

## Research Note

# An Empirical Chart Analysis of the Suitability of Telemedicine for Hospice Visits

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### ABSTRACT

Telehospice® (TH) utilizes telemedicine technology to provide care at the end of life. A bi-state project was launched in 1998 to study the use of home-based telemedicine for routine hospice care. Videophones were deployed for telenursing visits and evaluations by social workers. In order to determine what proportion of home hospice visits could be performed using currently available telemedicine technology, we reviewed clinical records retrospectively for hospice nurse home visits. Clinical notes documenting home nursing visits were obtained from two large hospices, one based in Kansas, and the other in Michigan. Records were randomly selected for patients who received hospice nurse visits during the month of January 2000. The charts were reviewed for patient demographic information, patient assessments, teaching activities, and interventions. Five hundred ninety-seven nursing notes were analyzed using an 85-item coding instrument. After careful review of the records, the coders also made a subjective observation regarding the suitability of each visit for telemedicine. As part of this analysis, we found that 64.5% of home hospice nursing visits could be performed by telemedicine. Using TH, it is possible to reduce the number of in-person visits, thereby significantly decreasing the cost of providing hospice care.

### INTRODUCTION

**H**OSPICE involves a multidisciplinary team of health professionals including nurses, physicians, social workers, and chaplains working together to ensure optimal care for patients near the end of life.<sup>1</sup> Hospice recipients undergo fewer diagnostic tests and therapeutic procedures, because the primary focus is on symp-

tom relief for the patient rather than on the cure.<sup>2</sup> Typically, nurses make home visits to assess pain and other symptoms, and to assist caregivers in caring for the dying patient. Hospice professionals address the emotional, social, and spiritual impact of terminal illness on the patient, family members, and friends by offering counseling and bereavement services both before and after a patient's death.<sup>3</sup> In the United

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States, patients referred for hospice services must be terminal, with a life expectancy of 6 months or less.

When asked, 9 of 10 Americans would choose to die at home, surrounded by friends and family.<sup>4</sup> In reality, however, more than 85% of deaths in the United States occur in an institutional setting, either in a hospital or an extended care facility.<sup>5</sup> In an effort to honor the dying patients' wishes, hospices tailor a detailed, individualized treatment plan to each client. This plan may include frequent home nursing visits, simplified medication regimens that are given orally, and psychosocial services to support patients and caregivers through difficult periods. This multidisciplinary approach enables more than 80% of hospice recipients to die at home.<sup>4</sup>

Unfortunately, in 1999 less than 25% of individuals dying in the United States were hospice recipients, perhaps contributing to the discrepancy between the wish of many to die in the home and the reality that most people die in an institutional setting.<sup>4</sup> A variety of reasons have been proposed for failure to access hospice care including geographic isolation in the rural sector, lack of referral by the primary care physician, patient refusal, and cost.<sup>6-8</sup>

Because it is delivered at the patient's home, hospice care telemedicine may be especially appropriate. This allows for the consultative portion of the patient-provider interaction to occur online, in real time, leaving the hands-on aspects of care to a caregiver in the patient's home.

A pilot home health study examined the feasibility of placing videophones into the homes of hospice patients located in Missouri and Michigan.<sup>9</sup> Project partners reported general satisfaction with the Telehospice® (TH) system, with nurses and social workers quickly embracing the service. Potential advantages of telemedicine included not having to drive long distances in rural settings and possibly avoiding after hour visits in certain unsafe urban areas. TH allowed the nurses to visit and treat patients without leaving their home or office.<sup>10</sup> Further study sought to find out whether hospice personnel felt it would be feasible to provide care via telemedicine and whether caregivers felt the quality of TH would be comparable to tradi-

tional care. Caregivers strongly believed that telehealth would improve access and conceivably decrease costs.<sup>11</sup> Interestingly, caregivers were more satisfied with the service, than hospice recipients.<sup>12</sup> In addition, a cost measurement study was conducted to monitor the expenses of launching and maintaining a TH service. The average cost per TH visit was \$29, one quarter of the cost of an average in-person visit.<sup>13</sup>

Encouraged by the pilot study, and with funding from the National Telecommunications Infrastructure Administration-Technologies Opportunities Program (NTIA-TOP), project researchers launched a bistate TH program to study the utilization, acceptance, diagnostic accuracy, and cost.<sup>14</sup> The following study was performed as part of the initial needs assessment for the project.

