

# Establishing a Central Order Entry System for Delivering Telepharmacy Services to Remote Rural Hospitals

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**Background:** Smaller, critical access hospitals continue to be challenged in finding sufficient pharmacist staffing to deliver quality pharmacy services. Innovative solutions are being explored, including use of technology, to address the problem of access to pharmacy services in remote rural areas.

**Objective:** To describe a new telepharmacy model that is being developed in North Dakota; the model establishes a central order entry site (COE site) that provides 24-hour pharmacist staffing and telepharmacy services to rural critical access hospitals within the state.

**Methods:** Nine rural hospitals in North Dakota established a contractual agreement with a pharmacist-staffed COE site in Fargo to obtain pharmacist staffing and pharmacy services via telepharmacy delivery.

**Results:** All 9 rural hospitals receiving telepharmacy services from the Catholic Health Initiatives (CHI) COE site are critical access hospitals with 25 beds or less and an average of 6625 community population (range 470–16,010); 9986 doses filled per month (range <100–21,000); 1.8 full-time equivalent staff (FTE) pharmacists (range 0–4.6); 1.5 FTE technicians (range 0–3.0); and 0700 hours–1700 hours Monday through Friday service (range consultant pharmacist by phone 24/7 to 0700 hours–2000 hours Monday through Friday, and 0800 hours–1700 hours weekends and holidays). Six are CHI affiliates and 3 are non-CHI hospitals; 4 are Joint Commission accredited. The telepharmacy technology costs at each rural hospital were \$25,300.

**Conclusions:** A telepharmacy model that involves a COE site that provides 24-hour pharmacist staffing with pharmacists who are highly trained and skilled in use of telepharmacy technology and dedicate their full-time jobs to delivery of telepharmacy services to remote rural hospitals is an affordable means of delivering pharmacy services to these hospitals.

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North Dakota's critical access hospitals have been challenged by the difficulty in finding sufficient pharmacist staffing and pharmacy services to accommodate their needs. In addition, regulatory agencies and advocacy groups, such as The Joint Commission, the Institute of Medicine, the Institute of Safe Medication Practices, and the Centers for Medicare & Medicaid Services, are placing increased pressure on hospitals to improve quality, safety, access, and monitoring of medications, including 24 hours per day, 7 days per week (24/7) pharmacist review of all medication orders and bedside medication verification prior to administration to patients.<sup>1-6</sup> These additional challenges have small rural hospitals scrambling

for answers in how to effectively and efficiently provide quality pharmacy services to their patients.

Telepharmacy has worked well in North Dakota in providing pharmacist staffing and pharmacy services to remote, medically underserved rural communities. Models for both retail and hospital settings have been well established in North Dakota and previously described.<sup>7-12</sup> North Dakota's telepharmacy approach has provided optimal flexibility in allowing several different modes of delivery for providing pharmacy services to rural hospitals.<sup>8</sup> Telepharmacy approaches previously implemented and tested include a retail pharmacist providing pharmacy services to a rural hospital; several rural hospitals

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form a hospital telepharmacy network to share pharmacists to cover needed hours; a rural hospital pharmacist delivering after hours services to multiple rural hospitals from home; and a mobile telepharmacy cart that can be transported between the pharmacy and any patient care area.<sup>8</sup>

A new telepharmacy model is being developed in North Dakota; it establishes a central order entry site (COE site) that can provide 24/7 pharmacist staffing and telepharmacy services to any remote rural hospital that desires these services. This model differs from the one previously reported in 2007,<sup>8</sup> in that it creates a centralized telepharmacy service operation in Fargo that provides rural hospitals anywhere in the state with access (ability to access) to a staff pharmacist 24/7 from 1 convenient central location. Staff pharmacists at the central telepharmacy site are highly trained in telepharmacy technology and delivery of telepharmacy services; they dedicate their entire daily work schedule to full-time delivery of telepharmacy services to participating rural hospitals. In addition, a new, upgraded mobile hospital telepharmacy cart with dual liquid crystal display (LCD) monitors has been developed for this new pharmacy program, which allows for remote order entry of medications. A description of the structure and function of this new hospital telepharmacy model is described herein.

## Telepharmacy Grant

North Dakota State University College of Pharmacy, Nursing, and Allied Sciences applied for and received federal funding (award # 1 D1BIT10965-01-00) of \$805,399 over a 2-year period from the Office for the Advancement of Telehealth, Office of Rural Health Policy, Health Resources and Services Administration to provide financial support for the initial start-up costs of implementing telepharmacy services at both central and remote hospital sites.

