Long Term Care e-Prescribing Standards Pilot Study

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Executive Summary

In January of 2006, Achieve Healthcare Technologies along with partners Benedictine Health System, RNA Healthcare Systems, RxHub, Prime Therapeutics and Blue Cross Blue Shield of Minnesota were awarded a $1,149,000 grant from the Agency for Healthcare Research and Quality to pilot an electronic prescribing software program.

Out of the five grants awarded, this was the only one in a Long Term Care (LTC) setting to receive an award. Although the adoption of electronic prescribing has been increasingly successful in the ambulatory market, it has been largely ignored in the LTC environment. This is due to a variety of circumstances including the cost of technology, software and training to implement applications as well as the lack of data regarding the benefits of electronic prescribing in the LTC setting. The result of this situation has been the development of standards for electronic prescribing that did not include the unique requirements found in the LTC prescribing process.

The primary purpose of the CMS Long Term Care e-Prescribing Standards Pilot Study (LTC e-Rx study) was to implement and test current National Council for Prescription Drug Programs (NCPDP) standards in the LTC setting. When the current standards did not meet the needs of the LTC market, the pilot team developed, tested, implemented and evaluated revisions to the NCPDP standards that enabled successful e-Prescribing in the LTC setting. Two examples of pilot revisions of the NCPDP standards include providing additional resident information and using the CANRX SCRIPT for providing resident discharge status. The secondary purpose of the LTC e-Rx study was to determine the impact to both the facility and the pharmacy in the areas of workflow timing, quality of care and financial benefit.

Using a Web based software approach; the pilot team was able to electronically connect the LTC facilities' clinical application (Achieve Matrix) with the pharmacy's application (RNA Health Systems). This created a fully integrated, computer-to-computer, electronic prescribing process eliminating the need for the manual, error-prone and time consuming processes largely in place today. The LTC e-Rx study team has successfully implemented e-Prescribing with the use of electronic communication between facilities, pharmacies and physicians. For the first time in LTC, facilities can electronically send prescriptions from an electronic health record to a pharmacy using the NCPDP SCRIPT standards. In addition, real-time resident drug coverage and patient safety alerts are available before the order is sent to the pharmacy.

The findings of the pilot study demonstrate that the use of e-Prescribing in LTC can be successful using current standards with some modifications. The study examines the impact to both the LTC facility and the pharmacy. It reveals benefits to the facility in both time and efficiency. Due to the duration of the pilot, the LTC e-Rx study team was unable to draw definitive data regarding impacts to resident safety. The benefits to the pharmacy were centered on the ability to have a fully integrated e-Prescribing process. The impact to the pharmacy workflow process was greater in the beginning of the pilot than to the LTC facility. This caused the pharmacy some additional work effort initially but yielded some benefits later in the pilot.

The study found some areas in which the e-Prescribing standards did not meet the needs of LTC, and minor revisions were not possible during the pilot. These areas are particularly evident in new, changed, and discontinued combination orders, such as medication with both routine and as needed schedules or tapered dose therapies. In order to continue the successful adoption of e-Prescribing in LTC, it will be critical for new/revised standards to be developed that will address these problematic issues. The CMS needs to include the LTC environment in the NCPDP Medicare Part D initiative to drive adoption in this market. The continuation of attention and support to promote adoption of e-Prescribing in the LTC setting will undoubtedly yield benefits in the areas of resident safety, facility and pharmacy productivity and cost savings as usage expands. Additionally, the study findings will discuss the challenge of prescriber adoption. Although the pilot was able to succeed using a "Nurse as an Agent" model; it is apparent that to realize the true productivity and safety improvements this technology can provide will require a substantial increase in prescriber adoption. Continuing to enhance the standards will improve usability of the system and may help in this regard as well.

Participation in this study for the past 12 months has clearly demonstrated both the benefits and the challenges of electronic prescribing in a LTC setting. The pilot has demonstrated that a standards-based process can work and can yield some initial benefits. It has also clearly demonstrated the need to continue to enhance and evolve the

standards to meet the needs of all prescribers and patients regardless of the care setting. This commitment will truly provide availability of and support for e-Prescribing applications that address the needs of the LTC market.

1.0 Description of the Pilot

1.1 Overview

Electronic prescribing (e-Prescribing), and the foundation standards that support it, will have a significant and wide ranging impact on the long term care (LTC) industry, which serves approximately 3.5 million residents in 17,000 skilled nursing facilities (SNF) across the United States. In 2006, the CMS Long Term Care e-Prescribing Standards Pilot Study (LTC e-Rx study) (RFA-HS-006-01) developed, implemented and performed a research study on the first ever standards based e-Prescribing system in LTC. Prior to 2006 e-Prescribing was primarily used by ambulatory providers and connected to retail and mail order pharmacies. In those settings, e-Prescribing is relatively mature, and the benefits are well understood. However, in LTC, the absence of any standards based e-Prescribing implementations has led to an information gap regarding the true impact to the industry.

1.1.1 The LTC e-Rx study is a key milestone in the strategic deployment of a healthcare wide e-Prescribing capability. Without LTC, a significant part of the continuum of care is missing. As the LTC industry continues to grow in the coming years, the opportunity cost of not addressing LTC e-Prescribing may become dramatic.

1.1.2 The primary purpose of the LTC e-Rx study was to implement the e-Prescribing standards in the LTC environment. The secondary purpose of the LTC e-Rx study was to determine the impact of the e-Prescribing standards in the LTC environment. The LTC e-Rx study will provide policy makers and legislators valuable evidence of implementing e-Prescribing in the LTC environment.

1.1.3 Due to limited funding and timing, the team was not able to commit to testing all of the standards called out in the request for application (RFA). The standards that are most relevant and beneficial to LTC were implemented and tested. During the study some of the standards were found to work sufficiently without modifications. Other standards required modifications to work correctly. When modifications were required, the changes were fed back to the American National Standards Institute (ANSI) accredited e-Prescribing standards body at the National Council for Prescription Drug Programs (NCPDP) for modification. Most of the changes have at least been approved for ballot.

1.1.4 The LTC e-Rx team included representatives from each participant in the e-Prescribing process: providers, prescribers, pharmacy, and payers. Additionally, the team included technology vendors representing all the e-Prescribing components including: LTC EHR/e-Prescribing system; e-Prescribing switch; payer system; and a LTC pharmacy dispensing system. All of these team members were either new to e-Prescribing or to LTC. The team worked aggressively throughout the first half of the year to develop and implement the technology and the second half to study it.

1.1.5 Due to the compressed time frame, the study team decided to perform a time-series parallel study that simultaneously compared the e-Prescribing implementation to a traditional paper based model. This was done by implementing and measuring the e-Prescribing technology at two skilled nursing facilities while also measuring a traditional prescribing model at two different skilled nursing facilities not using any technology for prescribing. Although there is a risk for contamination, this simultaneous and parallel study was seen as the best possible compromise to a true before/after normalized study.

1.1.6 The study includes quantitative measurement and user feedback to show the impact of e-Prescribing in terms of workflow timing, quality of care, and financial benefit. This report includes the data that was gathered and analyzed and the conclusions that were reached as a result of the study.

1.2 Standards

1.2.1 In this RFA, the following standards were included as the proposed foundation standards and were among the initial standards to be tested in the pilots:

1.2.1.1 NCPDP Formulary and Benefit Standard – This standard was accredited on October 25, 2005.

1.2.1.2 NCPDP SCRIPT

1.2.1.2.1 Medication History Request and Response Transactions – This feature became ANSI accredited in version 8.0 on September 14, 2005.

1.2.1.2.2 Prescription Fill Status Notification Transactions

1.2.1.2.3 Prescription Cancellation Transactions

1.2.1.2.4 Prescription Change Request and Response Transactions

1.2.1.2.5 Standard Version 5.0 which was ANSI accredited on May 12, 2004.

1.2.1.3 Structured and Codified SIG Format Version 1.0 – This version is still an NCPDP guidance document.

1.2.1.4 Clinical drug terminology testing whether RxNorm terminology translates to NDC for new prescriptions, renewals and changes.
1.2.1.5 Prior authorization messages
1.2.1.5.1 X12N 278 5010 - Healthcare Request for Review and Response
1.2.1.5.2 X12N 275 5010 - Additional Information to Support Healthcare Request, which acts as an envelope to carry HL7 Attachments.
1.2.1.5.3 HL7 Drug Prior Authorization (PA) Attachment, which is based on the HL7 Clinical Document Architecture (CDA), and incorporates LOINC-coded data elements
1.2.1.6 NCPDP Telecommunication Standard Guide, Version 5.1 which was ANSI accredited on September 1999
1.2.1.6.1 NCPDP Batch Implementation Guide, Version 1.1 for the NCPDP Data Record in the Detail Data Record
1.2.1.7 Health Care Eligibility Benefit Inquiry and Response
1.2.1.7.1 ASC X12N 270/271 Health Care Eligibility Benefit Inquiry and Response, Versions 4010, May 2000, and, Version 4010X092A1, October 2002

1.2.2 Because Health and Human Services (HHS) did not publish the final rule until after the pilots were awarded, the proposed foundation standards were adopted as foundation standards for the pilots. In the final rule, HHS stated that LTC facilities would not be required to participate in e-Prescribing. The Center for Medicare and Medicaid Services (CMS) clarified the reason in their question and answer section on their website (ID6149) stating "*They realize that the business model that is typical in the Long-Term Care (LTC) environment, where both the prescribers and the facility personnel are customarily involved in the prescribing process, is atypical of e prescribing in the ambulatory setting. The final rule therefore exempts from the requirement to use the NCPDP SCRIPT Standard prescription transaction between prescribers and the dispensers where a non-prescribing provider is required by law to be a part of the overall transaction process. During the pilot test, we are planning to review the business process and test the standards for e prescribing functionality in the LTC setting*."

