2.2. Data Collection

Triangulated data collection was used to enhance the reliability and validity of case studies [12][13]. Triangulated data collection was achieved in this study by two means. First, different perspectives were obtained by interviewing multiple key informants from three different functional groups at both the local health care facility and the health sciences center involved in each telemedicine project studied. Second, additional data sources other than interviews were used. Telemedicine consultations or videotapes of such teleconsultations were observed when possible, and archival data such as grant proposals and follow-up, needs assessments, and strategic plans were used when available.

Fifty-one health care professionals were interviewed, and the interviews were audiotaped and transcribed. Issue-focused, semi-structured interviews of key informants were used in order to provide the thick and richly textured data needed [18]. These interviews focused on the actual usage of the telemedicine equipment. The key informants were intentionally selected based on their current or past direct involvement in their organization’s telemedicine project and their availability. Key informants were members of one of three groups—health care providers (physicians, physician assistants, or nurse practitioners), administrators, and information technology professionals. Each site was visited by the researcher, and all interviews of the health care professionals at both the health sciences centers and the rural health facilities were face-to-face.

An emergency teleconsultation involving infectious diseases was observed, and a videotape of parts of ten telemedicine sessions involving neonatology, surgery, and nephrology were viewed. Grant applications and status reports, telemedicine need assessments, and organizational strategic plans for telemedicine also provided data about the relevant telemedicine projects. To validate findings from the case studies, a half day teleconsultation involving HSC III and three correctional facilities were observed. These correctional sites were not part of the sample; however, the technology, the specialties offered, the specialists involved, and the consultative process were identical to the telemedicine consults involving the rural facilities. The only major differences were that the ratios of specialties utilized. The next section presents the need for telemedicine as a sensemaking tool in remote locations, and the following section discusses the implications of viewing telemedicine as a tool for sensemaking.

3. Sensemaking Before Telemedicine: The Need for Increased Capabilities

Wicked decision problems were not a new phenomenon to remotely located health care providers. It was just that their sensemaking capabilities were limited to their own abilities or to the additional sensemaking capabilities available via telephone. The economic status of their patients and the limitations of communicating by telephone often left the rural physicians on their own. Despite the physicians’ best intentions, these limitations on the sensemaking capabilities had the potential to negatively impact the quality of care, as illustrated by a rural physician and his counterpart at HSC III.

Question: How were some of these cases handled prior to telemedicine?
4. Telemedicine as a Tool for Sensemaking

A physician at the same remote facility gave an example of how telemedicine was used as a sensemaking tool. The teleconsultation occurred shortly after the telemedicine equipment had been installed. A technical test of the system was actually the teleconsultation’s main purpose, and a patient who could not afford to travel back to HSC III for a surgical follow-up was the first scheduled teleconsultation. Just prior to the scheduled teleconsultation, a baby was born at the rural hospital. The baby was having problems, and the rural physician was having difficulty interpreting (or making sense of) the baby’s x-ray.

Our first consult...was kind of an experimental thing and they kind of looked (a patient) and that was about it. And then, I said that I had just delivered a baby about three hours earlier, who was having trouble, and so I said, “Can you get me a neo-natalist?” They went downstairs and brought back [the neo-natalist]. One of the big problems was that I couldn't tell on the x-ray if it was an aspiration pneumonia or a congenital defect, and she looked at it and said, “That's an aspiration pneumonia” and she told me to do different things and it stabilized. The baby's heart rate was dropping and looking good and we gave it a little bicarb and did what she said and we stabilized it and then we shipped it out. So, to me, that was the time that I first got really involved with it.

Each of the three teleconsultation projects studied had examples of telemedicine as both a useful and superfluous sensemaking tool are presented.