## MATERIALS AND METHODS

Two large hospice organizations in Kansas and Michigan participated in this retrospective study. This was based on a retrospective review of hospice nurses' notes using the Home Health Activities Assessment Instrument (HHAAI), a previously developed coding instrument.<sup>15</sup> Records from two care teams—one urban, one rural—in each state were photocopied including the nursing home visit note and accompanying demographic sheet; all patient identifiers were subsequently removed. The first 150 consecutive visits for each team in each state beginning January 3, 2000 were selected from the hospice information system patient database.

Two coders participated in this study: (1) a practicing oncologist and hospice medical director and (2) a medical student researcher familiar with hospice care and practice. Both observers were knowledgeable about the capabilities of telemedicine technologies and monitoring devices including videophones, electronic stethoscopes, otoscopes, and blood pressure and pulse monitors.

### *Survey tool*

The HHAAI (see Fig. 1) was used to determine the activities that took place during each visit. The HHAAI is divided into three broad

OBJECTIVE ASSESSMENT			OBJECTIVE ASSESSMENT (CONT)	INTERVENTION
INSPECTION (VISUAL)		Hands ON?		
WHAT:	SITE:	Y	<input type="checkbox"/> Weight <input type="checkbox"/> Odor	<input type="checkbox"/> Bladder Instillation <input type="checkbox"/> Blood Glucose Monitoring
WHAT:	SITE:	Y	<input type="checkbox"/> Gait	<input type="checkbox"/> Catheter Insertion, Removal & Care
WHAT:	SITE:	Y	<input type="checkbox"/> Alert & Oriented check	<input type="checkbox"/> Chest Percussion/Physiotherapy
WHAT:	SITE:	Y		<input type="checkbox"/> Disimpaction/Enema
WHAT:	SITE:	Y		<input type="checkbox"/> Exercise, Rehabilitative
<b>STETHOSCOPY</b>			<b>TEACHING</b>	Hands ON?
<input type="checkbox"/> Abdomen			<input type="checkbox"/> Adaptive Device Use/Adaptive Techniques	Y
<input type="checkbox"/> Heart			<input type="checkbox"/> Administration of Injection	Y
<input type="checkbox"/> Lungs			<input type="checkbox"/> Administr. Of Medications (NOT IM, IV, SC)	Y
<input type="checkbox"/> Peripheral Pulses/bruits			<input type="checkbox"/> Ambulation with Assistive Devices	Y
<input type="checkbox"/> Other (specify)			<input type="checkbox"/> Bowel/Bladder Training	Y
<b>PALPATION</b>			<input type="checkbox"/> Catheter Insertion and/or care	Y
<input type="checkbox"/> Abdomen			<input type="checkbox"/> Diabetic Care	Y
<input type="checkbox"/> Breast			<input type="checkbox"/> Disease Process/Complications	Y
<input type="checkbox"/> Lymph nodes			<input type="checkbox"/> Energy Conservation Techniques	Y
<input type="checkbox"/> Musculoskeletal: bones, joints, soft tissue/muscle			<input type="checkbox"/> Exercise/Techniques, Rehabilitative	Y
<input type="checkbox"/> Skin			<input type="checkbox"/> Gastrostomy Feeding	Y
<input type="checkbox"/> Thorax			<input type="checkbox"/> Inhalation Therapy/Adminis. of Medical Gases	Y
<input type="checkbox"/> Other (specify)			<input type="checkbox"/> IV Care	Y
<b>PERCUSSION</b>			<input type="checkbox"/> Nasogastric Feeding	Y
<input type="checkbox"/> Abdomen			<input type="checkbox"/> Ostomy or Ileoconduit care	Y
<input type="checkbox"/> Heart			<input type="checkbox"/> Precautions/Safety Measures	Y
<input type="checkbox"/> Lungs			<input type="checkbox"/> Proper Positioning of Bed-bound Patient	Y
<input type="checkbox"/> Reflexes			<input type="checkbox"/> Prosthesis and Orthotic Care	Y
<input type="checkbox"/> Other (specify)			<input type="checkbox"/> Psychiatric Care	Y
<b>ALL VITAL SIGNS</b>			<input type="checkbox"/> Therapeutic Diet Prep. & Maintenance	Y
<input type="checkbox"/> Blood Pressure			<input type="checkbox"/> Tracheostomy Care	Y
<input type="checkbox"/> Pulse			<input type="checkbox"/> Transfer Techniques	Y
<input type="checkbox"/> Respiratory rate			<input type="checkbox"/> Wound Care	Y
<input type="checkbox"/> Temperature			<input type="checkbox"/> Hospice Policy/ Services	Y
<input type="checkbox"/> Pain				

