

Grant Final Report

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Technology Exchange for Cancer Health Network (Tech-Net)

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Principal Investigator:

Teresa Waters, PhD

Team Members:

Furhan Yunus, MD

Mindy Merkel, BSN

Blenda Chambliss, FNP

Jeffrey Allen, MD

Jagsit Sachdev, MD

Karen Fox, PhD

Sydney Gray Ashby, MA

Performing Organization:

University of Tennessee Health Science Center

Project Officer:

Erin N. Grace

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The Agency for Healthcare Research and Quality (AHRQ)

U.S. Department of Health and Human Services

540 Gaither Road

Rockville, MD 20850

www.ahrq.gov

Abstract

Purpose: The Technology Exchange for Cancer Health Network (TECH-Net) is a collaborative, multi-state effort to implement a systematic care program to improve cancer management in the rural communities of west Tennessee, north Mississippi and east Arkansas.

Scope: This Health Information Technology (HIT) project builds upon a two-pronged approach to total clinical decision support. The first component provides access to oncology, hematology, and other specialists through the dedicated telehealth network of the University of Tennessee's Health Science Center (UTHSC). The second component involves a distributed electronic health record (EHR) integrated with decision support systems, online management of cancer protocols, electronic orders, and medication management systems. The primary goal of this implementation project has been to determine the extent to which a multi-state HIT collaborative network can contribute to measurable and sustainable improvements in the cost, safety, and overall quality of cancer care for a region.

Methods: The specific aims of the project focus on the implementation of technology, personnel, and workflows, the impact Tech-NET has on patient care, and the dissemination of findings to other programs interested in developing similar services: Specific Aim #1—To implement a collaborative, multi-state Health Information Technology System that meets the needs of patients, families and providers in a rural cancer care setting. Specific Aim #2—To improve access to appropriate care, increase the quality and safety of care and achieve better health outcomes at equal or lower cost for cancer patients in rural communities through an integrated Health Information Technology System. Specific Aim #3—To produce and distribute a generalizable, replicable model for implementing an integrated Health Information Technology System for cancer care.

Results: TECH-Net has linked six separate cancer outreach clinics in a tri-state area with the specialists and researchers of UTHSC and with Methodist University Hospital, a major tertiary care hospital, for comprehensive care and communications across the spectrum of adult cancer care. Implementation of this telehealth and EHR program took a phased approach, sequentially building clinical decision support into existing workflows. Evaluation is examining qualitative and quantitative data to measure the success of TECH-Net's implementation and to determine the impact on patient safety, cost, access to care and overall patient outcomes.

Key Words: none provided

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Final Report

Purpose

The specific aims of the project have focused on the implementation of technology, personnel, and workflows, the impact Tech-NET has had on patient care, and the dissemination of findings to other programs interested in developing similar services:

Specific Aim #1. To implement a collaborative, multi-state Health Information Technology System that meets the needs of patients, families and providers in a rural cancer care setting.

Specific Aim #2. To improve access to appropriate care, increase the quality and safety of care and achieve better health outcomes at equal or lower cost for cancer patients in rural communities through an integrated Health Information Technology System.

Specific Aim #3. To produce and distribute a generalizable, replicable model for implementing an integrated Health Information Technology System for cancer care.

Scope

The economic health of the southern United States has historically been weak. The per capita income lags significantly behind the rest of the nation (\$20,872 in the region versus \$25,288 US average in 1997; 82.5 % of national average). Unemployment rates are 7% higher in the region and poverty rates are 17% higher than the rest of the nation.¹

The economic health of the region and rural geography affects the equitable distribution of health care. The federal Bureau of Health Professions designated all of the counties targeted by TECH-Net, excluding Shelby County, as Health Professional Shortage Areas. Residents with special healthcare needs who live in these rural communities of the Mississippi Delta are typically referred to larger urban areas for care. These referrals involve time, travel and lost wages. When these barriers become significant, the patient may delay recommended referrals or treatments, further exacerbating their condition, increasing health care costs and the likelihood of an adverse outcome. Programs that bring specialty oncology and hematology care to these rural communities can provide rural physicians and their patients access to state-of-the-art care for improving health outcomes in a cost-effective and efficient manner. This rurality and corresponding lack of access to care is the first component that makes this population particularly vulnerable to diseases such as cancer.