1.2.3 To test the standards, a series of two overlapping phases were conducted:
1.2.3.1 Phase 1 studied NCPDP SCRIPT Version 8.1, NCPDP Formulary and Benefit Standard, ASC X12N 270/271 Health Care Eligibility Benefit Inquiry and Response, Versions 4010 and 4010X092A1, and NCPDP SCRIPT Version 8.1 Prescription Cancellation Transactions.
1.2.3.2 Phase 2 studied NCPDP SCRIPT Version 8.1 Prescription Fill Status Notification Transactions, codified discharge information using the NCPDP SCRIPT Version 8.1 Prescription Cancellation Transactions, and PA messages.
1.2.3.3 The following standards were originally identified in the RFA, but were not implemented or tested during the pilot: NCPDP SCRIPT Prescription Change Request and Response Transactions, Clinical Drug Terminology (RxNorm), Structured and Codified SIG Format Version 1.0 guidance, and the NCPDP SCRIPT Medication History Request and Response Transactions. These standards were deleted from the pilot after considering the value/relevance of these e-Prescribing standards in the LTC environment verses the time/expense to implement them during the pilot.
1.2.3.3.1 The CHANGE SCRIPT was analyzed for use in the LTC environment.
1.2.3.3.2 The Clinical Drug Terminology (RxNorm) and the Structured and Codified SIG information were not incorporated in the pilot because of cost, complexity, and risk to the pilot.
1.2.3.3.3 The NCPDP Medication History was omitted from the pilot because the team felt it was not relevant in the LTC environment because the LTC pharmacy of record has the resident's complete order profile – unlike the retail environment where a patient may get their prescriptions filled at multiple pharmacies.

1.2.4 Several modifications were needed to the NCPDP SCRIPT Version 8.1 to meet the e-Prescribing needs in the LTC environment. In response to these needed modifications, the NCPDP LTC Work Group 14 in conjunction with Work Group 11 submitted several Data Element Request Forms (DERF). See Appendix 1 for details.

1.2.5 Several modifications were needed to implement prior authorization. See Appendix 2 for details.

1.3 Key Objectives for the Pilot

1.3.1 The objective of the LTC e-Rx study was to determine the impact of key e-Prescribing foundation and initial standards. Additionally, the study strove to identify changes needed to existing standards that would allow effective use in the LTC setting. Finally, identifying and testing technology outside of the current standards that may be relevant and valuable to e-Prescribing in LTC was also studied.

1.3.2 The study carefully measured how e-Prescribing affects communication, workflow, and quality of care. Quantitative and qualitative measurements were made and analyzed for the treatment settings as well as the comparison settings.

1.3.3 Specifically the study sought to answer two key research questions:

1.3.3.1 What is the effect of e-Prescribing as compared to manual prescribing?

1.3.3.2 What are staff perceptions of automated e-Prescribing with regards to satisfaction, and what are the barriers and facilitators of implementation?

1.4 eRx Pilot Characteristics

1.4.1 Prescribers – In the LTC environment, the majority of the charting information is traditionally entered by agents of the prescriber.

1.4.1.1 During the data gathering period of the pilot, no physicians used the computerized physician order entry (CPOE) system.

1.4.1.2 Nurse Practitioners/Physician Assistants (NP/PA) used the CPOE system at one of the treatment facilities.

1.4.1.2.1 NP/PA's entered their own orders into Treatment Facility 1, which accounted for 5% of the orders for this facility in the study. No orders were entered by NP/PA's at Treatment Facility 2 in the pilot.

1.4.1.2.2 The adoption of order entry by NP/PA's was initially hindered by a problem with the CPOE system, which was resolved a few weeks after implementation.

1.4.1.2.3 NP/PA's are considered prescribers for this study because they are authorized to create orders for residents.

1.4.1.3 Nurses were the primary agents of the prescriber; they entered 94% of the orders at both Treatment Facilities.

1.4.1.4 See Appendix 3 for the detail breakdown of orders entered during the pilot at the two Treatment Facilities.

1.4.2 Prescriber uptake

1.4.2.1 Enrollment – Two physicians were trained, but they never used the CPOE system. Two nurse practitioners were trained, and one used the system. 22 registered nurses (RN's) and 38 licensed practice nurses (LPN's) were trained as agents of the prescriber to use the CPOE system.

1.4.2.2 Disenrollment – None of the users that started using the CPOE system stopped using it during the pilot.

1.4.3 Pharmacy software system - RNA Health Information Systems, a leading provider of computer software for retail and LTC pharmacies throughout the United States, provided the LTC pharmacy software system, their internet based RNA Eagle application.

1.4.3.1 This pharmacy software system was in use by the pharmacy prior to the pilot implementation.

1.4.3.2 RNA made programming change to send and receive e-Prescribing standard messages for the pilot.

1.4.3.3 RNA made the necessary programming changes to be certified by RxHub to send and receive these e-Prescribing standard messages. See Appendix 4 for the RxHub certification methodology.

1.4.3.4 RNA (along with the partner pharmacy – Preferred Choice Pharmacy) worked with the Minnesota Board of Pharmacy to insure the e-Prescribing process implemented for this pilot was an approved methodology.

1.4.3.5 RNA worked with Preferred Choice Pharmacy to make changes to allow the pharmacy to process the incoming electronic new/discontinued/change orders and adjust to this new workflow model, including automating the process for resident admissions and discharges.

1.4.3.6 RNA installed a refill request module into Preferred Choice Pharmacy's software system to accommodate electronic refill requests. Scanners, appropriate hardware, and software were installed in the treatment facilities to process electronic refill requests.

1.4.3.7 RNA made programming changes to receive and display a link to the PA status page hosted by MediMedia.

1.4.4 eRx Vendor – Achieve Healthcare Technologies, the largest privately held provider of information system products and services to the LTC facility industry, provided the CPOE system, their internet based Matrix eScribing application.

1.4.4.1 This LTC facility software system was in use by the treatment facilities prior to the pilot implementation.

1.4.4.2 Achieve made programming changes to send e-Prescribing standard messages for the pilot for new orders, order changes, and discontinued orders.

1.4.4.3 Achieve made programming changes to receive fill status SCRIPT's for new orders from the pharmacy software.

1.4.4.4 Achieve changed its discharge process to create a CANRX SCRIPT indicating the resident's status as expected to return, not expected to return, or expired.

1.4.4.5 Achieve made the necessary programming changes to be certified by RxHub to send and receive these e-Prescribing standard messages as outlined in Appendix 4.

1.4.4.6 Achieve worked with the other partners to insure that the end to end SCRIPT transmission process worked.

1.4.4.6.1 Achieve built architecture to support these outbound and inbound SCRIPT messages and to alert for transmission errors.

1.4.4.6.2 Achieve took the lead to resolve transmission errors reported by the treatment facilities.

1.4.4.7 Achieve made programming changes to incorporate an electronic PA request process into the prescribing flow. This process determined whether electronic PA submission was appropriate for the current prescription and presented the request form and submission process hosted by a third party (MediMedia). In addition, Achieve added links to the current PA status page hosted by MediMedia.

1.4.4.8 Achieve developed a configurable electronic eligibility checking process that is used when a resident is admitted to a facility.

1.4.4.8.1 Resident eligibility can also be scheduled to periodically send a batch eligibility check for an entire facility to check resident coverage against the RxHub Pharmacy Benefit Manager databases, which automatically updates a resident's coverage information when a match is found.

1.4.4.8.2 For the pilot, Achieve also allowed the facility to manually assign resident eligibility from MediMedia's InfoScan formularies.

1.4.4.9 Achieve enhanced the order entry process to display the resident's formulary coverage for the drugs displayed.

1.4.4.9.1 The drug lookup in the order entry process displays medications by each drug's third party coverage level from the highest coverage level to the lowest coverage level.

1.4.4.9.2 Generic and therapeutic alternatives can be referenced and are sorted by formulary status.

1.4.4.10 Achieve also made a number of programming changes for this pilot that did not involve the e-Prescribing standard messages including:

1.4.4.10.1 Allowing a facility to utilize First Data Bank (FDB) as the primary source of drug identification and clinical information.

1.4.4.10.2 Developing a configurable clinical alert process that checks the resident's current orders and diagnosis to warn the user when new orders are entered if there are FDB patient safety alerts.

1.4.4.10.3 Allowing a prescriber to electronically sign new/changed/discontinued orders and order renewals.

1.4.5 Setting of Care - LTC was the setting of care for the pilot.

1.4.5.1 The LTC setting has a different prescribing process than the typical two parties (pharmacy and prescriber) seen in the retail setting. A three party medication prescribing process exists between the nursing facility staff, dispensing pharmacy and the prescriber.

1.4.5.2 See Appendix 5 for the American Society of Consultant Pharmacists *Comments on the e-Prescribing Notice of Proposed Rule*, which notes the typical prescribing process steps that occur in the LTC setting. The pilot LTC facilities have a prescribing process similar to the typical process outlined in Appendix 5.

1.4.5.3 The residents (patients) in LTC usually have numerous comorbidities and are among the frailest elderly. In 2001, it is documented that a national survey of nursing facilities found that in 2000 the average nursing facility resident took 8.1 routine medications, and 41.1% took nine or more routine medications *(Tobias DE, Sey M. General and psychotherapeutic medication use in 328 facilities: a year 2000 national survey. Consult Pharm* 2001;16;54.)

1.4.5.4 Currently there are very few LTC e-Prescribing sites in the LTC setting. This is mainly due to technology and cost barriers in the industry, including the costs of purchasing and installing equipment/software, training of limited nursing staff with high turn over rate, and lack of research about the benefits of e-Prescribing in the LTC setting.

1.4.5.5 Similar barriers are found in the retail setting but are compounded in the LTC environment by adding a third party, the nursing facility to the pharmacy-prescriber communication process.

1.4.6 Minnesota based LTC Facilities – Benedictine Health System (BHS), a non-profit health system that owns/manages hospitals, skilled nursing facilities, assisted living facilities, independent living facilities, and an institutional pharmacy in the Midwest, provided the two treatment LTC facilities for the electronic prescribing pilot.

1.4.6.1 These two treatment facilities were using the non-e-Prescribing order entry process that Achieve supported prior to the pilot. Although the LTC facility order entry changes implemented as part of the pilot were significant, the impact was not nearly as radical as the initial Matrix' order entry process implementation in 2005. The most significant workflow change for the treatment facilities during the pilot was the implementation of the scanners for the refill process.

1.4.6.2 The two comparison facilities selected use a traditional, paper-based prescribing process with no electronic medication management system.

1.4.6.3 The Minimum Data Set (MDS) process is electronic for all four facilities.

1.4.6.4 See Appendix 6 for the table outlining the characteristics of the four facilities utilized in the pilot.

1.4.7 Pharmacy – Preferred Choice Pharmacy (PCP), a member of BHS, which serves 19 LTC facilities in Minnesota, provided the pharmacy services for the pilot for all four LTC facilities in the study.