Do you think this visit could have been done via Telemedicine? 1=Yes 2=NO

FIG. 1. Home health activities assessment instrument modified for the hospice population

categories: (1) objective assessment, (2) teaching, and (3) intervention. The objective assessment is further categorized to include measurement of vital signs, visual inspection, stethoscopy, palpation, and percussion. The HHAAI was modified to include educational activities and services unique to the hospice population (e.g., “Hospice Policy and/or Ser-

vices”). The coders were also asked to comment subjectively whether the visit could have been done via telemedicine or not.

*Data analysis*

Descriptive statistics were used to describe diagnosis by gender, typical activities that oc-

TABLE 1. FREQUENCIES AND PERCENTAGES OF DIAGNOSIS BY GENDER

<i>Diagnosis</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>	<i>Percentage</i>
Cancer	172	207	379	63.5
AIDS	15	0	15	2.5
Blood diseases	1	0	1	0.2
Mental disorders	0	6	6	1.0
Dementia, Alzheimer's	16	42	58	9.7
Congestive heart failure	28	74	102	17.1
COPD emphysema, chronic bronchitis	13	14	27	4.5
Renal failure	0	9	9	1.5
Total	245	352	597	100

AIDS, acquired immune deficiency syndrome; COPD, chronic obstructive pulmonary disease.

curred during a hospice nurse visit, teaching activity and intervention activity. Frequencies and percentages were used to describe discrete variables. Generalized linear models were used to analyze the suitability of hospice visits via telemedicine by gender and also by cancer or non-cancer diagnosis to take into account multiple visits per patient and the clustering of data within hospitals. Data were analyzed using SAS system for Windows version 8.02 (SAS Institute Inc., Cary, NC).

**RESULTS**

*Intercoder reliability*

A Web-based number generator was used to create a random subset of the records. The two coders reviewed those records to determine inter-coder reliability, which was found to be acceptable (Scott's  $\pi = 0.91$ ).

*Study population*

The study sample consisted of 597 notes documenting hospice visits by nurses. Three hundred three (50.8%) occurred in an urban or suburban area, and 294 (49.2 %) of the visits were in a rural setting. In addition, 284 (47.6%) notes were from nursing visits that took place in Kansas and 313 (52.4%) in Michigan. The number of visits per patient varied from 1 to 10. Patients ranged in age from 26 to 99 years ( $\underline{M} = 74$ ,  $\underline{SD} = 14.18$ ). There were slightly more vis-

its with females (59%) than with males (41%). Table 1 illustrates the breakdown of diagnosis for each nursing visit by gender. As expected in the hospice population, most patients were dying from a malignancy (63.5%).

TABLE 2. FREQUENCIES AND ASSESSMENTS OF 597 NURSING VISITS AS DOCUMENTED IN HOSPICE NURSING VISIT NOTE

Vital signs:		
Blood pressure	479	80.2
Pulse	469	78.6
Respiratory rate	494	82.7
Temperature	249	41.7
Pain	471	78.9
Stethoscopy of:		
Abdomen	358	60.0
Heart	461	77.2
Lungs	457	76.5
Peripheral pulses/bruits	0	0
Other	0	0
Palpation of:		
Abdomen	377	63.1
Breast	0	0
Lymph node	1	0.2
Musculoskeletal	2	0.3
Skin	361	60.5
Thorax	0	0
Pedal pulse	266	44.6
Edema	193	32.3
Other	13	2.2
Percussion of:		
Abdomen	3	0.5
Heart	0	0
Lungs	0	0
Reflexes	28	4.7
Other	0	0
Objective assessment of:		
Weight	75	12.6
Odor	47	7.9
Gait	70	11.7
Alert and oriented check	488	81.7

### Chart review findings

Frequencies and percentages for assessment activities are shown in Table 2. As anticipated, the most commonly performed assessment activity included measurement of vital signs. Physical examination included stethoscopy of heart and lung sounds, 77.2% and 76.5% of the time, respectively. Evaluation of mental status, coded as "alert and oriented," was recorded just over 80% of the time. Finally, clinic notes revealed that hospice patients were queried about pain in almost 80% of the nursing visits.