Table 2. Telemedicine as a Sensemaking Tool: Implications for Individual Projects

<table>
<thead>
<tr>
<th>Implications for Individual Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>The appropriateness of telemedicine is dependent on the type of cues necessary.</td>
</tr>
<tr>
<td>Telemedicine technology and setup must facilitate sensemaking.</td>
</tr>
<tr>
<td>The technology necessary to support sensemaking may be different than medical technology standards.</td>
</tr>
<tr>
<td>Telemedicine is sensitive to the variety and quality of expertise and experience.</td>
</tr>
<tr>
<td>Trade-offs between the partner’s expertise and technology capabilities of telemedicine system may exist.</td>
</tr>
<tr>
<td>Telemedicine is a social phenomenon that is personality based and requires respect and trust.</td>
</tr>
</tbody>
</table>

4.1. The Appropriateness of Telemedicine Is Dependent on the Type of Cues Necessary

Sensemaking begins with identifying and deciding which cues from the environment should be focused on and which should be discounted or ignored. Telemedicine, as a sensemaking tool, is useful only if it helps in the identification and interpretation of those cues. Therefore, the appropriateness of telemedicine is dependent on the type of cues deemed useful. Not surprisingly, telemedicine can be an effective sensemaking tool when visual cues are important. A remote physician affiliated with HSC III gave an example:

One thing that works real well is clinically assessing the toxicity of, like, in pediatric patients. Because, you know, a lot of pediatrics is getting the feel for how sick they are and how sick they look. Sometimes you can describe it, but sometimes, the thing you want help with—where experience and an unbiased opinion helps—you need sort of a visual picture to assess the toxicity and getting a look at the patient helps.

However, telemedicine is not a useful sensemaking tool for all types of visual cues. The same physician explained:

The key is where a picture is worth a thousand words. When you can get a situation where a picture is worth a thousand words, that's where it's most helpful. If you're just giving data and the guy can comment on the data about a patient, then it's really not that necessary, but when you say—you try to describe a skin lesion or
something. Well, you can say maculopapular until you're blue in the face, but people don't really know what you're trying to say. But when you show them pictures, that says it all.

A pediatric oncologist at HSC I gave an example where they initially used telemedicine, but gradually realized the cues they needed could be conveyed just as well by more conventional means. In this case, telemedicine added very little in terms of their sensemaking capabilities, and, as a result, they stopped utilizing telemedicine for their activities.

After a kind of initial "gee whiz" kind of stuff and the sort of the feasibility was done, you know, it's kind of like, well what next. And so then we went through a phase where you know it really wasn't helping us all that much in the care to examine every individual patient via telemedicine...The nurse would go over the blood counts and those kind of reports. And sometimes we would see patients that would have particular problems, but that ended up being kind of like well you could do that with a fax and a telephone and so after that, you known, when we really didn't have anything more, I think we basically stopped using it.

Another oncologist gave an example of when he used the telemedicine equipment but realized that it didn't provide any additional cues compared to using the telephone. His patient was an eight year old with leukemia undergoing chemotherapy. The patient had low hemoglobin, which indicated anemia. The patient’s hemoglobin level had dropped from the prior week, and the oncologist was concerned. The oncologist asked the patient and his family some questions and then told the family to drive the patient to HSC I. The patient underwent a blood transfusion upon his arrival and was immediately examined by the oncologist. The oncologist commented on the teleconsultation.

So I was able to pick up the diagnosis by seeing the patient over the (telemedicine) system...Now the problem is—I probably could have done it over the phone only; I probably didn't need to be seeing this patient face-to-face and that's why I think that in that sense that the system didn't work.

The physician at the rural facility associated with HSC III gave examples where he used the telemedicine system for OB/GYN teleconsultations, but stopped using the system for such activities because the visual cues needed, in this case fetal heart strips and results from diagnostic tests, could be communicated by means other than the telemedicine system.

Several times we presented OB's over the [network] and, you know, we'd give them the figures and the data and show the labels, this is a pregnant woman, you know, and the fetal heart strip you could fax, you don’t have to show that on the TV or anything, so I didn't think that worked out to well.

4.2. Telemedicine Technology and Setup Must Facilitate Sensemaking

Sensemaking is about selecting, extracting, and deriving meaning from cues. In addition to being dependent on the appropriateness of the cues, telemedicine, in order to be effective as a sensemaking tool, needs to be designed and utilized in a manner that facilitates sensemaking. Both the technology and the organization of the teleconsultation need to be designed and run in a manner that minimizes distractions from sensemaking activities. The director of telemedicine at HSC III described what they attempted to achieve and how they organized with their teleconsultation activities.