1.4.7.1 Prior to the pilot implementation, the pharmacy received the bulk of their new, change, discontinue, and refill orders via facsimile. For BHS facilities utilizing the Achieve Matrix software system prior to the pilot, the new, change, and discontinued orders were entered into this application and transmitted from Matrix via facsimile. All refill order requests were submitted manually via facsimile. The facilities that did not utilize the Achieve Matrix software system submitted all orders manually via facsimile.

1.4.7.2 During the pilot, the pharmacy found it necessary to implement a number of new workflow processes in order to make the change from a paper based order system to an electronic transmission reception for the two treatment facilities.

1.4.7.3 Along with these workflow changes for the two treatment facilities, the pharmacy maintained their traditional workflow for the remaining 17 LTC facilities that they serviced during the pilot.

1.4.8 Network Providers – RxHub, which provides an end-to-end solution that enables prescribers to select the most clinically appropriate and cost effective prescription to be sent electronically to the patient's pharmacy of choice, was the network provider for the pilot. RxHub worked with Achieve and RNA to assist with their electronic messaging certification.

1.4.9 Pharmacy Benefit Managers (PBM's) – The four PBM payers available via RxHub for the pilot were Caremark, Express Scripts, Medco, and Prime Therapeutics. RxHub provided connectivity to these PBM's (along with Blue Cross Blue Shield of Minnesota and the Minnesota's Medicaid program) to provide eligibility and coverage information for the two treatment facilities' residents.

1.4.10 MediMedia Information Technologies, a Division of MediMedia, USA, has served as a leading provider of plan specific formulary data to its electronic prescribing partners for more than 10 years. MediMedia's InfoScan™ product line was recently expanded to include PA services. As a partner in the electronic PA portion of this pilot, MediMedia enhanced their InfoScan Prior Authorization Service to implement and test electronic PA standards.

1.4.10.1 MediMedia's InfoScan Prior Authorization service seamlessly integrated into Achieve Matrix to provide electronic PA criteria during the order process, allowing authorized facility staff to submit electronic PA requests to Prime Therapeutics.

1.4.10.2 MediMedia provided connectivity between Achieve's CPOE process and RxHub for the transmission of electronic PA requests and responses.

1.4.10.3 MediMedia hosted an online user interface which provided the real-time status of all PA requests to prescribers, nursing facilities and pharmacies.

1.4.11 The Research Oversight team, which was lead by Dr. Phyllis Gaspar, PhD, consisted of Constance Schein, RN, M.Sc.; Ann Deziel, RN; and Chris Malone, Ph.D. (Statistician).

1.5 Baseline statistics

1.5.1 Number of prescriptions written per month (paper and electronic).

1.5.1.1 The number of new prescriptions written per month at the two treatment facilities was recorded by the Achieve CPOE software because all orders were entered into this application prior to the e-Prescribing implementation at these two facilities.

1.5.1.2 Prior to the e-Prescribing implementation, these orders were electronically faxed to the pharmacy by the CPOE software.

1.5.1.3 The information below details the number of new orders at the two treatment facilities that were written during May 2006 – prior to the e-Prescribing implementation.

1.5.1.3.1 Baseline Number of New Prescriptions – Pre-Pilot
Treatment Facility 1 – May – Total New Prescriptions – 1209
Treatment Facility 2 – May – Total New Prescriptions – 523

1.5.2 Outside of pilot scope – The number of callbacks from the pharmacy to the prescriber per month, the pre-pilot medication error rate, and the number of adverse drug events (ADE) per site were not measured for the pilot.

1.5.2.1 These items were deemed out of scope for the pilot due to cost and time limitations to establish pre-pilot baseline values and post-pilot analysis.

1.5.2.2 This information was already reported in previous quarterly reports.

2.0 Approaches and Methodology to Testing

2.1 The following e-Prescribing standards were implemented and tested during the LTC e-RX study:

2.1.1 Formulary and Benefit Information and Healthcare Eligibility Benefit Inquiry and Response (ASC X12N 270/271) (Phase 1) – Achieve built formulary benefits by modifying the CPOE part of the Achieve Matrix® EHR software system to include eligibility information for residents. This information was provided to Achieve by RxHub through an X12N 270/271 transaction. During the pilot, Achieve was certified as supporting these transactions by RxHub. RxHub receives and publishes real-time benefits information from the PBM's to the Achieve Matrix software system. RxHub provides payer formulary lists to Achieve on an as-needed basis to stay current. Additionally, the Matrix CPOE drug lookup feature was enhanced to display resident drug coverage information. If a drug required prior authorization, it alerted the prescriber/agent during the order entry process.

2.1.2 NCPDP SCRIPT for New, Canceled Order, and Fill Status – RxHub was the infrastructure switch for the study and routed NCPDP SCRIPT messages between the Achieve Matrix and RNA systems using RxHub's SIG services. RxHub already provided these services prior to the pilot. During the pilot, Achieve and RNA were certified by RxHub as supporting these telecommunication capabilities in their systems to connect to RxHub using these standard interfaces. In particular, support for electronic messaging, in addition to fax, and development of reports and web pages to present status; complete the technology capability. The messages include new and cancelled orders. Fill Status supports outbound messaging from the pharmacy to the facility.

2.1.3 NCPDP 5.1 Telecommunications Standard (Phase 1) – This standard was implemented within the RNA Eagle pharmacy management systems and was supported by all payers participating in the Medicare Part D program prior to the pilot implementation.

2.1.4 Prior Authorization Messages – Standardized electronic PA messages facilitate the automated communication of PA data between a payer and the point of care. The pilot used the methods described in Appendix 2 to implement and test these standardized transaction sets.

2.2 Non-standard technology

In addition to the standards testing, several non-standard technology capabilities were also tested in the study including:

2.2.1 Automated Refill Demonstration - LTC does not have a business process for a refill request from the pharmacy to the physician. Because refill requests are not applicable to LTC, that part of the SCRIPT messaging was not implemented during the pilot. Refills are handled differently in LTC. Typically, long term medication orders are charted with no end date. The pharmacy typically delivers a one month supply of medications to the nursing facility for these orders. When the medication is about to run out, the facility will fax a refill or re-supply request to the pharmacy. Prior to the pilot, there was not a SCRIPT standard that supports this LTC re-supply request. However, this is a very important process as many of the ongoing medication orders are dispensed under this re-supply process model. During the pilot study, the treatment facilities used an automated re-supply request system that was developed by the pharmacy software to automate the refill process. The system uses bar-coding to automate the re-supply requests. This capability is efficient and reduces errors at the facility and the pharmacy.

2.2.2 Patient Safety Checks – Tools were implemented within the e-Prescribing system to provide real time patient safety checks for new medication orders. These checks utilize FDB information to flag alerts during order entry for clinical risks such as drug/condition interaction, drug/drug interaction, duplicate therapy, and Beers list alerts for medications with geriatric risk.

2.3 Research Approaches and Methodology

2.3.1 Research team activities prior to start of study included:

2.3.1.1 Hiring of qualified research staff

2.3.1.2 Approval for conduct of the study obtained from Winona State University IRB

2.3.1.3 Documentation of Human Participant Protections Education for Research Teams Certification by all research staff

2.3.1.4 The data collection team, consisting of the administrators and staff representing pharmacy and nursing, met to draft a list of activities that reflect the steps in prescription processing for new orders and refills.

2.3.1.5 An excel file data collection form was developed for each type of order that enabled the data collector to record the time of each process step.

2.3.1.6 The data collection training included facility site visits to introduce the process to the staff and to orientate to the buildings. During these site visits, the process for data collection was reviewed, and an example case for each aspect was completed. The Project director and staff introduced the study to the facility administration. An information letter was posted at the facilities noting the data collection study.

2.3.2 The data collection process included:

2.3.2.1 The data collectors at the facilities introduced themselves to the staff and requested observation of medication order process.

2.3.2.2 The data collector used a stop watch to measure each event's start and completion time, which was recorded on the data collection form along with notes such as the number of medications in the order.

2.3.2.3 A baseline study was conducted to establish workflow performance measurements prior to the implementation of the e-Prescribing standards. Measurements were also taken after Phase 1 & Phase 2 along with user satisfaction surveys after Phase 2. Data collection for each phase took place over 3-4 days during a two week time period.

2.3.3 Outcomes targeted – Research Questions

2.3.3.1 What is the effect of e-Prescribing as compared to manual prescribing? This question was addressed in the following analysis areas:

2.3.3.1.1 New order processing task time at the facility

2.3.3.1.2 New order processing task time at the pharmacy

2.3.3.1.3 Refill processing task time at the facility

2.3.3.1.4 Refill processing task time at the pharmacy

2.3.3.1.5 Number of residents triggering 9 or more medications.

2.3.3.2 What are staff perceptions of automated e-Prescribing with regards to satisfaction, barriers, and facilitators of implementation? This question was addressed by user surveys.

3.0 Testing Outcomes

3.1 The following items evaluate whether the e-Prescribing standards work, the incremental impact of each standard, and make recommendations for their use in the LTC setting.

3.1.1 NCPDP SCRIPT 8.1 NEWRX– The NEWRX transaction was implemented in the first phase of the pilot in late June 2006.

3.1.1.1 The New Order (NEWRX) transaction provides the foundation for e-Prescribing and is required in the LTC setting for e-Prescribing to communicate new orders between the prescriber-facility system and the pharmacy. The chart in Appendix 7 details the number of new orders at the two treatment facilities that were written before (May 2006) and after (through Dec 2006) the pilot was implemented. The chart demonstrates that once e-Prescribing was implemented, it was utilized to transmit almost all of the new orders for the remainder of the pilot. From May-December a total of 6996 NEWRX SCRIPTS were successfully transmitted out of a total of 7433 possible new orders, which is a 94% success rate.

3.1.1.2 In LTC, there are nuances to the order workflow that required the pilot to further define how this transaction was used and populated. Orders are typically open ended causing the following required fields to be less important in LTC:

3.1.1.2.1 Prescribers usually do not indicate a dispense quantity on the chart order for a LTC resident's medication because the pharmacy dispensing system typically determines the amount per dispensing event (e.g. 30 day blister card).

3.1.1.2.2 Prescribers do not indicate refills on a chart order for a LTC resident's medication since they normally have to no end date.

3.1.1.2.3 In LTC, the pharmacy has the opportunity to have a complete picture of a resident's medications. A LTC pharmacy is interested in all resident orders, even orders that they do not fill for some reason (e.g. facility provides some medication stock). This introduces the need to send a PROFILE order. Achieve indicated this as "Do Not Fill".