Frequencies and percentages of teaching activities are shown in Table 3. The most frequently taught activity concerned psychiatric and/or psychospiritual support (documented in 54% of the clinic notes) followed by discussion of hospice policy and services (51%). Teaching with regard to disease process/complications was common as was education regarding oxygen administration, coded as "inhalation therapy/administration of medical gases," and administration of medications (32.7% for each category). Thirty five of 597

(5.9%) clinic notes reviewed revealed teaching that required "hands-on" activity.

Frequencies and percentages of interventions performed are shown in Table 4. By definition, interventions require hands-on activity. The most commonly performed intervention was wound care, which was performed during 43 visits (7.2%). Consistent with the treatment philosophy of those receiving hospice care, relatively few interventions were performed.

### Suitability for telemedicine

The coders judged that 385 of the 597 (64.5%) hospice nursing visits could reasonably have been performed using current telemedicine technologies including videophones and devices for home monitoring. A visit was scored as not suitable for telemedicine if it was an initial visit, a death call, an in-person visit request by the family in response to a crisis, or if an intervention was performed. As indicated in Table 5, there was no significant association between the suitability of a telemedicine visit and the gender of the patient.

TABLE 3. FREQUENCIES AND PERCENTAGES OF TEACHING ACTIVITIES DURING 597 HOSPICE NURSING VISITS AS DOCUMENTED IN THE NURSING VISIT NOTE

<i>Teaching activity</i>	<i>Frequency</i>	<i>Percentage</i>
Adaptive device use/adaptive techniques	0	0.0
Administration of injection	4	0.7
Administration of medications (Not IM, IV, SC)	195	32.7
Ambulation with assistive devices	1	0.2
Bowel/bladder training	0	0.0
Catheter insertion and/or care	3	0.5
Diabetic care	2	0.3
Disease process/complications	273	45.7
Hospice policy/services	305	51.1
Energy conservation techniques	11	1.8
Exercise/techniques, rehabilitative	0	0.0
Gastrostomy feeding	6	1.0
Inhalation therapy/administration of medical gases	195	32.7
IV care	1	0.2
Nasogastric feeding	0	0.0
Ostomy or ileoconduit care	1	0.2
Precautions/safety measures	183	30.7
Proper positioning of bed-bound patient	33	5.5
Prosthesis and orthotic care	0	0.0
Psychiatric care/psychospiritual support	323	54.1
Therapeutic diet prep. and maintenance	2	0.3
Tracheostomy care	0	0.0
Transfer techniques	1	0.2
Wound care	25	4.2
Hands-on teaching	35	5.9

IM, intramuscular; IV, intravenous; SC, subcutaneous.

TABLE 4. FREQUENCIES AND PERCENTAGES OF INTERVENTIONS PERFORMED DURING 597 HOSPICE NURSING VISITS AS DOCUMENTED IN THE NURSING VISIT NOTE

<i>Intervention activity</i>	<i>Frequency</i>	<i>Percentage</i>
Bladder instillation	1	0.2
Blood glucose monitoring	1	0.2
Catheter insertion, removal, and care	17	2.8
Chest percussion/physiotherapy	0	0
Disimpaction/enema	12	2.0
Exercise, rehabilitative	0	0
Heat treatments	0	0
Inhalation therapy equipment care/medical gas administration	0	0
Injection, intramuscular	1	0.2
Injection, subcutaneous	15	2.5
IV administration of fluids or medications	16	2.7
IV placement and care	15	2.5
Medical equipment	0	0
Medication administration	6	1.0
Nasogastric feeding, tube insertion, and care	0	0
Ostomy or ileoconduit care	3	0.5
Physiatric therapy	0	0
Specimen collection	3	0.5
Syringe filling	0	0
Tracheostomy/nasopharyngeal aspiration and care	0	0
Urine specimen testing	1	0.2
Venipuncture	16	2.7
Wound care/dressing	43	7.2
Other intervention	4	0.7

IV, intravenous.

Analysis further revealed no significant association between telemedicine suitability and the diagnosis of the hospice patient, as illustrated in Table 6.

Additionally, no significant association was noted between teaching activities and the state where the nursing visit took place. Moreover, there was no significant association displayed between some teaching activities and the location of the client—rural setting versus urban setting. No significant association was found in the relationship between intervention activities and the state where the nursing visit took place—Kansas versus Michigan. Finally, there was no significant relationship between intervention activities and the location of the patient—rural setting versus urban setting.