The secret is organization— not equipment—and you can’t get too tied down on equipment. The equipment has to have the criteria that it has no detractors. Detractors from what? Detractors from what we're trying to do. We're trying to give consultative service, therefore anything that detracts from that process is to be avoided at all costs...Our job is to give a consultation. We have to make it as close to the normal practice of medicine as we possibly can. So everything that I've done has been to try and duplicate the current, acceptable methodology of practicing medicine...The [teleconsultation sites] send us the paperwork that is needed—it is faxed the night before. We give it to the doctor, he walks in, he sits down and does his consultation, handles nothing, writes his consult there, we fax it back and he has his consult in a worksheet for his payment and the consult hard copy would go into the chart.

He continued by emphasizing the role they expected the telemedicine equipment to play and how they went about getting such equipment. The equipment was designed to enable the health care providers to focus on the medical activities in which they were engaging.

One of the premises we went on was we didn't want a whole bunch of equipment. Everybody's trying to sell all this crap. No! We're going to tell you what we need and no more. So therefore the [telemedicine system] was designed to our specifications. I need just what I need to have a consultative service with the provider concentrating on what he is doing and he has very little equipment to manage. I don’t need two cameras and I don’t need this and I don’t need that and I don't need a technician on either end.

4.3. The Technology Necessary to Support Sensemaking May Be Different Than Medical Standards

The radiographic images transmitted utilizing the teleconsultation equipment were not expected to be of sufficient quality to be useful for sensemaking because none of the three sites had a digital scanner or cameras with resolutions that met the standards set by the American College of Radiological Society for digital
radiographic images. However, the physicians found the quality of still radiographic images transmitted using either the video camera focusing on a backlit image or a standard Elmo document camera were more than sufficient for their sensemaking needs. An oncologist involved in the transplant project at HSC II described:

It was critical to the consult(ation)—we are using a document camera to image CT-scans. And at my level of radiological sophistication, that is actually enough. It is actually a very nice picture, enough so that we can look at their CT-scans.

The physicians felt the ability to zoom the cameras in on a particular part of the X-ray more than compensated for any loss of resolution that might occur using the video or document camera. The infectious disease specialist at HSC I commented:

For me as a clinician, most of the time now if I had actually the film in the office wouldn't be anymore helpful than seeing it on the screen when they are able to zoom in on an area.

4.4. Telemedicine is Sensitive to the Variety and Quality of Expertise and Experience

Sensemaking is sensitive to both the quality and variety of others' expertise [5]. Therefore, telemedicine as a sensemaking tool needs to provide access to as varied a range of expertise that is applicable. A rural physician dealing with infectious diseases commented that she utilized varied expertise in two manners. First, she put together a group of doctors who had different types of expertise relative to her problem:

You've got to put all your expertise together. [City 1] has thoracic surgery capability. [City 2] has [radiologist]. [City 3] has [infectious disease specialist]. I told [infectious disease specialist] we'll put a T1 line into her house if she ever quits. I'll pay for that T1 line myself. But you know those kinds of things make a big difference in terms of how I can survive doing treatment down here.

Second, she utilized a different group of specialists who all specialized in infectious diseases, but had different methods of treating the infectious diseases.

Before 1994 there were 14 cases. In 1994 we took care of six cases here all by varying tenuous phone consultation with [three different hospitals] and we've always called those three because the definition of an internist (the physician herself) is obsessive, compulsive, and paronoid. They all differ by the way of their treatment recommendations and we're well aware of that. In 1995, we had two cases; in 1996, we had 13 and so far this year [1997] we've had 20 cases so it just kind of went up and if it keeps going, obviously this year will be a banner year. And there's no way I would have taken this on (without teleconsultations).

However, a physician at the HSC affiliated with that site pointed out that the quality of expertise was also very critical. He gave an example where the lack of expertise on the transmitting side of the teleconsultation relationship contributed to the cessation of the pediatric oncology teleconsultations.