The goals of the telepharmacy grant are to establish a COE site in Fargo, which will ultimately deliver 24-hour pharmacist coverage via telepharmacy technology to any rural hospital in the state that chooses to contract for these services. Grant project activities include establishing the COE site (facility, space, operations, services) including director, pharmacist staffing, supportive personnel, equipment, and technology; recruiting 9 remote rural critical access hospitals to be served by the COE site; assuring compliance with all North Dakota Board of Pharmacy regulatory requirements for operating a hospital telepharmacy program; developing the technology network and infrastructure (hardware and software) for the COE site and remote rural hospital sites to support the project; developing policies, procedures, and agreements between the various project partners; monitoring quality assurance of the project, including evaluating its overall safety, efficacy, cost, and sustainability; assessing hospital and pharmacy professional's satisfaction with the project;

and providing appropriate training for key personnel, technical support, and health-care providers involved in the project.

## Board of Pharmacy Request for Proposals

The North Dakota Board of Pharmacy (NDBOPH) developed an application process for identifying and evaluating qualified applicants interested in developing a hospital telepharmacy COE site in North Dakota to serve remote rural hospitals across the state. The NDBOPH sent a request for proposals to hospital pharmacists in the state; the request contained minimum requirements for applicants regarding their COE site development plans. These requirements included developing a plan for establishing a hospital telepharmacy COE site that provides dedicated pharmacist staffing and pharmacy services 24/7 to remote rural critical access hospitals of the state; providing a list and description of interested remote rural hospitals that were willing to be initially served by the COE site; submitting an online application to North Dakota State University (NDSU) for obtaining access to federal grant funds to support the initial start-up costs for the COE site; and submitting a formal written request and proposal to the NDBOPH for review and approval to ensure compliance with the rules and regulations governing telepharmacy practice in North Dakota. Three proposals were initially considered by the NDBOPH (1 from a retail pharmacy and 2 from hospital-based pharmacies). However, 2 eventually withdrew their applications; the remaining applicant (Catholic Health Initiatives [CHI]) was selected to develop the hospital telepharmacy COE site.



The central order entry site provides a quality assurance monitoring program to remote rural hospitals to track and ensure the quality of services provided.



## Central Order Entry Site

CHI is a national, nonprofit health system based in Denver, CO. It operates in 19 states and includes 75 hospitals (19 with critical access designation); 40 long-term

care assisted and residential facilities; and 2 community-based health organizations.<sup>13</sup> The CHI hospital telepharmacy COE site (ePharmacist Direct/CHI) is a 585-square foot space remodeled within one of CHI's buildings in Fargo, ND. The CHI-COE site space contains an office for the Telepharmacy Director, 4 additional offices for clinical pharmacists, and a conference break room. The initial staffing for the CHI-COE site includes 1 full-time director, 1.5 full time equivalent (FTE) clinical pharmacists staffing, and an additional pharmacist as needed. Initial hours of service provided by the CHI-COE site include 1600 hours to 0200 hours Monday through Friday, and 1400 hours until 0000 hours on weekends. However, the CHI-COE site currently is extending its hours of service after negotiating telepharmacy service contracts with remote rural hospitals in Minnesota. As a result, the hours of service are being extended to cover 1400 hours to 0730 hours Monday through Friday, and 24-hour services are provided on Saturdays, Sundays, and holidays. With the expanded hours, 2.0 FTE of additional pharmacist staffing was added to the CHI COE site schedule. Based on recent requests from future remote hospital site prospects, it is anticipated that additional pharmacist staffing will be added soon to provide services 24/7. Remote rural hospitals that already have a staff pharmacist on location and are already part of the hospital telepharmacy network may be used to help provide pharmacist staffing to achieve this 24/7 coverage to remote rural hospitals in need.

Services provided via telepharmacy technology by the CHI COE site to remote rural hospital sites include: (1) review of medication orders, (2) review of medications that are or have been prepared for the patient to be administered by the nurse, and (3) order entry if the hospital has a pharmacy computer system or automated dispensing cabinets that allow the CHI COE site access into the remote hospital's computer system. The pharmacist at the CHI COE site also provides face-to-face consultations with the pharmacy staff, nursing staff, and physicians at the remote hospital site to discuss medication orders and therapies (Figure 1). During the initial implementation phase of telepharmacy at each remote hospital site, the CHI COE site also provides remote sites with on-site support for telepharmacy process assessment, development and implementation of services, review and revisions of policies and procedures, and workflow changes needed to implement telepharmacy services. The CHI COE site also provides a quality assurance monitoring program to remote rural hospitals to track and ensure the quality of services being provided.