3.1.1.3 In the LTC environment, it is also important to maintain coordination between the nursing facility and the partner pharmacy regarding resident information.

3.1.1.3.1 This relationship requires a strong interaction between the two partners for new residents, discharged residents, payer changes for residents, room changes, etc.

3.1.1.3.2 When a new resident is added to a nursing facility, the pharmacy needs to know as much information as possible to establish this new resident's record in the pharmacy system.

3.1.1.3.3 Delivery information is important because a LTC pharmacy delivers the order to the facility where the resident resides instead of the patient picking it up, which is done at a retail store.

3.1.1.4 The pilot utilized the SCRIPT transaction to pass the order information noted above as LTC nuances. These pilot variances to the NCPDP SCRIPT 8.1 are noted in Appendix 8.

3.1.2 The CANRX SCRIPT is needed to communicate discontinued orders from the prescriber-facility system to the resident's LTC pharmacy. An LTC pharmacy needs to be informed of discontinued orders to provide a comprehensive drug utilization review (DUR) for each resident and to manage the automated re-supply process utilized by many LTC pharmacies, in which residents' non-controlled, routine, oral solid orders are refilled by the pharmacy before the supply is exhausted.

3.1.2.1 The CANRX was used as defined by SCRIPT to send discontinued resident orders to the pharmacy and as defined by the SCRIPT variances noted in Appendix 8. The CANRX transaction was implemented in the first phase of the pilot in late June 2006.

3.1.2.2 The CANRX was also utilized to assist with order changes in LTC. Since LTC orders are typically open ended, the prescriber may want to make changes to an existing order. When a prescriber modifies an existing order, Matrix' CPOE application uses both a NEWRX SCRIPT and a CANRX SCRIPT to communicate this order modification to the LTC pharmacy.

3.1.2.2.1 The CANRX SCRIPT is sent to the LTC pharmacy for the original order that was modified.

3.1.2.2.2 The NEWRX SCRIPT is sent to the LTC pharmacy for the new order that is created pursuant to the order change.

3.1.2.2.3 By tying these transactions together, the LTC pharmacy can decide the appropriate action upon receipt – whether to discontinue the original order or change the original order in the pharmacy application.

3.1.2.2.4 Two fields were utilized within the NEWRX and CANRX to indicate that this is a Change Script. See Appendix 8 for this changed order information.

3.1.3 The pharmaceutical Eligibility (ASC X12N 270/271) and NCPDP Formulary and Benefit Standards – These standards were also implemented in the first phase in late June 2006. No changes were made to these standards for the LTC e-RX Study.

3.1.3.1 One premise of the pilot was that providing accurate and timely formulary and benefit information to the prescriber as the order was created was useful in assisting the prescriber to select the most appropriate medication based upon the resident's coverage. Anecdotal feedback from the pilot indicated that the benefit of this information was not fully realized during the study because only 4.15% of the new orders were entered by NP/PA prescribers during the pilot.

3.1.3.2 In the two treatment facilities, the pilot team was able to provide coverage information for 84 out of the 196 residents (43%) using the eligibility information available from RxHub during the study.

3.1.3.2.1 This eligibility information was updated for a resident by matching the resident's name, date of birth, gender, and zip code from the LTC facility's database (Matrix) against the RxHub database.

3.1.3.2.2 If there was a match, then the resident's pharmacy insurance information in Matrix was automatically updated with the RxHub plan information. The 43% coverage percentage was much higher than anticipated.

3.1.3.2.3 When a resident had the RxHub plan information assigned, then Matrix could display the corresponding RxHub formulary coverage status for medications during the order entry process to allow the prescriber to select products based upon their payer coverage status for the resident.

3.1.3.3 During the pilot, additional pharmacy coverage plans were also available from MediMedia's InfoScan formulary list to allow the nursing facility the ability to assign one of InfoScan's over 4,000 formularies to the 57% of the residents that did not have an RxHub insurance plan automatically assigned.

3.1.3.3.1 These InfoScan formularies had to be manually assigned to each resident in order to display the resident's medication coverage information during the order entry process.

3.1.3.3.2 At the conclusion of the pilot, the resident pharmacy insurance coverage was reviewed at the two treatment facilities, and no InfoScan plans were assigned to any resident. Since no InfoScan plans were assigned during the pilot, the value of this feature was unknown.

3.1.3.3.3 Anecdotal feedback from these facilities indicated that increasing prescriber order entry adoption would increase the value of having resident medication coverage information.

3.1.4 NCPDP 5.1 - Since this eligibility standard was already implemented by RNA's pharmacy software and was utilized by the LTC pharmacy prior to pilot, this standard is regarded as required by the pharmacy to validate resident coverage prior to dispensing. This eligibility standard is essential to LTC pharmacies.

3.1.5 Prior Authorization for the provider and pharmacy using X12N 278/275 with HL7 PA Attachment incorporating LOINC and CDA structure.

3.1.5.1 With additional funding provided by the American Society of Consultant Pharmacists (ASCP) Foundation, the pilot was able to implement an electronic PA request process using these standards in the second phase in late October 2006.

3.1.5.2 See Appendix 2 for complete PA testing details.

3.1.5.3 Since its implementation, the pilot has demonstrated that an electronic PA process is technically feasible, and that it is practical to provide real-time PA request status to both the nursing facility software application (for the prescribers/agents of the prescriber) and to the pharmacy software application.

3.1.5.4 A total of three electronic PA request opportunities were presented during the course of pilot testing. Of those, two were processed successfully and resulted in electronic responses from the pharmacy payer. The other electronic PA request was presented to the prescriber/agent, but it was not submitted.

3.1.5.5 The pilot was very pleased to have demonstrated that the electronic PA process could be implemented in a practical yet effective manner, that all required information could be communicated electronically (with the messaging adjustments described in Appendix 2), that the time required of the prescriber could be minimized, and that the process status could be made visible to the facility and LTC pharmacy through minor adaptations to their systems. However, due to the limited number of electronic PA request submissions, further research is required to thoroughly demonstrate its value in the LTC environment.

3.1.6 NCPDP SCRIPT Fill Status – This standard was implemented in the second phase during late October 2006.

3.1.6.1 The pharmacy sends a FILL status to the nursing facility when an order is 'filled' in the RNA pharmacy application.

3.1.6.2 The FILL is utilized in this environment to indicate what exact packaged medication is coming, with the exact instructions that will be on the label. The Fill Status conveys changes made by the LTC pharmacy such as generic substitutions, strength changes, and direction variances.

3.1.6.3 A slight change was made to this standard for the pilot. We added a "Not Filled Reason Code", a "Date", and a text reason to the Fill Status SCRIPT to enable the pharmacy to indicate why they are not filling a medication order. Communicating this information was important to the facility and the LTC pharmacy to assure the resident receives accurate medications in a timely manner.

3.1.6.4 Anecdotal feedback from the treatment facilities indicated that the Fill Status content was not referenced enough during the pilot to ascertain the potential value of this standard during the pilot.

3.1.7 During the second phase implementation in October 2006, the pilot team utilized the NCPDP SCRIPT CANRX to indicate resident discharge status.

3.1.7.1 The LTC pharmacy indicated that having the resident discharge information was very valuable.

3.1.7.2 When a resident is discharged from the facility using the LTC facility software, this application uses a single order for the discharged resident to send a CANRX to the pharmacy to inform them of the resident's discharge.

3.1.7.3 A few small changes were made to the CANRX SCRIPT to indicate the discharge, a discharge reason, and the date. See Appendix 8 for discharge information variances. We created three defined reasons for discharge noted below.

3.1.7.3.1 D1 = Discharge – Expired

3.1.7.3.2 D2 = Discharge – Return Not Expected

3.1.7.3.3 D3 = Discharge – All other Reasons

3.1.7.4 When the LTC pharmacy receives this information, they check for the existence of a discharge code. If present, they discharge the resident from the LTC pharmacy system based on the discharge type. This prevents medications from being dispensed inaccurately for discharged or expired residents. Without this communication a LTC pharmacy has the potential to bill for false claims.

3.1.8 NCPDP SCRIPT Change Transaction – This transaction was not developed in the pilot study; however, the pilot participants did analyze the use of this transaction in the LTC setting.

3.1.8.1 The pharmacy indicated that it would be very helpful for them to be able to utilize the change transaction request for orders that had formulary coverage problems, clinical issues, or needed clarification.

3.1.8.2 The change request could be used by the LTC pharmacy to indicate to the prescriber the formulary coverage or clinical issue, along with providing alternative medications for prescriber consideration.

3.1.8.3 A new identifier should be added to indicate a clarification question.

3.1.8.4 In answer to this change request, the prescriber could either – accept the pharmacy's recommended alternative (which would cancel/DC the original medication order), deny the pharmacy's recommendation, or approve the original medication order with changes (e.g. directions) using the change response SCRIPT transaction.

3.1.8.5 In order for the change transaction to work in LTC, the prescriber must be notified and respond in a timely manner; otherwise, this new process will breakdown and the LTC pharmacy will have to telephone the nursing facility and/or prescriber to alert them and ask them for resolution (which is the current method used by the pharmacy to resolve these types of issues).

3.1.8.6 The pilot partners felt that prescribers were not likely to respond promptly to the change request transaction given the low level of prescriber adoption for new order entry.

3.1.9 RxHub measured the processing performance for the transactions that were run through them for the pilot originating in the Achieve CPOE application or the RNA pharmacy software.

3.1.9.1 The average processing time for all of the transactions was less than 1 second.

3.1.9.2 During the implementation of the pilot in June 2006, users noted when a medication order was entered at the nursing facility and received at the pharmacy; it was anecdotally noted as instantaneous.

3.1.9.3 See Appendix 4 for the RxHub Processing Performance details.

3.1.10 None of the other e-Prescribing foundation standards were studied or implemented in this pilot.

3.2 During the pilot the pilot team proved that e-Prescribing can be delivered and implemented in the LTC environment.

3.2.1 The pilot is still in operation for all participants, and there is no consideration by any pilot partner to "turn it off".

3.2.2 Anecdotal feedback from users indicate that the system has saved the nursing facilities and the LTC pharmacy staff data entry time and time on telephone call backs.

3.2.3 During the pilot Achieve tracked the number and types of transmission errors for the NEWRX and CANRX NCPCP SCRIPTS that occurred in their transaction gateway, which was developed to send/receive transactions to/from RxHub. See Appendix 9 for the complete details of these transmission errors.