You really do have to rely on the expertise of the person on the other end. For example, it is important to know what the liver and the spleen are doing because, if you have a recurrence of leukemia, it is going to show up in the liver and spleen. You will have a big liver and spleen. So if you can't actually touch the patient yourself, you have to rely on the person at the other end. And if that person is a pediatrician, chances are they are going to do an okay job. If they are nurses, they may well do a great job, but you just don't know. If you don't have great confidence that these nurses are well trained enough to do the exam and tell you “Yes, this liver is not enlarged.” There were a lot of times when the nurse would say “I don't know. Maybe it is, maybe it isn't. I just can't tell.” Well all of the sudden, you just can't make any decisions because that is a major point in their decision tree in their therapeutic thinking...So for those reasons we really didn't feel this [teleconsultation] was meeting their needs as well as they were hoping it would. So (the teleconsultations) phased out.

The pediatric oncologist involved in the project emphasized the need for the other party to possess a certain level of expertise so that they can make sense of the cues that can not effectively transmitted via the telemedicine equipment.

The other condition that is absolutely necessary is to have somebody—for telemedicine—is to have a qualified person that will link the patient and the physician. That person has to be at least a registered nurse practitioner or a physician's assistant...That person needs to do a good physical examination with an abdominal exam, heart sounds and everything—they need to relate to you what is happening to the patient. Or if they are going to use the equipment and they are going show you the middle ear or the heart sounds, then there needs to be understanding of what's going on over there.

4.5. Trade-offs between the Partner’s Expertise and the Technology Capabilities May Exist

There may be occasions when utilizing telemedicine as a sensemaking tool where a trade-off exists between the other party’s expertise and the technological capabilities of the telemedicine equipment. Technological limitations can sometimes be overcome by utilizing the other’s expertise, or the other’s lack of expertise can at times be overcome by the technological capabilities of the system. For example, one of the earliest signs of a relapse in pediatric leukemia is the appearance of abnormal clusters of cells in the eye.
Therefore, the oncologist needs to be able to examine the whole area of the retina. One means of doing so is by utilizing a direct ophthalmoscope— with which only a small portion of the retina can be seen at any time— and maneuvering it around so that the retina is eventually completely seen. In teleconsultations, the oncologist must rely on the other party to control the direct ophthalmoscope in a manner in which the retina is completely examined. If the other party is unable to do so, then important visual cues— critical for the oncologist’s sensemaking capabilities— may be missed.

That was the problem faced by the pediatric oncologists at HSC I. They had to rely on a nurse who had not been trained to use the direct ophthalmoscope. The oncologist did not feel she had the needed expertise. As a result, they stopped doing retinal exams as part of their teleconsultations.

There was a technological solution to overcoming the other party’s lack of retinal exam expertise. The physician at HSC I explained:

There were other solutions available. There are electronic indirect ophthalmoscopes on the market. They are the big machines you put your head into and they do take one image of the entire retina. But we did not have that available. So on that basis the oncologists felt they were not receiving the information they needed.

4.6. Telemedicine Is a Social Process That Is Personality Based and Requires Respect and Trust

Sensemaking is a social processing that is personality-based and requires respect and trust. As such, telemedicine as a sensemaking tool is very much a social process that is sensitive to the personalities involved and requires respect and trust. A major implication of the social aspects of telemedicine as a sensemaking tool is that it is very sensitive to the personalities involved. As one physician bluntly put it:

Telemedicine is definitely personality preference; there's no doubt about it. If you're a dork on one end, the camera is not going to make you less of a dork when you get transmitted across the airwaves.