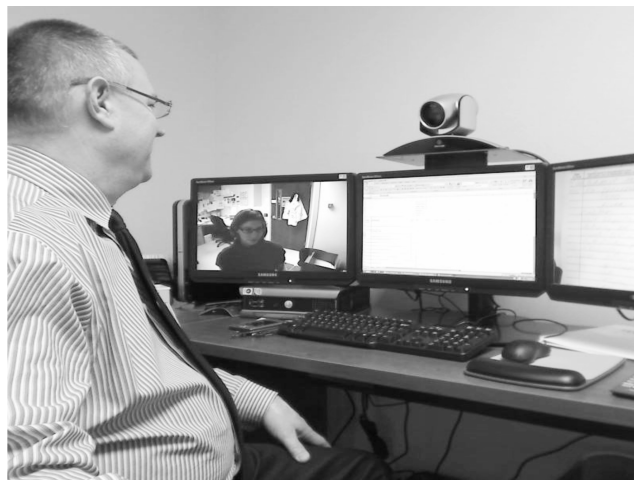
## Remote Rural Hospitals

Nine rural hospitals in North Dakota have established a contractual agreement with the CHI COE site in Fargo to obtain pharmacist staffing and telepharmacy services. These rural hospitals include Mercy Medical Center in

Williston (population 12,512), Carrington Health Center in Carrington (population 2268), Mercy Hospital in Devils Lake (population 7222), Towner County Medical Center in Cando (population 1342), St. Joseph Hospital and Health Center in Dickinson (population 16,010), Lisbon Area Health Services in Lisbon (population 2292), Jamestown Hospital in Jamestown (population 15,527), Oakes Community Hospital in Oakes (population 1979), and Nelson County Health System in McVille (population 470). All 9 of these remote rural hospitals receiving telepharmacy services from the CHI COE site are critical access hospitals with 25 beds or less. Six of the 9 remote rural hospitals are CHI affiliates and 3 are non-CHI hospitals. Table 1 describes some demographic characteristics of the 9 remote rural hospitals participating in this CHI COE site hospital telepharmacy program.

## Technology

In North Dakota, telepharmacy technology has been standardized for both hospital and retail settings.<sup>7,8</sup> The technology used for hospital telepharmacy includes a standard personal computer containing pharmacy order entry software, two 17-inch LCD monitors (1 displays the patient's medication profile, the other displays the document camera images), Polycom-VSX 7000 video conferencing equipment, microphone, Sonic Firewall and virtual private network (VPN) system (to privacy protect transmitted medical information in accordance with HIP-PA compliance requirements), an XGA (Dukane Corp., St. Charles, IL) document imaging camera, optical scanner (for remote order entry), and a fax machine. This telepharmacy technology is installed at both the CHI COE site and the remote rural hospital sites. The telepharmacy technology is installed as fixed workstations (direct wired connections) at the COE site. However, remote rural hospital sites have the option of choosing between



**Figure 1.** Pharmacist at the CHI COE site reviews medication orders at a remote rural hospital site.

fixed workstations or a mobile telepharmacy cart built by Telepharmacy Solutions—Custom Data, Inc., depending on their preference. An advantage of the mobile telepharmacy cart is that it can be moved to any location within the hospital (pharmacy, ER, nursing station, patient bedside) in need of pharmacist consultation or pharmacy services.<sup>14</sup> A new, upgraded mobile hospital telepharmacy cart with dual LCD monitors has been developed for this new hospital telepharmacy program and allows for remote order entry of medications (Figure 2). In addition, the costs for telepharmacy technology for this hospital telepharmacy program are very affordable (\$25,300 per unit, Table 2) for remote rural hospitals with limited budgets, compared with the more expensive pharmacy automated dispensing devices (\$75,000–250,000 or more). Using this hospital telepharmacy configuration, the pharmacist at the CHI COE site has the ability to connect to up to 4 remote rural hospital telepharmacy sites simultaneously from each telepharmacy workstation.