### DISCUSSION

This study documents services performed for hospice patients during home nursing vis-

its including physical assessment, teaching, and various interventions. Activities related to the physical examination—vital signs, visual inspection, stethoscopy, mental status check—were performed on a relatively routine basis. As expected with this patient population, teaching occurred frequently including discussions pertaining to psychospiritual support, hospice services, and disease processes. By using home-based telemedicine technology such as videophones and home monitoring equipment, our analysis indicates that many of these hospice services could be performed on line, thereby eliminating the need for an in-person home visit.

TABLE 5. SUITABILITY OF HOSPICE VISIT VIA TELEMEDICINE BY GENDER

<i>Gender of patient</i>	<i>TM yes</i>	<i>TM no</i>	<i>Total</i>
Male	168	77	245
Female	217	135	352
Total	385	212	597

*p* value = 0.32.  
TM, telemedicine.

TABLE 6. SUITABILITY OF HOSPICE VISIT VIA TELEMEDICINE BY DIAGNOSIS

<i>Diagnosis</i>	<i>TM yes</i>	<i>TM no</i>	<i>Total</i>
Cancer	233	146	379
AIDS	15	0	15
Diseases of the blood	1	0	1
Mental disorders	4	2	6
Dementia, Alzheimer's	41	17	58
Congestive heart failure	67	35	102
COPD, emphysema, chronic bronchitis	17	10	27
Renal failure	7	2	9
Total	385	212	597

*p* value = 0.46.

AIDS, acquired immune deficiency syndrome; COPD, chronic obstructive pulmonary disease.

One of the limitations of this analysis is that it was based entirely on a retrospective review of the clinical record, possibly excluding undocumented activities that would not be amenable to TH. However, it is reasonable to assume that services related to an intervention physical presence of a hospice nurse is required would be memorable and subsequently less likely to be left out of the visit note. One could reasonably argue that the most likely activity to occur without documentation is the psychosocial component of hospice care. This supportive service—offered by all members of the hospice team including nurses, social workers, and chaplains—is considered an integral component in care of the dying and could be performed via telemedicine. While some might consider telemedicine a barrier to communication on such a deeply personal level, others may prefer a telemedicine visit and would consider an in-home visit to be an intrusion into their personal space.<sup>12</sup> These communication issues are addressed in other ongoing studies.

To err on the conservative side, if any intervention or hands-on teaching activity took place in the home, the reviewers agreed the visit could not have been performed by telemedicine. Clearly some procedures cannot be performed via telemedicine and will always require the physical presence of a nurse or physician. However, it is reasonable to assume that an adequately trained family member or caregiver could perform routine assessments

such as vital signs, visual inspection, and wound dressing changes. In addition, in this setting, it is worth considering whether or not the on-site assessments made by a hospice nurse would lead to different treatments or outcomes for hospice patients.

While differences in services were documented in the rural sector compared with the urban population, none of the differences reached statistical significance. After careful review, it cannot be said that one group received more services compared to the other in a consistent manner. In addition, some differences in activities performed during visits were noted when comparing notes from Kansas and Michigan. Perhaps the two hospices emphasize different services or require unique documentation specific to their organization, which would account for the differences noted. We cannot easily explain the differences, and, in fact, none reached statistical (or clinical) significance.

Another important consideration in the application of telemedicine technology to hospice care is the potential for cost savings suggested by previous investigations.<sup>13</sup> Similar to many other health care organizations, hospice organizations are increasingly pressured to provide quality care under financially restricted conditions. Recent reduction in Medicare reimbursement levels for clients in the rural sector brought about by the Balanced Budget Act of 1997 adds to this challenge.<sup>14</sup> Hospice organizations are particularly dependent on Medicare reimbursement because almost two thirds of hospice patients are Medicare recipients.<sup>4</sup> This study reveals a significant portion of hospice visits may be performed by telemedicine and TH may be useful to both urban and rural populations. If only 10% of home nursing visits could be replaced via telemedicine, the potential savings to the hospice organization is enormous.

In light of the findings of this study, further investigations are warranted to address the utility of telemedicine in the hospice care setting. As part of the Kansas-Michigan Telehospice<sup>®</sup> project, studies addressing diagnostic accuracy, acceptance by patients, providers and/or caregivers, utilization, and cost are ongoing.

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