The second critical component of the targeted population is the high percentage of minorities and the devastating impact cancer has on this population, as reported by the Office of Minority Health. While African Americans have a lower incidence of new breast cancer cases than Caucasians, African Americans are more likely to die from this disease than other ethnic groups (mortality rate of 31.4 per 100,000)². Many of these disparities are explained by late diagnosis,

lifestyle factors, and access to appropriate care.³ The counties served by this project are comprised of 46.2% minorities, in comparison to 19.8% nationwide, according to 2000 US census data. (See Table 1 below)

Table 1. 2000 US census data on the percentage of minorities in counties targeted by TECH-Net

2000 Census Data	Total Population	# Minorities	% Minority
Shelby, TN	896,013	472,199	52.7%
Fayette, TN	30,536	11,451	37.5%
Obion, TN	32,346	3,817	11.8%
Grenada, MS	22,938	9,657	42.1%
DeSoto, MS	114,352	16,238	14.2%
Panola, MS	34,697	17,175	49.5%
Alcorn, MS	34,612	4,361	12.6%
Crittenden, AR	51,114	25,097	49.1%
St. Francis, AR	28,952	14,939	51.6%
TECH-Net Counties	1,245,560	574,934	46.2%
U.S.	284,796,888	56,389,784	19.8%

Given this underserved population, the alarming disparities in local healthcare and the impact cancer has on this population, the communities surrounding Memphis provide fertile ground to study new and innovative approaches to care that will affect these disparities. UTHSC investigators, University of Tennessee Cancer Institute (UTCI) providers, and Methodist clinicians, along with their community partners, have developed a new approach to rural care to decrease disparities in cancer care and cancer outcomes. TECH-Net has created a solid HIT foundation and infrastructure to provide state-of-the-art cancer care to rural populations as well as community-based prevention programs.

Methods

Establish a Health Information Technology network utilizing telehealth, electronic medical records, computer-assisted protocol-driven standards of care, patient education, and CME.

The implementation of the TECH-Net system has involved the combined resources and expertise of UTHSC, the UTCI and Methodist Healthcare System. The University of Tennessee Health Science Center set up and maintained telehealth connectivity among six sites, including UTCI's University and Bartlett locations and four rural sites. UTHSC researchers and staff have also assumed responsibility for conducting the project evaluation. Clinicians from UTCI and Methodist Health System have provided oncology care and support services to cancer patients through the telehealth network as well as in-person at UTCI offices and remote sites. Provision of acute care services has been provided through the inpatient service at Methodist.

Specific Aim #1: To Implement a Collaborative, Multi-State Health Information Technology System That Meets the Needs of Patients, Families and Providers in a Rural Cancer Care Setting

Each outreach clinic served by the TECH-Net project has been connected to the UTHSC campus via a dedicated point-to-point T-1 facility capable of transmission speeds of 1.544Mbps and utilizing the latest H.323 video protocols. This network is monitored and managed using Hewlett Packard OpenView network management system. Each clinic received a Polycom H.323 video-conference unit equipped with medical diagnostic tools, microphone and a rolling A/V cart. This equipment is connected to the dedicated 1.544 Mbps network via dedicated Cisco network switches and a network router. The network router has been equipped for remote real time diagnostic use and preventive maintenance upgrades. This dedicated network and its diagnostic capabilities ensure outreach clinics the maximum amount of trouble free service.

The outreach clinics served by the TECH-Net project have become part of a dedicated IP network that utilizes the latest video conferencing protocols (H.323) with 768Kbps connectivity for point-to-point calls from most locations. The network includes cascaded industry standard Accord Multipoint Conferencing Units (MCU's) for bridging multiple video calls together. This arrangement allows for the broadcasting of educational and training sessions to large audiences while retaining the advantages of interactive video. An Accord Gateway equipped with ISDN PRI facilities is another vital component of the system, affording network members from behind a UTHSC firewall, the ability to access and participate with any video-conferencing unit located anywhere in the world that is operating on standard H.320 protocols or better.