The CHI COE site transmits verbal and visual communication to the remote pharmacy sites through the use Audio/Video Telepharmacy Equipment with Multipoint Calling technology, which is connected to standard personal computers in the central pharmacy site. A back-up system of telephone communication and faxing of information is used when the transmission of information through the telepharmacy technology stated above is not available or optimal, and there is an urgent or emergent need to communicate or view and process medication orders.

The telepharmacy video-conferencing technology allows the licensed pharmacist at the COE site to visually verify medication orders and verbally communicate in real time with the registered pharmacy technician or medical staff at the remote rural hospital site. The remote

rural hospital sites transmit images of medication orders, patient demographics, lab information, and medication preparation through the use of XGA resolution document imaging cameras connected to personal computers, which are attached to the fixed workstations or telepharmacy mobile carts. An optical scanner was added for the remote capture and entering of medication orders from the rural hospitals to the CHI COE site. Software is being developed for medication order entry and for prioritizing and tracking progress of entered medication orders. This new software will allow the remote rural hospital personnel to enter essential patient and order information as well as scan the original physician orders and submit those to the queue at the CHI COE site. The pharmacist at the CHI COE site can then track the status of any medication order in real time at various points in the process including: (1) when the order was received, (2) who completed first review of the order and when, and (3) who provided the final review of the medication order and dispensed the product and when. For those rural hospitals with automated dispensing devices, the pharmacist at the CHI COE site remotely enters the medication order into the rural hospital's computer system. The system can then track when remote order entry has been completed and who completed it.

The remote hospital telepharmacy sites transmit information to the CHI COE site over a VPN through a contracted local Internet service provider in their service areas (minimum of 512K point-to-point circuit), across the North Dakota BTWAN (Bioterrorism Wide Area Network), or across the Catholic Healthcare Wide Area Network. CHI-affiliated remote rural hospitals use the Catholic Healthcare Wide Area Network. The non-CHI remote rural hospitals use the BTWAN infrastructure for telepharmacy. The telepharmacy application is struc-

**Table 1. Demographic Characteristics of Remote Rural Hospitals, Pharmacy Personnel, and Hours of Service**

HOSPITAL	ACUTE CARE/ SWING BED FACILITY, n	JOINT COMMISSION ACCREDITED	PHARMACY PERSONNEL, n			AVERAGE DOSES FILLED/MONTH, n	PHARMACY HOURS OF SERVICE
			RPHs	(FTEs) TECHS	CLERKS		
MMC	25/10 <sup>a</sup>	yes	4.6	3.0	NR	21,000	0700–2000 M–F, 0800–1700 weekends, holidays
CHC	25/18 <sup>b</sup>	no	1.0	2.0	1.0	4,500	0700–1600 M–F
MH	25	yes	1.0	1.0	1.0	8,000	0800–1630 M–F
TCMC	20	no	1.0	1.0	NR	11,000	0700–1700 M–F available by phone 24/7
SJHC	25	yes	3.6	3.0	0	15,000	0700–1900 M–F, 0700–1600 weekends, holidays
LAHS	25	no	<1.0	1.75	NR	6,500	0800–1300 M–F
JH	25	yes	3.5	2.5	0	9,800	0700–1730 M–F, 0700–1530 weekends, holidays
OCH	20	no	<1.0	2.5	NR	13,975	0700–1700 M–Th, 0700–1500 Fri, Sat on-call
NCHS	19/39 <sup>c</sup>	no	NOS <sup>d</sup>	0	NR	<100	Consulting pharmacist by phone 24/7

CHC = Carrington Health Center, Carrington, ND; FTEs = full-time equivalents; JH = Jamestown Hospital, Jamestown, ND; LAHS = Lisbon Area Health Services, Lisbon, ND; MH = Mercy Hospital, Devils Lake, ND; MMC = Mercy Medical Center, Williston, ND; NCHS = Nelson County Health System, McVille, ND; NR = none reported; OCH = Oakes Community Hospital, Oakes, ND; SJHC = St. Joseph Hospital and Health Center, Dickinson, ND; TCMC = Towner County Medical Center, Cando, ND.

<sup>a</sup>10 psychiatric.

<sup>b</sup>18 basic care unit.

<sup>c</sup>39 long-term care.

<sup>d</sup>None on staff or on-site; consultant 1 afternoon per month.

tured as a separate network within the BTWAN, thus allowing remote rural hospitals the capability of using the BTWAN for other applications simultaneously with telepharmacy. In the event of an emergency, the BTWAN would be exclusively used for the emergency application, and all other applications, including telepharmacy, would be discontinued. The rural hospitals would then resort to transmitting telepharmacy information via facsimile and phone as a backup solution during emergency use of the BTWAN until the network connection was restored.