3.2.3.1 For the entire pilot, there were 410 errors out of a total of 9787 new and cancel transmission, which is a 4.2% error rate.

3.2.3.2 Most of these errors were "Communication Errors" that occurred after the implementation of the two phases of the pilot. These "Communication Errors" were caused by software and hardware changes.

3.2.3.3 In addition, many of the errors occurred in multiples – as a failed electronic transmission that was tried numerous times before the user decided to send the order via electronic fax to the pharmacy, which is the backup method to an electronic transmission.

3.2.3.4 The nursing facility CPOE user is alerted when there is an electronic transmission failure to the LTC pharmacy – so the user can try to electronically transmit the order again or elect to send the order via electronic fax to the LTC pharmacy.

3.3 The pilot partners worked with the NCPDP WG14 to introduce four new DERF's in 2006, and another DERF is being submitted in February 2007.

3.4 Clinical outcomes - The e-Prescribing standards affect on quality and patient (resident) safety was measured by comparing the order count per resident in the two treatment facilities for the month of May (pre-pilot) and December (which was over 5 months after the pilot was implemented in late June). See Appendix 10 for the Resident Order Review details.

3.4.1 There was a 1.54% decrease in the number of active orders per resident per month.

3.4.2 There was a 2.39% decrease in the number of residents with 9 or more active orders per month.

3.4.3 These slight decreases suggest a possible positive affect on quality and patient safety, but the pilot could not determine what caused these decreases.

3.4.4 The primary reason that the pilot study did not show a more pronounced affect on these measurements was that 95% of the orders were entered into the CPOE system by agents of the prescriber – not the prescriber. The primary responsibility of agents of the prescriber has traditionally been to accurately record prescriber orders – not to evaluate clinical alerts from the CPOE system.

3.4.5 Increasing CPOE entry by prescribers is one of the keys to positively affecting the quality of care and resident safety because the CPOE clinical alerts should be presented to the prescriber in order to more proactively affect the resident's medication management.

3.5 Research team results – the research team's complete report is in Appendix 11.

3.5.1 Two of the many facility tasks that were measured and analyzed by the research team demonstrated possible effects due to e-Prescribing.

3.5.1.1 The communication tasks, which included all time related to telephone, written, or in person communication with either the pharmacy or the physician/NA/PA, for the treatment and comparison facilities were analyzed for the three data collection points (pre-pilot baseline, after phase 1 & 2). It was noted that the comparison facilities did not change over time; however, there was a significant decrease in average times for the treatment facilities – which had smaller average times after phase 2.

3.5.1.2 The fax communication times for the treatment and comparison facilities were analyzed for the three data collection points. The treatment facilities had a significantly lower typical communication fax time than the comparison facilities after phase 2.

3.5.2 The pharmacy tasks with sufficient data for analysis of changes over time were sorting faxes, insurance rejections, new admissions, new/changed orders, and refills. There was not enough evidence to suggest that the e-Prescribing system affected the typical time spend on any of these tasks. However, there were several observations worth noting.

3.5.2.1 The number of occurrences requiring fax sorting was reduced after the implementation of e-Prescribing.

3.5.2.2 There was a moderate reduction after Phase 2 in the typical time spent per medication, for new admissions, and a reduction in the variation in time spent per medication for insurance rejections.

3.5.3 The overall nursing facility satisfaction with e-Prescribing for the two treatment facilities indicated that they were slightly dissatisfied. Thirteen nursing staff members participated in the satisfaction survey. There was variation in the staff perspective of e-Prescribing with some noting that it was a hassle and others noting that it made their work easier.

3.5.3.1 The majority of the negative comments were related to the dependability of the system, which was perceived to add additional steps to the order process.

3.5.3.2 The positive comments repeatedly noted the elimination of the use of the fax machine.

3.5.3.3 Troubleshooting was an area that the staff indicated they would have liked more training.

3.5.3.4 Having a user friendly "cheat sheet" and more follow-up training would have been beneficial.

3.5.4 Two pharmacy staff team members participated in the satisfaction survey; they were very dissatisfied with the following items concerning the pilot:

3.5.4.1 Processing refills that were rejected was identified as the biggest problem. The automatic refill system allows the pharmacy to setup edit options, such as utilization percentage, prescription end date, third-party coverage, etc., that are applied prior to processing a refill. It appears that the process may be slowed by a database issue, which RNA is addressing.

3.5.4.2 Combination orders (specifically Warfarin and Prednisone) were mentioned as very difficult to process. This problem is due to current limitations in the NCPDP standards for handling combination orders as noted in section 3.6.3.

3.5.4.3 Another area that was identified as difficult was discontinued orders, they thought should have been changed orders. This problem is also due to NCPDP standards' limitations, which handle order changes as a discontinue of the current order (CANRX) and a new order for the changed order (NEWRX).

3.5.4.4 Having a "cheat sheet" and follow-up training would have been beneficial.

3.5.5 Results of this research study indicate a potential for time savings by nursing and pharmacy staff through the use of e-Prescribing.

3.5.5.1 The short timeframe for the pilot limits the findings. In order for the three phases of data collection to occur the time period from implementation to data collection was less than two weeks. The staff comfort level is using the system was not established prior to data collection. This reflected in repetition of tasks and staff dissatisfaction.

3.5.5.2 As the system becomes more dependable, the repetition of tasks would be anticipated to decrease, and the staff satisfaction would increase.

3.5.5.3 In order to determine the full effects of the e-Prescribing system, a longer period of time to measure effectiveness is necessary. It is imperative that prescribers incorporate e-Prescribing into their every day practices for the full effect on patient safety, quality of care, and efficiency to be achieved.

3.6 This section notes pharmacy workflow changes and outcomes of the pilot.

3.6.1 Effect on functionality with integration of other systems - The traditional paper process and the e-Prescribing process are two totally separate functions within the pharmacy. The two processes did not integrate until after the prescriptions were processed through the system.

3.6.2 Primary users - The primary users in the pharmacy were the staff pharmacists. Pharmacists were concerned about accuracy in the nurse as agent model and about how additional questions and processing time for combination orders impacted efficiency.

3.6.3 Impact on pharmacy callbacks and rework - Anecdotal comments suggest that the pharmacists made more clarification calls to the facilities and had more rework with combination orders. Combination orders are prescriptions with multiple dosing directions, such as medications that are administered on both a routine and as needed basis. The current SCRIPT standard NEWRX and CANRX message formats do not enable a combination order to be communicated in a single transmission; instead they

must be split into an individual message for each dosing direction. When the pharmacy receives a new order that's been sent in this manner, a pharmacist must manually re-combine the individual messages before entering into the dispensing system. Combination orders can cause similar problems at the pharmacy when they are changed or discontinued.

3.6.4 Retention rates - No change occurred as processing e-Prescribing was an expectation for all pharmacists that processed orders on the pharmacy system.

3.6.5 Barriers to adoption - Pharmacist concern for accuracy with the nurse as agent model and inefficiencies in processing combination orders are the primary barriers. Some system functionality adjustments to improve efficiencies would be required for full adoption. In order to address the key process challenges, the SCRIPT standard must be adjusted to enable combined orders to be communicated in a single message. Until that capability is in place, process inefficiencies at the receiving pharmacy are unavoidable.

3.6.6 The impact of e-Prescribing on pharmacy practice is as dramatic a change as moving from typed labels and documentation on hard copy prescriptions to using computers for prescription processing. Not only is it a significant work process change, but also a major professional practice change – a true paradigm shift. Changes of this magnitude take time to adjust to and accept. When evaluating the pharmacy staff satisfaction levels with e-Prescribing, a number of factors should be kept in mind.

3.6.6.1 The nursing facility staff had worked with the Matrix software system for quite some time prior to the implementation of e-Prescribing. e-Prescribing created only minor changes to the medication order process for the facility staff. Prior to the implementation of e-Prescribing, the pharmacy staff worked exclusively with a paper and facsimile system. e-Prescribing was a dramatic work flow change for the pharmacy staff.

3.6.6.2 On implementation day the two test facilities converted totally to e-Prescribing resulting in one medication order process for the facility. The pharmacy staff needed to work with two very different medication order processes with 17 facilities utilizing the traditional system and only 2 facilities with e-Prescribing.

3.6.6.3 The Matrix software system had been used for quite some time in the test facilities prior to the implementation of e-Prescribing. Many of the initial facility medication order process challenges had been addressed prior to e-Prescribing. Since there was not a test period for the e-Prescribe pharmacy software, there was not an opportunity to identify and correct problems or challenges prior to implementation of e-Prescribing. Challenges needed to be addressed as they arose.

3.6.6.4 The short duration of the Pilot Study did not allow time to make system changes and see resulting improvements in satisfaction.

3.6.7 See Appendix 12 for the Pharmacy e-Prescribing Workflow Model.

3.7 Software development and implementation

3.7.1 The development effort for the initial development of SCRIPT 8.1 went very well. All partners cooperated, and this portion of the pilot was completed in what would have to be characterized as record time. During the analysis phase of this development, several shortcomings of SCRIPT 8.1, as it relates to the LTC environment, were identified:

3.7.1.1 Need to identify the resident's location (facility/unit/room/bed).

3.7.1.2 Need to identify "do not send" orders.

3.7.1.3 Need for resident responsible party/payer information.

3.7.1.4 Need ability to discontinue an existing order.

3.7.2 By partner agreement, a place was found within the SCRIPT 8.1 record to include these data elements, with the understanding that a standardized solution would be pursued through NCPDP. Currently all of these modification requests are in the NCPDP DERF process.

3.7.3 After deployment of phase 1, it was determined that SCRIPT 8.1 also did not allow for appropriate handling of resident discharges and readmissions. Again, by partner agreement a "work-around" was agreed upon, and SCRIPT standard changes are in the NCPDP DERF process.

3.7.4 Currently the e-Prescribing process is working well for the LTC pharmacy with one notable exception. This exception is the handling of combination orders, i.e. prescriptions with complex directions. Specifically, these are prescriptions that have one of the following: both routine and as needed (PRN) directions, different quantities for the administration times, or have a tapered dosing schedule. The approach proposed by the NCPDP Structured and Codified SIG Task Group holds promise as a solution to this challenge. Further research is needed to determine whether it fully addresses the situations encountered in long-term care settings. The NCPDP WG14 LTC EHR Task Group is currently discussing this issue.