If the teleconsultation parties do not treat each other in a respectful and professional manner, telemedicine as a sensemaking tool is likely to fail because one party will either discount the other party’s input, or decide not to put up with the lack of respect and cease the teleconsultations. As a remote health care provider recalled when asked:

Question: In terms of dealing with the doctors up there, how has that been?
Well, pretty good. In general, and that's an important key to the success of the program, because, you know, if the doctors make you look good, and let you learn something, then you'll want to come back. But if they make you look bad, then you don't want to do it again. And most of the doctors are really good about... you know, even if they feel like you've done exactly the wrong thing, they'll say, "Yes, that was an excellent thought. And I would ask a couple of other things." But there are some guys that are jerks over it, and there was one infectious disease guy that, wooh!, I mean, he would sit back and he would say, "What kind of bull____, what kind of asshole, nah, nah, nah... and you could hear him off the screen. You know, I could hear him talking about this off the radio, you know, and...we'd just never consult him again. You'd say, never, ever get this guy again.

Question: Did you end up... For example, that one was infectious disease. Are there other people in that field that you can end up working with, or.... Yeah, there was another infectious disease guy that was great. He was great. Very patient. Good. But this one guy has had a burr up his saddle and we'd consult him a couple of times, but each time, he was like, he needed a personality transplant or something.

An administrator/physician at another remote site pointed out that when physicians need help, they tend to rely on people they trust. He also pointed out how teleconsultations can be useful in determining if the other party is trustworthy.

Most of us will go to those we trust to give us the information in a way that we can readily adapt it to our need and move on...I like [teleconsultations] because I can see the other individual and if they're acting smart alec or in a way that doesn't enhance trust, it doesn't enhance the ability, doesn't really help me a whole lot, I can cut it short.

5. What Does Telemedicine as a Tool for Sensemaking Imply for the Future of Telemedicine?

Telemedicine utilized as a sensemaking tool and an information processing tool to address ambiguity in addition to uncertainty reduction has the potential to lower the cost and increase the quality of remote health care delivery. However, while telemedicine utilized as an information processing tool to reduce uncertainty may, in a long run, result in lower utilization rates of telemedicine networks, telemedicine utilized as both a sensemaking and information processing tool to address wicked decision problems may result in increased usage of telemedicine networks.

5.1. Telemedicine as a Tool for Sensemaking Can Reduce the Cost of Health Care Delivery

Telemedicine as a tool for sensemaking may reduce the cost of health care delivery by enabling remote health care providers to diagnose and treat conditions at an earlier stage than they may have traditionally been treated
in remote areas. A rural health care provider described how telemedicine was utilized to speed up and improve the clinical decision-making process.

Question: You gave some examples where your patients ended up using telemedicine because they couldn't afford to go to [HSC III]. What happened before telemedicine? Well, the big thing out here is, you know, they have to reach a threshold where they, you know, if it gets bad enough, then they'll go. And, so what happens it that that threshold gets raised, until they've got to be...they're real sick before they go...You know, a lot of things happen in small, isolated places, because people delay in diagnosis. And that's big then, because you go, "Well, let's see if it gets better. Well, I hate to go all the way down there if it's going to get better." And the delay in diagnosis, the way this really helps, is that it makes that clinical decision quicker, or at least it brings in that tertiary second opinion to make the decision quicker, if you need that. And, a lot of people that don't have that access because they're so isolated out here, or they have to reach that threshold to go up there and get that. So, I think that's the key, is that it lowered the threshold with which we could get a tertiary care consult. And, in that sense, it makes the clinical decision sooner, you know, if you think of health care as some kind of algorithm format. You progress down the algorithm quicker, so you get the decision made quicker and get on the road to therapy sooner, or whatever you want to do.

5.2. Telemedicine as a Sensemaking Tool May Increase System Utilization

Telemedicine projects to date have had disappointingly low utilization rates, for a number of possible reasons (See [2][17][19] for a discussion on these issues). Longer term, the fall in telemedicine utilization rates may be a signal that telemedicine, utilized as an information processing tool is effective in reducing uncertainty. Telemedicine as an information processing tool loses its purpose once the information has been transferred and processed. As a remote physician stated:

You ask him (the specialist) a question and your learning curve comes up. You get that piece of information high on your recall list and then you don't ask that question for a while and you ask some other question that has slipped from your memory. You know, at any given time in the past, we were competent on almost everything, but you know, as times goes on and you don't see a certain disease process very often, it slips from your memory, some of the details of the treatment process and stuff, and it's.... After you present the patient, then that learning curve is right up there, and you don't have to ask that question again.