CHI accesses drug information electronically through a subscription to Micromedex, Inc. This drug information software resides on the CHI intranet and can be accessed by pharmacists and pharmacy personnel at both the CHI COE site and all remote rural hospital telepharmacy

sites. The electronic drug information software is used on a daily basis to assist pharmacists at the central or remote site during the medication order review process. The electronic drug information software provides proper dosing, administration, monitoring, storage, preparation, drug-drug, drug-disease, and drug-food interactions, and other important medication information.

## Governance Structure

CHI developed a comprehensive governance structure to facilitate optimal management, communication and information sharing, quality assurance monitoring, trouble shooting, and decision making related to the administration of this multi-institutional hospital telepharmacy network. This was thought to be especially important because of the diversity of the project participants. The governance structure includes an Executive Council, Standardization Team, Implementation Team, Advisory Committee, Users Group, and CHI COE site Build Team (Figure 3). A summary of the names, membership, purpose, and responsibilities of each of the CHI Hospital Telepharmacy Governance Committees is provided in Table 3. A readiness assessment tool was also developed by the Implementation Team to assess the readiness of rural hospitals to implement telepharmacy services.<sup>15</sup>

## Contractual Agreements

In order to establish and implement telepharmacy services between the CHI COE site and remote rural hospital sites, several contractual agreements needed to be developed and signed by all participating parties. These



Figure 2. Mobile telepharmacy cart with dual LCD monitors.

Table 2. Mobile Telepharmacy Cart and Technology at Remote Hospital Sites

COST (\$)	ITEMIZED EQUIPMENT LIST
7,300	Audio/video teleconferencing equipment
4,000	Mobile telepharmacy cart with battery and mounting brackets
3,100	XGA resolution document imaging camera and interface
1,250	Personal computer
650	17 inch LCD monitors (2)
350	Cabling and USP power supply
950	Virtual private network
750	Installation cost
1,950	Travel expenses
5,000	Connectivity (512K point-to-point circuit charge)
25,300 <sup>a</sup>	Total costs for telepharmacy equipment

LCD = liquid crystal display.

<sup>a</sup>An additional \$5000 is budgeted for each remote rural hospital site for cross training 2–3 nurses as pharmacy technicians to satisfy the Board of Pharmacy requirement of having appropriately trained and qualified pharmacy personnel at the remote hospital site to operate the telepharmacy technology/equipment for processing medication orders between the central and remote sites.

contractual service agreements included, but were not limited to, the following: (1) a contractual agreement between CHI and each remote rural hospital site receiving services from the CHI COE site; (2) a contractual software and business agreement between CHI and Custom Data, Inc. for developing and implementing the telepharmacy software and technology for the hospital telepharmacy program and network; (3) a telepharmacy grant sub-award agreement between NDSU and each participating rural hospital site and the CHI COE site for purposes of awarding grant funds to support each site in implementing a telepharmacy program; (4) a Business Associate Agreement between CHI and all participating telepharmacy sites; and (5) a contractual agreement for quality assurance data collection and monitoring.

The NDSU grant sub-award agreement includes information regarding the conditions of the grant; the scope of work and expectations of the telepharmacy site; the project timeline; an itemized budget (funds available) for each site, including allowable costs; invoices and billing format and process; reporting requirements; persons responsible for the project; intellectual property; confidentiality of information; default and termination; audit requirements; communications and publications; liability and indemnification; and Central Pharmacy Services Agreement. Examples of the various contractual agreements to establish this hospital telepharmacy program are available online.<sup>16,17</sup>

## Quality Assurance Monitoring

As part of the assessment plan, the investigators are working with project partners to establish a reporting system for rural hospitals participating in the hospital telepharmacy program, beginning with the 9 initial remote hospital pharmacy sites. The investigators are working with the National Alliance Society of Pharmacy Associations, Pharmacy Quality Commitment (PQC), and 2 consultant pharmacists from CHI to develop 2 software components: 1 to detect adverse drug events (ADEs) and medication error reporting network in rural hospitals, and the second to track quality indicators.

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Quality indicators will be tracked  
for each rural hospital according  
to guidelines agreed upon.