3.7.5 Another deficit that was discovered in SCRIPT 8.1 as it relates to LTC is the inability for a facility to request a replenishment of a particular medication. For the pilot, this was addressed by using eRxRequest, a bar code enabled re-supply request tool from RNA Health Information Systems. The need for a medication replenishment request within the SCRIPT standard was addressed by DERF 795 by the NCPDP WG14 and WG11 Task Groups for e-Prescribing.

3.7.6 Overall, the LTC e-RX pilot was a huge success. Numerous issues were identified with the SCRIPT 8.1 standard. However, through partner agreement, "work-arounds" were identified and implemented. Additionally, great progress has been made towards incorporating LTC industry specific solutions within the standard.

3.8 State and Federal Regulations

3.8.1 Currently, pharmacies and pharmacists are not permitted by the Drug Enforcement Administration (DEA) to fill any controlled substances transmitted by electronic prescribing methods. The LTC pharmacy industry leaders worked with NCPDP to evaluate and modify the "Electronic Prescribing Security and eSignature Infrastructure" process for the LTC e-Prescribing setting. The infrastructure was supported by the National Committee on Vital Health Statistics (NCVHS) and they recommended that HHS and DEA adopt the infrastructure as part of the e-Prescribing process. As a result of the review, LTC industry leaders created the NCPDP "Electronic Prescribing Security and eSignature Infrastructure – Long Term Care Alternate Model" diagram, which is reviewed in Appendix 13.

3.8.2 This infrastructure is currently in use for e-Prescribing and is also in use as part of this pilot. The pilot is using a secure web based prescribing tool that has the same technology configuration as described in the "Electronic Prescribing Security and eSignature Infrastructure – Long Term Care Alternate Model" diagram. The pilot demonstrates that LTC e-Prescribing can work in the same way as retail/ambulatory settings from a Security and eSignature standpoint, and there should not be any material exceptions needed to support the LTC setting.

3.8.3 Minnesota Board of Pharmacy - At the time the Pilot started, the Minnesota Board of Pharmacy did not have specific rules about e-Prescribing in Long Term Care. The Board expected the process to be compliant with all Board of Pharmacy Rules regarding Long Term Care particularly as they related to signatures, controlled substances, and agent of the physician. The Board required a paper trail for all prescriptions filled as in a paper system, which required the need for the RNA pharmacy system to print reports of all e-Prescribing transactions. During the course of 2006, the Board has drafted some guidelines for e-Prescribing and has raised concerns about accuracy of orders processed by an Agent of the Physician. The Board has also raised concerns about the ability to verify that the prescriber generating the order is really the prescriber and not an unlicensed office person.

4.0 Conclusions

4.1 The primary issue studied by the pilot was whether the e-Prescribing standards could be implemented and used in the LTC environment to enable prescribers and their agents to electronically manage the medications for LTC residents.

4.1.1 The pilot partners demonstrated that these standards could be developed and implemented in the LTC environment to facilitate e-Prescribing. The CMS needs to include LTC in the NCPCP Medicare Part D initiative to drive adoption in this market.

4.1.2 Some modifications to the e-Prescribing standards were made to the NCPCP SCRIPT 8.1 in the pilot by the partner agreement to accommodate requirements for the LTC environment. The pilot team felt that the LTC environment could not wait for the full NCPDP implementation process that can take up to 2 years to complete.

4.1.3 Additional standards work needs to be done in order to provide a complete e-Prescribing solution to the LTC setting.

4.1.3.1 Orders with multiple directions (e.g. BID and PRN) pose the greatest obstacle for the LTC pharmacy.

4.1.3.1.1 These are separate orders in the LTC facility because they must be charted separately.

4.1.3.1.2 These orders are typically treated as a single order in the LTC pharmacy in order to dispense and submit a prescription as a single claim.

4.1.3.1.3 The current SCRIPT NEWRX format does not allow these orders to be communicated to the pharmacy in a combined form. Multiple NEWRX messages – each representing a dosing direction for the same medication – must be transmitted to communicate such an order.

4.1.3.1.4 Likewise, the SCRIPT standard does not enable a clean modification to a particular dosing instruction in a combined order. For example, the CANRX message format does not allow the discontinuation of a single dosing direction to be put in context of the full order. It is left up to the pharmacist to determine whether other dosing directions remain in effect or not.

4.1.3.1.5 As a result, combination orders present processing challenges at the LTC pharmacy when they are created (multiple NEWRX's), modified (NEWRX and CANRX), and discontinued (CANRX).

4.1.3.1.6 Modifications to the SCRIPT standard are needed to enable a LTC pharmacy to efficiently process e-Prescription orders with multiple directions. The approach proposed by the NCPDP Structured and Codified SIG Task Group holds promise as a solution to this challenge, but further research is needed to determine whether it fully addresses the situations encountered in long-term care settings. The NCPDP WG14 LTC EHR Task Group is currently discussing this issue.

4.1.3.2 Another important finding of the pilot was the need to develop the CHANGE SCRIPT request and response to allow the LTC pharmacy to electronically contact the prescriber to question an order due to billing problems, clinical concerns, or to clarify the order.

4.1.3.3 The pilot team worked within the NCPDP WG14 and WG11 to get four DERF's to ballot, one approved in 2006 and three in 2007 are still in ballot.

4.1.3.3.1 DERF 779 – Census Update Transaction.

4.1.3.3.2 DERF 784- Prescription modification.

4.1.3.3.3 DERF 795 – Resupply request.

4.1.3.4 The pilot team worked within the NCPDP WG14 to try and obtain permission from the DEA to pilot the electronic submission of control drug prescriptions. The pilot team was not successful in this effort. This area needs to be addressed in order for e-Prescribing to provide a fully functional method of order management.

4.1.3.5 The last standards based conclusion from the pilot is the need to increase the automated resident eligibility assignment.

4.1.3.5.1 The pilot demonstrated that participants would not use a manual eligibility assignment process.

4.1.3.5.2 During the pilot the team was able to automatically assign eligibility to 43% of the residents in the two treatment facilities.

4.1.3.5.3 This is a very respectable percentage for the pilot, but it should be increased to help drive increased prescriber adoption and add value to this feature.

4.2 The secondary issues studied by the pilot were to determine if the implementation of the e-Prescribing standards could improve patient care and safety and whether e-Prescribing saves time within the LTC environment at the facility and at the LTC pharmacy.

4.2.1 Another challenge identified in the pilot was the need to increase prescriber adoption in the e-Prescribing process. The coverage and clinical alerts displayed during the order entry process should be reviewed by the prescriber prior to submitting the order to the LTC pharmacy in order to provide the greatest value to all providers (prescribers, nursing facilities, and pharmacies).

4.2.2 The duration and scope of this pilot study was too limited to conduct a full scientific investigation of these complex issues – especially the patient care and safety issues.

4.2.3 The research study did measure the time required to process orders at the nursing facility and found that the total time spent in communication of orders as well as the time faxing medication orders was less when utilizing e-Prescribing. The time saving for faxing an order was on average one minute less for the treatment group as compared to the comparison group. This could mean significant savings when considering the number of orders processed in one day at a nursing facility.

4.2.4 Even though the differences for the comparison and treatment groups for the pharmacy staff time on tasks was not significantly different, there was a decline in the time in fax sorting, processing new admissions, and new orders for the treatment group over time.

4.3 The following were the specific hypotheses of this study from the original RFA.

4.3.1 Cost reduction: Providing eligibility, formulary benefits, and prior authorization to the prescriber and/or agent of the prescriber during the prescribing process will reduce the costs associated with off-formulary and non-generic medication ordering.

4.3.1.1 Due to the limited prescriber adoption and the scope of this pilot, the pilot team was not able to provide definitive cost reduction data concerning providing eligibility information.

4.3.1.2 Anecdotal feedback from the pilot participants indicate that it is helpful for the prescriber to see drug coverage as new orders are entered for a resident.

4.3.2 Workflow Efficiency: Providing practical and useful content in a simple, accessible, easy-to-use interface that allows prescribers and/or agents of the prescribers to electronically place orders in a system that is tightly integrated with the patient's Electronic Health Record (EHR) should improve workflow efficiency and efficacy between the prescriber, the nursing facility, and the pharmacy.

4.3.2.1 The research noted time savings for some tasks at the nursing facility and at the LTC pharmacy.

4.3.2.2 The pilot demonstrated the value of providing a true computer- to- computer end-to-end solution where the prescriber/agent of the prescriber can enter a new order into the Achieve CPOE process, and the order is automatically sent electronically to the LTC pharmacy via RxHub.

4.3.2.2.1 The RNA software receives the SCRIPT from RxHub within 1 second cueing the pharmacist that a new or discontinued eRX has been received.

4.3.2.2.2 The pharmacist can then select the desired eRX to process.

4.3.2.2.3 The RNA application calls the normal order entry screen and pre-populates the medication order information into the proper fields – such as facility information, resident information, and medication information – including directions, which streamlines the new order entry process at the LTC pharmacy.

4.3.2.2.4 Discontinued orders are also efficiently processed in a manner similar to the way new orders were described above.

4.3.2.2.5 The LTC pharmacy process to admit and discharge residents was also enhanced by the pilot as much of the required information is contained in the SCRIPT and is pre-populated into the proper fields by the RNA pharmacy application.

4.3.3 Safety and Care Improvement: The use of patient safety checks during the prescribing process will positively impact patient safety as it relates to inappropriate prescribing and adverse drug events.

4.3.3.1 Most of the order entry during the pilot was not done by the prescribers, but, rather, by agents of the prescriber.

4.3.3.2 Historically, the main responsibility of these agents of the prescriber has been to record the prescriber's order information into the CPOE application exactly as the prescriber indicated.

4.3.3.3 Anecdotal feedback from these agents of the prescriber indicate that they largely ignored the patient safety alerts that the CPOE system displayed during the order entry process primarily for two reasons – that the prescriber's order could not be altered by these agents and that these safety alerts were traditionally handled between the LTC pharmacy and the prescriber.

4.3.4 Robustness and Security: Enabling an electronic data exchange between the nursing facility's CPOE and the LTC pharmacy's dispensing system, using NCPDP standard message formats should increase transmission reliability and security of prescription medication orders over traditional fax and paper based systems. Doing so will streamline the LTC pharmacy medication delivery process, minimize transmission errors, and eliminate duplicate entry of orders.

4.3.4.1 The SCRIPT transmissions from the prescriber-facility to the LTC pharmacy are processed automatically and take less than 1 second to complete.