The head of the telemedicine program at HSC III estimated the impact of telemedicine as an information processing tool when he commented on what he thought would happen to teleconsultation utilization rates:

The presenter is the biggest benefactor of all this because after awhile, he becomes damn sharp talking to the chair of orthopedics one hour a week. After awhile, well, "Why in the hell am I going to present that case again. I already know how to handle it."...And therefore, they use the teleconsultative services is like this, whew! and then it goes down, well why? Because I can handle a hell of a lot. How much could they handle that they could not handle before? I'd say 30%, what they would ship before with a seasoned presenter. After a year, hey, "Why in the world would I send the same thing I presented to the chief five times? Why would I even present it? I know what he's going to say, I know what he is going to do. He's going to tell me you can't do a damn thing for this and use physical therapy. I've got it!" That's the biggest benefit of this whole thing...Now I think that the presenter in a year will diminish his presentations—He will take care of 30% cases that he could not handle that now he knows how to handle. 30%!

Yet, while telemedicine as an information processing tool utilized to reduce uncertainty may result in the long-term reduction of teleconsultations, telemedicine utilized as both a sensemaking tool and an information processing tool to address wicked decision problems may result in significant increases in telemedicine utilization rates. Telemedicine as a sensemaking tool is more likely to be accepted by remote health care providers because it does not present a threat to them, nor does it diminish their importance. Telemedicine as a sensemaking tool enables remote physicians to address more ambiguous cases involving wicked decision problems. A remote physician affiliated with HSC I explained:

One of the items against telemedicine is well, it's just toy and once you get through the learning curve, I mean once I learn how to treat [infectious disease], I don't need it anymore and what's the fun of having it. And what we found is we're taking care of more cases and more complicated cases and the number of attendees to the (tele)conferences has actually gone up. Normally the studies that I've seen on telemedicine, they'll show this initial peak and then it drops off as interest goes. The number of cases that we're presenting are obviously going way up.

Telemedicine utilized as a sensemaking tool to address wicked decision problems also means cases that otherwise would have needed to be transferred to the relevant health sciences center can now be treated locally. The increased number of patients being treated locally often requires an increase in the number of teleconsultations as issues previously addressed by transferring the patients to be health sciences centers are now made sense of via telemedicine. An oncologist involved with the bone marrow transplant program described:

Question: What happens with patients who don't respond to the treatment—who are having problems? Do they end up going back up there or staying here?
With [HSC II’s] support, we're gaining more comfort that if there are problems that can be taken care of here—they are not saying, “You need to send the patient up (to the HSC).” Instead, they can see the patient (via teleconsultations) and they can see what we do. So there's a comfort that's developed. We've developed a comfort that we can do what's best for the patient. And I think they feel comfortable that, if we're uneasy, we'll send (the patients) back. (Otherwise) we feel comfortable that they're comfortable with us taking care of the patients (here).

6. Conclusion

Telemedicine, in addition to being utilized as an information processing tool to reduce uncertainty, can also be utilized as a tool for sensemaking to address wicked decision problems. The isolation of the remote health care provider historically has limited their sensemaking capabilities, and telemedicine can reduce these limitations. Telemedicine as a tool for sensemaking to address wicked decision problems has a number of implications for telemedicine projects. The appropriateness of telemedicine is dependent on the type of cues necessary, and the telemedicine technology and setup must facilitate sensemaking. The technology necessary to support sensemaking may be different than the relevant medical technology standards. Telemedicine is sensitive to the variety and quality of expertise and experience, and there may be trade-offs between the partner’s expertise and technology capabilities of the telemedicine system. Finally, telemedicine as a tool for sensemaking is a social phenomenon that is personality based and requires respect and trust. Telemedicine as both a tool for sensemaking and information processing has the potential to decrease the cost and increase the quality of health care delivery to remote areas. Longer term, telemedicine utilized as an information processing tool to reduce uncertainty may result in lower utilization rates of telemedicine networks, while telemedicine utilized as both an information processing and a sensemaking tool to address wicked decision problems may increase utilization rates.

References