The existing network also includes access to, use of, and storage on a robust streaming video server housed in a climatically controlled, access secured location powered by a UPS. This configuration allows users off the network (and without video conference equipment) to participate in educational and training sessions though a standard internet connection. Sessions are digitally archived and made available through streaming video, which can be either viewed live or downloaded from the internet after a session is completed.

UTHSC employs dedicated personnel to operate, monitor and maintain this network, utilizing network management software, Accord bridging operations, scheduling of educational events, management of clinical time, and routine maintenance and network management. Table 2 outlines the volume and usage of the network based on the monthly reports supplied by the rural clinics multiplied by the average minutes of initial and follow up clinical oncology consults.

Table 2. Volume and usage of TECH-Net

Time Period	Network Minutes	Visits	Other Sessions
2005	4,050	135	6
2006	8,370	279	5
2007	3,150	105	0
Total	15,570	519	11

Specific Aim #2: To Improve Access to Appropriate Care, Increase the Quality and Safety of Care and Achieve Better Health Outcomes at Equal or Lower Cost for Cancer Patients in Rural Communities Through an Integrated Health Information Technology System

The evaluation of Specific Aim #2 is being accomplished through a prospective control group design to evaluate the impact of TECH-Net on the access, quality, safety, outcomes and cost of care for cancer patients in rural areas. Specifically, rural patients receiving care through the TECH-Net telehealth/EHR network as well as urban patients receiving traditional care through UTCI's Memphis clinics were asked to participate in a one-year follow-up study of their cancer care and outcomes. Two hundred and seventeen (217) patients (134 rural, 83 urban) were enrolled in the study from 05/25/05 to 09/30/08. Table 3 outlines the study measures and data sources.

Table 3: Study Measurements

Study Measure	Notes	Data Source
Medical errors	Structured implicit expert review	Medical record
Medication errors	Structured implicit expert review (process component)	Medical record
Treatment failure	Structured implicit expert review (patient outcome)	Medical record
Adverse outcome	Structured implicit expert review (patient outcome)	Medical record
Treatment success	Structured implicit expert review (patient outcome)	Medical record
Protocol adherence	Structured implicit expert review	Medical record
Quality of life- Generic	SF-12 form	Patient
Quality of life- Disease Specific	Functional Assessment of Cancer Therapy (FACT-G)	Patient
Patient satisfaction	Study survey questionnaire	Patient
Appointment waiting times	Study survey questionnaire	Patient
Travel distance- Patient	Study survey question, miles	Patient
Travel distance- Physician	Miles from Memphis to clinic	Physician work schedule
Direct medical cost	Health care utilization	Medical record
Direct non-medical cost	Study survey questionnaire	Patient
Indirect costs	Study survey questionnaire	Patient
Investigational protocol	Structured expert review	Medical record

Specific Aim #3: To Produce and Distribute a Generalizable, Replicable Model for Implementing an Integrated Health Information Technology System for Cancer Care

Each partner of TECH-Net is committed to sharing the findings of this project, with the potential of reaching a wide range of audiences. Avenues for dissemination include formal presentations at local and national meetings, as well as sharing of reports and documentation associated with the project with various providers across the country.

Results

TECH-Net has linked six separate cancer outreach clinics in a tri-state area with the specialists and researchers of UTHSC and with Methodist University Hospital, a major tertiary care hospital, for comprehensive care and communications across the spectrum of adult cancer care. The program has been so well-received by clinicians and patients, that the telehealth/EHR connections have remained active after the completion of the grant. These connections and rural sites are currently being funded through by UTCI.

Two hundred and seventeen (217) patients (134 rural, 83 urban) were enrolled in the evaluation study from 05/25/05 to 09/30/08. Patient satisfaction has been high - 95 % of patients indicated their telemedicine visit was as good as or better than an in-person office visit. Patients also report high satisfaction with reduced transportation costs and appointment wait times.