4.3.4.2 If there is a transmission error to the LTC pharmacy, the Achieve CPOE application creates a resident message for the user to address this error by either re-sending the electronic prescription or to elect to send it via electronic fax to the LTC pharmacy. This electronic transmission failure notification mechanism is more reliable than the traditional facsimile transmission alerts.

4.3.4.3 Some respondents for the nursing facility satisfaction survey indicated that e-Prescribing increased the transmission reliability, speed, and security of orders over fax and paper based systems. Some respondents felt e-Prescribing transmissions were not reliable.

A.1 Appendix

NCPCP LTC Work Group 14

Several modifications were needed to the NCPDP SCRIPT Version 8.1 to meet the e-Prescribing needs in the LTC environment. In response to these needed modifications, the NCPDP LTC Work Group 14 in conjunction with Work Group 11 submitted four Data Element Request Forms (DERF).

- DERF 743 – This DERF identified a specific unit, room and bed for medication delivery to the NCPDP SCRIPT Version 10.0 Patient Segment. This NCPDP SCRIPT Version was updated in October 2006 and is waiting for ANSI accreditation.
- DERF 779 – This DERF will create a new Census Update Transaction. This new CENSUS SCRIPT is used to inform the pharmacy when a resident is admitted, discharged, or has a demographic change (e.g. a change in U/R/B or payer) that is not related to an order. Until this CENSUS DERF is available, the pharmacy system should review each NEWRX to see if any resident changes have occurred to insure that the pharmacy system is updated when the NEWRX is processed.
- DERF 784- This DERF creates a new prescription modification process to link the current order cancel/DC with the new order to indicate to the pharmacy that this was a change to an existing order. This change was how an order modification was addressed in the pilot.
- DERF 795 – This DERF creates a way to send a refill request from the facility to the pharmacy. This new RESUPPLY SCRIPT DERF is designed for use in the LTC environment to allow nursing facilities to request a new supply/refill from a pharmacy.

The DERF's 779, 784 and 795 were presented at the NCPDP meeting in November 2006, and they were approved for ballot. These DERF's will be distributed for ballot on January 12, 2007 and the ballot will close on February 12, 2007. If there are no negative comments, the DERF's will probably be sent to the NCPDP Board of Trustees for approval in March 2007. If there are negative comments, those will be adjudicated at the February 2007 NCPDP Joint Technical Work Group Meeting. Work Group meetings and the ballot will be re-circulated with the February 2007 ballots (unless any of the comments are categorized as persuasive and substantive, if they are then the ballot, or the part of the ballot that earned that categorization, will be removed). Any new comments from the February 2007 ballots will be reviewed (but not categorized) at the May 2007 Work Group meeting. After the May 2007 Work Group meeting, NCPDP will send an appeal letters to any remaining or new negative comments. The receipt of the last letter starts a 30 day appeal period. Should no appeals be received, NCPDP will send the DERF's to the NCPDP Board of Trustees for approval, probably in July 2007. The best case for the release of these DERF's in the NCPDP SCRIPT Version 10.1 would be April 2007 and the worse case would be August 2007.

A.2 Appendix

Prior Authorization Transaction Method

1. The pilot implemented the "unsolicited model" of electronic prior authorization, in which the initial prior authorization request message contains all criteria needed by the payer to process the request, because it offers the most efficient workflow for the prescriber. The alternative, "solicited model" involves an initial request to the payer, a response in which the payer identifies the PA criteria, and a second request to the payer containing the criteria as it pertains to the patient.
2. The pilot designed improvements to the NCPDP Formulary and Benefit Standard to facilitate the electronic transmission of prior authorization criteria between the payer and the point of care. The pilot payer, BCBS MN, published drug- and plan-specific prior authorization data via RxHub using the improved Formulary and Benefit Standard.
3. MediMedia developed an automated process to integrate standardized electronic prior authorization criteria into its InfoScan Prior Authorization Service. A portion of that data was also integrated into the Matrix system, enabling it to recognize whether electronic prior authorization was supported for a given resident and drug.
4. Matrix's medication ordering process was modified to initiate the electronic PA process when an included plan and medication were involved. The Matrix system connected to MediMedia's InfoScan Prior Authorization Service using a secure Internet protocol, HTTPS (Hypertext Transport Protocol over a Secure Socket Layer), in order to begin the submission process. Electronic prior authorization submission was an optional process in the order workflow and was not required to submit the medication order.
5. "Administrative" prior authorization criteria were pre-populated during the handshake between Achieve's Matrix and MediMedia's InfoScan Prior Authorization Service using a standard HTTPS/post. These pre-populated criteria included information about the resident, physician, drug and diagnosis.
6. In response to a Matrix request, MediMedia presented the appropriate prior authorization criteria to the prescriber using a secure online form. With many of the administrative prior authorization criteria pre-populated by Matrix, the prescriber was only required to answer applicable clinical criteria, which numbered as few as 2-4 questions under the scope of this pilot.
7. When the prescriber submitted an electronic prior authorization request, MediMedia applied basic data validation rules to all user input. Electronic prior authorization messages were compiled to conform to X12N 278/275 and HL7 Drug Prior Authorization Attachment standards. The electronic prior authorization message was transmitted to RxHub via HTTPS.
8. MediMedia's InfoScan Service maintains detailed electronic prior authorization transaction data. This data is made available through an online facility so all stakeholders can view real-time transaction status.
9. Matrix included a reference to MediMedia's InfoScan Service in the electronic prescription request (NCPDP NEWRX) transmitted to the partner pharmacy system.
10. The electronic prior authorization request was presented to payer staff through an online facility developed by RxHub for the pilot. Payer staff processed the request using their ordinary decision process and returned the approval or denial using the online tool. RxHub compiled the X12N 278 response and transmitted it to MediMedia via HTTPS. MediMedia electronically reconciled each electronic response against its associated request, which automatically updated the real-time status.
11. Achieve added a link to MediMedia's InfoScan Prior Authorization Service, through which authorized Matrix users could view the real-time status and outcome of each electronic prior authorization request.
12. RNA added a link to MediMedia's InfoScan Prior Authorization Service, through which an authorized pharmacist could view the real-time status and outcome of each electronic prior authorization request.

Prior Authorization SCRIPT Modifications

The following modifications to the electronic transmission standards were made during the pilot in order to implement electronic PA:

1. Modifications were needed to the Formulary and Benefit 1.0 to enable the payer to distribute PA medications and associated questions.
    a. The following list types were added to the Formulary and Benefit specification to support the pilot:

i. Drug to Question Mapping
ii. Custom Question Definition

b. The pilot prototyped a further addition to the Formulary and Benefit standard to specify required and conditional PA questions. That addition was formalized and submitted to RxHub for use in other CMS pilots - PA Question Applicability List. The pilot did not implement this modification due to funding and timing limitations.

2. Modifications were needed to the HL7 PA Attachment to enable the use of payer–defined questions when an appropriate pre-defined question was not available.

Prior Authorization Testing Outcomes Details

1. Due to the short time frame, the pilot limited the electronic PA request process to a single payer (Prime Therapeutics) and five drug classes that require PA. These drug classes were the Ace Inhibitors (AECI), Angiotensin II Receptor Antagonists (ARB), Leukotriene Modifiers, Protein Pump Inhibitors, and Antidepressants. These five drug classes were selected because of their high utilization in the treatment facilities.
2. When a resident had one of two Blue Cross Blue Shield Minnesota plans administered through Prime Therapeutics and the drug ordered belonged to one of the five test drug classes, then the prescriber/agent of prescriber was presented an electronic PA form with the same content as the currently utilized paper form.
    a. The resident demographic and drug information on the electronic form was pre-populated by the application, as described in the Methods section. These pre-populated criteria included information about the resident, prescriber, drug and diagnosis.
    b. The prescriber/agent of prescriber had to answer between two and four clinical questions on the form before submitting the electronic PA request.
    c. After the electronic PA request was submitted, both the LTC facility software and the LTC pharmacy software were able to view the real-time status of the electronic PA request, and the approval or denial once processed by the payer.
3. Since its implementation, the pilot has demonstrated that an electronic PA process is technically feasible, and that it is practical to provide real-time PA request status to both the nursing facility software application (for the prescribers/agents of the prescriber) and to the pharmacy software application.
4. A total of three electronic PA request opportunities were presented during the course of pilot testing. Of those, two were processed successfully and resulted in electronic responses from the pharmacy payer. The other electronic PA request was presented to the prescriber/agent, but it was not submitted.
    a. Both electronic PA requests were generated using the process developed by Achieve, MediMedia, RxHub, and Prime Therapeutics.
    b. In both cases, the PA request form was completed by the prescriber, forwarded to the payer, and receipt acknowledged within one minute of starting the process.
    c. Both electronic PA requests were for products that had quantity limits that only require a PA when the quantity prescribed is beyond the product's limit.
    d. In both cases, the requests were denied because the direction/quantity was below the quantity limit for the product – so a PA was not required (or approved).
    e. For products with quantity limits, step therapy requirements, or similar coverage limitations, refinements will need to be made to the piloted electronic PA process to better determine whether or not a PA is required for the particular resident involved—so that prescribers will only be prompted to fill out an electronic PA form when it is required. The current Formulary and Benefits specification enables payers to provide group-specific details regarding quantity limits and other coverage limitations, which could be utilized to address this challenge. However, not all payers provide this level of detail, as was the case in this pilot. Further, a particular resident's prescription history and other circumstances factor in to whether PA will be required for a given medication. Today, there does not exist an electronic means for ascertaining these patient-specific factors. Prescribers' willingness to adopt an electronic PA process will be impacted by the frequency with which requests turn out to be unnecessary. Success of electronic PA will depend heavily upon the payer's ability to provide the information needed to ensure that the electronic PA process is initiated only when needed.
5. The pilot was very pleased to have demonstrated that the electronic PA process could be implemented in a practical yet effective manner, that all required information could be communicated electronically (with the messaging adjustments described above), that the time required of the prescriber could be minimized,

and that the process status could be made visible to the facility and LTC pharmacy through minor adaptations to their systems. However, due to the limited number of electronic PA request submissions, further research is required to thoroughly demonstrate its value in the LTC environment.

6. The table below notes the date and time for the two successful transmissions of electronic PA in the pilot for each recorded step in the process.