▼

For the first software component, a documentation form was adapted from a paper ADE audit form used by



Figure 3. Catholic Health Initiatives governance structure for the hospital telepharmacy program.

CHI. The rates and types of ADEs and medication errors that occur over 36 months will be assessed and the results will be compared with national data for small and large hospitals. Generally, we expect that most of the

ADEs will be reported at the CHI COE site. Staff (eg, technicians, pharmacists, nurses, physicians) working at each of the remote rural hospital sites have also been encouraged to report ADEs.

**Table 3. Catholic Health Initiatives Hospital Telepharmacy Governance Committees**

COMMITTEE NAME	MEMBERS	PURPOSE/RESPONSIBILITIES
Executive Council	NDSU Dean of Pharmacy (chair), NDSU Telepharmacy Grant Coordinator, NDBOPH Executive Director, NDBON representative, CHI Fargo Division representative, and a Communication representative; ex officio members include CHI National Pharmacy Director Supply Chain, CHI National Pharmacy Director Clinical Services, and CHI COE site Telepharmacy Director	Council provides input and makes recommendations to CHI regarding critical decisions that need to be made in implementing, marketing, managing, and sustaining the CHI hospital telepharmacy program; final decisions regarding program are made by CHI
Advisory Committee	CHI National Pharmacy Director Supply Chain (chair), North Regional Health Alliance Executive Director, Hospital CEO representative, CHI Fargo Division representative, CHI Hospital Pharmacy Director representative, non-CHI Hospital Pharmacy Director representative, Chief Nursing Officer representative, NDSHP President, NDSCS Pharmacy Technician Training Program representative, consumer advocate, NDPhA Executive Vice President, UND Department of Rural Health representative, Change Agent, Communication representative, Project Manager, NDSU Pharmacy Program representative, and NDBOPH representative; ex officio members include CHI National Pharmacy Director Clinical Services, CHI COE site Telepharmacy Director, and NDSU Telepharmacy Grant Coordinator	Committee develops process to receive, evaluate, and prioritize recommendations from the Standardization Team, Implementation Team, CHI COE site Build Team, and Users Group, and advises the Executive Council on critical issues regarding the development, implementation, and ongoing management of the hospital telepharmacy program, providing a conduit for communication between the various management teams and the Executive Council; provides quarterly and annual summary reports to the Executive Council on various teams' recommendations, current status, and future plans regarding COE site services
Standardization Team	CHI National Pharmacy Director Clinical Services (chair), CHI National Pharmacy Director Supply Chain, CHI COE site Telepharmacy Director, participating hospitals Pharmacy and Therapeutics Committee representatives, NDSU Quality Assurance and Pharmacy Practice representatives, Rural Health Care Demographic representative, CHI COE site clinical pharmacists, and NDBOPH (ad hoc) member	Team develops standardized policies, procedures, protocols, guidelines, medication administration times, medication storage processes, medication concentrations, and quality assurance data measures for the hospital telepharmacy program to reduce variation among users and thus decrease the potential for error in a centralized pharmacy service to multiple hospitals and to assist in staff training; makes recommendations to the Advisory Committee and the Executive Council regarding telepharmacy policies and procedures
Implementation Team	CHI National Pharmacy Director Clinical Services (chair); CHI COE site Telepharmacy Director; CHI Information Technology representative; nurse representative; physician representative; NDBOPH (ad hoc) member; and NDSU Telepharmacy Grant Coordinator	Team develops process and tools to assess the readiness of rural hospitals to implement telepharmacy services; provides oversight in evaluating each rural hospital site's preparedness for telepharmacy prior to implementation; provides system-level feedback of planning, implementation, and start-up of each site to the Advisory Committee and the Executive Council; recommends to the Advisory Committee and Executive Council which rural hospitals are ready to implement telepharmacy services and recommends sequencing of telepharmacy implementation for each hospital based on readiness assessment
COE site Build Team	CHI COE site Telepharmacy Director (chair), CHI Facilities Manager representative, CHI Information Technology representative, Custom Data, Inc. Information Technology representative, NDBOPH representative, architect (ad hoc) member, and NDSU Economic/Work Efficiency representative	Team develops a plan and process for creating a central site capable of providing order entry and clinical pharmacy services via use of telepharmacy technology to meet the needs of remote rural hospitals; provides oversight for developing the telepharmacy model for the CHI COE site, planning for the physical layout, coordination of technology needs, and a template for clinical services offered to each rural hospital; works closely with the Implementation Team to coordinate the actual implementation of telepharmacy services at the central and remote sites
Users Group	CHI COE site Telepharmacy Director (chair), NDBOPH representative, CHI Information Technology representative, and end user representatives from each of the remote rural hospitals receiving telepharmacy services from the CHI COE site	Group provides a mechanism for direct feedback from participating remote rural hospital end users receiving telepharmacy services from the CHI COE site; provides feedback to the Advisory Committee and Executive Council regarding end users' satisfaction with telepharmacy services received from the CHI COE site.