Two separate Quality of Life (QOL) measures were used to compare the urban and rural cohorts at baseline and assess changes over time (baseline, 6 months, 12 months). The SF-12 was used to assess general quality of life and yielded two subscales: the physical component subscale (PCS) and the mental component subscale (MCS). Scoring was calculated using population norms available from RAND. The FACT-G was used to assess quality of life related to cancer and cancer care. Results are presented in Table 4. Our QOL data suggest that there were very few differences in baseline QOL between the urban and rural cohorts and the measures did not change significantly over time.

Table 4. Quality of life results for TECH-Net patients

Table 4a. FACT-G

Subscale Measure	Baseline Urban N=84	Baseline Rural N=133	6 Month Follow-Up Urban N=46	6 Month Follow-Up Rural N=117	12 Month Follow-Up Urban N=29	12 Month Follow-Up Rural N=81
Personal Wellbeing	18.95	18.30	18.16	20.17*	19.01	20.69
Social Wellbeing	23.04	23.21	22.12	23.24	23.28	22.61
Emotional Wellbeing	19.16	18.83	18.48	19.15	17.46	19.15
Functional Wellbeing	17.90	17.41	16.11	18.18*	15.75	18.80**
Overall Score	79.04	77.43	74.88	80.09	75.50	81.24

Table 4b. SF-12

Subscale Measure	Baseline Urban N=84	Baseline Rural N=133	6 Month Follow-Up Urban N=46	6 Month Follow-Up Rural N=117	12 Month Follow-Up Urban N=29	12 Month Follow-Up Rural N=81
Physical Component Summary (PCS)	41.66	39.36*	39.99	40.23	40.93	41.88
Mental Component Summary (MCS)	51.50	50.01	50.40	51.17	52.64	51.82

*Statistically significant difference, Urban vs. Rural, $p \leq 0.10$ (Paired T-Test)

**Statistically significant difference, Urban vs. Rural, $p \leq 0.05$ (Paired T-Test)

We find modest differences between urban and rural patients in Functional Wellbeing scores at 6 and 12-months, with rural patients scoring slightly *higher* than their urban counterparts.

Slight differences at baseline for Physical Component Summary (PCS) scores and at 6 months in Personal Wellbeing are also detected, although differences barely reach conventional significance levels ($p \leq 0.10$). We found no significant differences over time in either the rural or urban patient cohorts.

Cost analysis comparing cost savings (physician travel time) with telemedicine costs (equipment, high speed lines) indicates that the cost-benefit depends critically on distance to the rural facility and number of physician trips avoided. Initial cost data indicate that telemedicine must save at least 5 hours of physician travel time per month to break even. Telemedicine also appears to be associated with significant improvements in access to care for rural patients. Using patient self-reported health care utilization (verified with local providers for accuracy), disparities in health care visits between urban and rural patients fell from an initial high point of a 3-fold difference at Month 1 to a less than a 2-fold difference at 6 months (see Table 5).

Table 5. Average healthcare visits per month: urban vs. rural patients

Study Month	Urban Patients	Rural Patients	Ratio Urban/Rural
Month 1	4.5	1.5	3.0
Month 2	3.6	1.2	3.0
Month 3	4.0	1.3	3.1
Month 4	3.9	1.6	2.4
Month 5	3.7	1.8	2.1
Month 6	4.1	2.6	1.6

Analysis of other study measures (medical errors, medication errors, treatment success/failure, adverse outcomes, use of investigational protocols, and protocol adherence) is still ongoing. Chart abstraction has been completed on 124 patients and we anticipate completion of this process by 02/28/09. This process was delayed in order to allow time for one-year follow-ups.

Conclusions

Telemedicine offers a promising method for increasing access to oncology care in rural areas that is well-accepted by patients. Cost savings are achievable at relatively low patient volumes. The healthcare visit improvements observed for rural patients also suggests that telemedicine facilitates access to a wider range of health care professionals. It is likely that the regular care and follow-up provided through telemedicine visits identifies unmet need and early problems that might otherwise go undetected or untreated.

References

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List of Publications and Products

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Fox, KC. "Technology Exchange for Cancer Care Network (TECH-Net)", presentation at AHRQ 1st Annual Health Information Technology and Patient Safety Conference, Rockville, Maryland, June 2006.

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