CHI = Catholic Health Initiatives; COE = central order entry; NDBON = North Dakota Board of Nursing; NDBOPH = North Dakota Board of Pharmacy; NDPhA = North Dakota Pharmacists Association; NDSCS = North Dakota State College of Science; NDSHP = North Dakota Society of Health-System Pharmacists; NDSU = North Dakota State University; UND = University of North Dakota.

For the second software component (also PQC), a number of quality indicators (standard measures) will be monitored at baseline and periodically over 36 months. The quality indicators will be tracked for each rural hospital according to the guidelines agreed upon by project partners, the consultant pharmacists, and the investigators. Six general indicators are collected on a monthly reporting basis and include: hours of on-site pharmacy service, hours of on-call pharmacy service, number of medication orders processed, number of potential harmful ADEs caught, and number of minor ADEs caught. Fifteen disease-specific indicators are also collected and examples include: percentage of patients on aspirin with acute myocardial infarction on arrival, percentage of congestive heart failure patients with left ventricular systolic dysfunction on ACE inhibitors, and percentage of pneumonia patients with influenza vaccination. The quality measures were adapted from those used in the 2008 Medicare Rural Hospital Flexibility Program (Flex Program) for Critical Access Hospitals.<sup>18,19</sup>

To develop the software components, the investigators obtained funding from the telepharmacy grant set aside for ADE/medication error reporting (\$7500) and a second request was funded by the NDBOPH (\$2700). Participation in the ongoing collection of quality assurance information is a condition or requirement for rural hospitals to obtain a board of pharmacy telepharmacy permit and access to federal grant funds supporting implementation of a hospital telepharmacy program. An incentive for compliance with quality assurance reporting was developed and includes hospitals receiving a 10% discount in their quality assurance participation fees. This measure, coupled with training of hospital staff, ongoing monitoring, and monthly conference calls with project partners, helps mitigate the potential problem of underreporting.

## Summary

Smaller critical access hospitals continue to be challenged in finding sufficient pharmacist staffing to deliver quality pharmacy services. Innovative solutions are being explored, including use of technology to address the problem of access to pharmacy services in remote rural areas.<sup>6</sup> Telepharmacy has worked well in North Dakota in improving access to pharmacists and pharmacy services in both retail and hospital settings.<sup>7,8</sup> Several telepharmacy models have been developed and tested for rural hospitals to consider.<sup>8</sup> A telepharmacy model that includes a central order entry site that provides 24-hour staffing with pharmacists who are highly trained and skilled in the use of telepharmacy technology and who dedicate their full-time job to delivery of telepharmacy services to remote rural hospitals is an affordable means of delivering pharmacy services to these hospitals.  $\hat{=}$

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## References

1. Kienle P, Uselton JP. Maintaining compliance with Joint Commission medication management standards. *Patient Safety & Quality Healthcare*. July/August 2008. [www.psqh.com/julaug08/medication.html](http://www.psqh.com/julaug08/medication.html) (accessed 2009 Dec 29).
2. Traynor K. Four JCAHO medication management standards to change July 1. *Am J Health Syst Pharm* 2006;63:1210-2.
3. Joint Commission on Accreditation of Healthcare Organizations. 2007 Hospital/Critical access hospital national patient safety goals. [www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/07\\_hap\\_cah\\_npsgs.htm](http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/07_hap_cah_npsgs.htm) (accessed 2009 Dec 30).
4. Aspden P, Wolcott J, Bootman JL, Cronenwett LR, eds. *Preventing medication errors: quality chasm series*. Washington, DC: The National Academies Press, 2007. [www.nap.edu/openbook.php?record\\_id=11623](http://www.nap.edu/openbook.php?record_id=11623) (accessed 2009 Dec 30).
5. Casey M, Moscovice I, Davidson G. Pharmacist staffing and the use of technology in small rural hospitals: implications for medication safety. Upper Midwest Rural Health Research Center Working Paper 1. December 2005. [www.uppermidwesthrhc.org/pdf/medication\\_safety.pdf](http://www.uppermidwesthrhc.org/pdf/medication_safety.pdf) (accessed 2009 Dec 30).
6. Casey M, Elias W, Knudson A, Gregg W. Implementation of telepharmacy in rural hospitals: potential for improving medication safety. Upper Midwest Rural Health Research Center. December 2008. [www.uppermidwesthrhc.org/pdf/report\\_telepharmacy.pdf](http://www.uppermidwesthrhc.org/pdf/report_telepharmacy.pdf) (accessed 2009 Dec 30).
7. Peterson CD, Anderson HC Jr. The North Dakota telepharmacy project: restoring and retaining pharmacy services in rural communities. *J Pharm Technol* 2004;20:28-39.
8. Peterson CD, Rathke A, Skwiera J, Anderson HC Jr. Hospital telepharmacy network: delivering pharmacy services to rural hospitals. *J Pharm Technol* 2007;23:158-65.
9. McCarthy D, Nuzum R, Mika S, et al. The North Dakota experience: achieving high-performance health care through rural innovation and cooperation. The Commonwealth Fund. Commission on a High Performance Health System. May 2008. [www.commonwealthfund.org/usr\\_doc/1130\\_McCarthy\\_North\\_Dakota\\_experience.pdf?section=4039](http://www.commonwealthfund.org/usr_doc/1130_McCarthy_North_Dakota_experience.pdf?section=4039) (accessed 2009 Dec 30).
10. North Dakota telepharmacy project. North Dakota State University. Telepharmacy rules. [www.ndsu.edu/telepharmacy/telepharmacy\\_rules/](http://www.ndsu.edu/telepharmacy/telepharmacy_rules/) (accessed 2009 Dec 30).
11. Khan S, Snyder HW, Rathke A, et al. Is there a successful business case for telepharmacy? *Telemed J E Health* 2008;14:235-44.
12. North Dakota telepharmacy project. North Dakota State University. <http://telepharmacy.ndsu.nodak.edu/> (accessed 2009 Dec 30).
13. Catholic Health Initiatives. [www.catholichealthinit.org/](http://www.catholichealthinit.org/) (accessed 2009 Dec 30).
14. Custom Data, Inc. Telepharmacy solutions. [www.customdata.com/Pharmacy.asp](http://www.customdata.com/Pharmacy.asp) (accessed 2009 Dec 30).
15. Implementation Readiness Assessment for rural hospitals to assess readiness for implementing telepharmacy services. [www.ndsu.edu/fileadmin/telepharmacy/implementationreadinessassessment.pdf](http://www.ndsu.edu/fileadmin/telepharmacy/implementationreadinessassessment.pdf) (accessed 2010 Jan 15).
16. Central Pharmacy Services Agreement between CHI COE site and remote rural hospitals. Telepharmacy Services. Catholic Health Initiatives. [www.ndsu.edu/fileadmin/telepharmacy/exampleCHIcentralservicesagreement.pdf](http://www.ndsu.edu/fileadmin/telepharmacy/exampleCHIcentralservicesagreement.pdf) (accessed 2010 Jan 15).
17. Telepharmacy grant subaward agreement between NDSU and remote rural hospitals. North Dakota Telepharmacy Project. North Dakota State University. [www.ndsu.edu/fileadmin/telepharmacy/exampleNDSUtelepharmacygrantsubaward.pdf](http://www.ndsu.edu/fileadmin/telepharmacy/exampleNDSUtelepharmacygrantsubaward.pdf) (accessed 2010 Jan 15).
18. Flex Monitoring Team Briefing Paper No. 20, Critical Access Hospital Year 3. Hospital Compare Participation and Quality Measure Results. August 2008. [www.flexmonitoring.org/documents/BriefingPaper20\\_HospitalCompare3.pdf](http://www.flexmonitoring.org/documents/BriefingPaper20_HospitalCompare3.pdf) (accessed 2010 Jan 12).
19. Updated 2009 report. Flex Monitoring Team Briefing Paper No. 22, Critical Access Hospital Year 4. Hospital Compare Participation and Quality Measure Results. September 2009. [www.flexmonitoring.org/documents/BriefingPaper22\\_HospitalCompare4.pdf](http://www.flexmonitoring.org/documents/BriefingPaper22_HospitalCompare4.pdf) (accessed 2010 Jan 11).