Initial PA	12/8/2006 13:38	Initial PA	11/21/2006 13:50
User completed PA form	12/8/2006 13:38	User completed PA form	11/21/2006 13:51
278 request submitted	12/8/2006 13:39	278 request submitted	11/21/2006 13:51
278 request submitted	12/8/2006 13:39	278 request submitted	11/21/2006 13:51
Status query	12/8/2006 14:07	278 request denied	11/22/2006 9:54
278 request denied	12/8/2006 14:57		

A.3 Appendix

NEWRX SCRIPT's by User

The chart below lists the detail transaction information for new orders that were entered during the pilot study by type of user with the number of new medication orders/month.

Analysis of Electronic Scripts By Creator

Treatment Facility 1	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total	% Total
Charge Nurse	0	76	546	762	668	463	672	591	3778	66.80%
Charge Nurse Limited	0	0	0	0	0	196	204	195	595	10.52%
Clinical/Financial	0	0	0	0	0	0	0	0	0	0.00%
Corporate Clinical Manager	0	0	0	0	0	1	0	0	1	0.02%
Director of Nursing	0	3	13	45	23	9	19	11	123	2.17%
LPN	0	9	247	199	226	64	41	30	816	14.43%
MDS Coordinator	0	0	12	4	4	2	0	2	24	0.42%
NP/PA	0	0	0	35	80	66	45	71	297	5.25%
Pharmacist	0	0	6	0	0	0	0	0	6	0.11%
Unit Coordinator	0	0	13	0	0	0	0	0	13	0.23%
Unknown	0	0	2	0	1	0	0	0	3	0.05%
Total NEWRX Scripts	0	88	839	1045	1002	801	981	900	5656	100.00%

Treatment Facility 2	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total	% Total
Charge Nurse	0	0	25	51	32	28	67	56	259	17.35%
Charge Nurse Limited	0	0	0	0	0	0	0	0	0	0.00%
Clinical/Financial	0	0	0	0	0	1	0	1	2	0.13%
Corporate Clinical Manager	0	13	0	0	0	2	0	0	15	1.00%
Director of Nursing	0	51	104	222	228	194	219	161	1179	78.97%
LPN	0	0	0	0	0	0	0	0	0	0.00%
MDS Coordinator	0	0	0	0	0	0	0	0	0	0.00%
NP/PA	0	0	0	0	0	0	0	0	0	0.00%
Pharmacist	0	0	21	0	0	0	0	0	21	1.41%
Unit Coordinator	0	0	0	0	0	0	0	0	0	0.00%
Unknown	0	1	3	1	6	1	5	0	17	1.14%
Total NEWRX Scripts	0	65	153	274	266	226	291	218	1493	100.00%

Both Treatment Facilities	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total	% Total
Charge Nurse	0	76	571	813	700	491	739	647	4037	56.47%
Charge Nurse Limited	0	0	0	0	0	196	204	195	595	8.32%
Clinical/Financial	0	0	0	0	0	1	0	1	2	0.03%
Corporate Clinical Manager	0	13	0	0	0	3	0	0	16	0.22%
Director of Nursing	0	54	117	267	251	203	238	172	1302	18.21%
LPN	0	9	247	199	226	64	41	30	816	11.41%
MDS Coordinator	0	0	12	4	4	2	0	2	24	0.34%
NP/PA	0	0	0	35	80	66	45	71	297	4.15%
Pharmacist	0	0	27	0	0	0	0	0	27	0.38%
Unit Coordinator	0	0	13	0	0	0	0	0	13	0.18%
Unknown	0	1	5	1	7	1	5	0	20	0.28%
Total NEWRX Scripts	0	153	992	1319	1268	1027	1272	1118	7149	100.00%

A.4 Appendix

Description of RxHub Certification Methodology

RxHub's certification process begins with the completion of a trading partner agreement and certification kickoff meeting and ends with successful deployment to production.

RxHub defined the original e-Prescribing transaction set, which includes NCPDP SCRIPT modifications for medication history, NCPDP Formulary and Benefit 1.0, and a specific implementation of X12 270/271 for pharmacy benefit information, along with transaction evolution, RxHub's certification has evolved into a very comprehensive process including the follow phases:

- Planning
- Application education
- Data analysis, workflow, and transaction specification reviews
- Connectivity requirements
- Transaction and connectivity development
- Transaction data integration certification
- Application certification
- Production Installation
- Data loads and distribution

RxHub assigns a senior implementation manager to every customer that incorporates the following roles:

- Project Manager
- Account Manager
- Business Analyst
- Testing Analyst
- Production Support Analyst

RxHub expects every customer to assign resources to the project that fills each of these roles as well. Both RxHub and customer assign account managers to maintain ongoing business relationship.

RxHub provides their customer with project plan templates, detailed implementation guides, predefined test plans, and test data based on product and type of network participant (e.g. point of care vendor, pharmacy benefit manager, and pharmacy). They provide Quality Assurance (QA) testing and certification environments that their participants may utilize on a daily basis. The test and certification environments contain test data that is reflective of what the participants can expect to see once they are in production. RxHub does not allow any Protected Health Information (PHI) in their certification environment. The certification environment allows the participant to validate their connectivity setup, transaction format syntax, processing of response transactions and file processing capabilities.

Once the customer completes the transaction and application certification, the customer is scheduled for production deployment and handoff to support team. The certification team will be reassigned from time to time for recertification as customer application and transaction standards evolve. RxHub follows formal change control process to announce, deploy, and certify all externally facing functionality.

RxHub Processing Performance

This chart demonstrates that the "end-to-end" transaction time through RxHub between the pilot partners, which is noted in the chart Average in seconds for the Total From & To Participants, was less than 1 second on average.

Direction	Transaction	< 1.5 sec	% of Total	< 3 sec	% of Total	> 3 sec	% of Total	Total	Average in seconds
From Participant	270	945	99.0%	955	100.0%	0	0.0%	955	0.333
	CANRX	342	99.4%	344	100.0%	0	0.0%	344	0.199
	NEWRX	1110	99.6%	1114	100.0%	0	0.0%	1114	0.185
	RXFILL (Response)	981	100.0%	981	100.0%	0	0.0%	981	0.061
To Participant	270 (Response)	929	97.7%	941	100.0%	10	1.1%	951	0.193
	CANRX (Response)	339	100.0%	339	100.0%	0	0.0%	339	0.076
	NEWRX (Response)	1113	100.0%	1113	100.0%	0	0.0%	1113	0.074
	RXFILL	981	100.0%	981	100.0%	0	0.0%	981	0.227
Total From & To Participants	270	1874	98.3%	1896	99.5%	10	0.5%	1906	0.526
	CANRX	681	99.7%	683	100.0%	0	0.0%	683	0.275
	NEWRX	2223	99.8%	2227	100.0%	0	0.0%	2227	0.259
	RXFILL	1962	100.0%	1962	100.0%	0	0.0%	1962	0.288

A.5 Appendix

American Society of Consultant Pharmacists – LTC Prescribing Process

As noted in the American Society of Consultant Pharmacists Comments on the e-Prescribing Notice of Proposed Rule Making, the following prescribing process steps occur in the LTC setting:

1. *The facility nurse usually performs the initial assessment of the resident upon onset of a new symptom(s), unless the prescriber happens to be visiting the facility at that time. According to the nursing facility regulations found in the State Operations Manual at Tag F-387, "A physician must see the resident at least once every 30 days for the first 90 days after admission and at least once every 60 days thereafter."*
2. *The nurse contacts the prescriber, whose office is offsite, for appropriate treatment options and subsequent orders. Whether the nurse or prescriber initiates assessment, the prescriber ultimately utilizes resident specific information from the medical chart, which is housed at the facility – not the prescriber's office. Reviewed information includes current medications, medication history, demographics (e.g., weight, height, age), drug allergies and concurrent diagnoses and/or symptoms.*
3. *Orders (prescriptions) are usually received in a verbal or faxed format.*
4. *The nurse enters this order into the resident's medical chart.*
5. *The nurse then faxes or phones in the prescriber's order to the dispensing pharmacy chosen by that facility/resident.*
6. *The dispensing pharmacist conducts a prospective medication review by examining potential drug allergy conflicts, drug-drug and other interactions, and other potential medication-related problems. The pharmacy fills the prescription using the NCPDP Telecommunication 5.1 Standard for claim submission. Messages received pertaining to third party coverage, such as formulary information or prior authorization, are considered by the pharmacy and communicated to the facility and prescriber by phone or fax for resolution. Documentation necessary to fulfill these coverage requirements is usually provided by the facility staff, since they have primary access to the resident's medical chart. Although, prescribers and pharmacy staff are also involved in the process.*
7. *The dispensing pharmacy delivers the medication to the facility where the nurse accepts and notates receipt of the medication. Nursing facilities are required by federal regulation to provide prescribed medications to residents in a "timely manner." Regulations located at Tag F-425 of the State Operations Manual from the Centers for Medicare and Medicaid Services states, "A drug, whether prescribed on a routine, emergency, or as needed basis, must be provided in a timely manner. If failure to provide a prescribed drug in a timely manner causes the resident discomfort or endangers his or her health and safety, then this requirement is not met."*
8. *Prescription renewal is documented by the physician when he/she signs each resident's current orders during the recapitulation process, usually occurring every 30 days. For medications warranting refills, this need is either communicated to the pharmacy by the facility or it is automatically refilled by the pharmacy based on the day's supply of the dispensed medication.*

http://www.ascp.com/resources/policy/upload/ePrescribingNPRMComments.pdf

A.6 Appendix

Facility Characteristics

The table below outlines the characteristics of the four facilities utilized in the pilot.

Characteristic	Treatment Facility 1	Treatment Facility 2	Comparison Facility 3	Comparison Facility 4
Type of Community	Suburban	Rural	Suburban	Suburban
Number of Beds	75	109	94	95
Preferred Choice Pharmacy	Yes	Yes	Yes	Yes
Electronic Medication Order Entry/Clinical Documentation System	Yes	Yes	Only MDS – Minimum Data Set	Only MDS – Minimum Data Set
Short Term Rehab Focus	Yes	No	No	Yes
Traditional LTC Focus	No	Yes	Yes	Yes
Extensive MD/Nurse Practitioner Involvement with Residents	Yes	Yes	Yes	Yes

A.7 Appendix

Successful NEWRX SCRIPT's

The chart below details the number of new orders at the two treatment facilities that were written before the pilot was implemented (May 2006), after it was implemented on 6/26/06, and the new orders created during the remainder of 2006. The chart demonstrates that once e-Prescribing was implemented, it was utilized to transmit almost all of the new orders for the remainder of the pilot.

Analysis of Electronic Scripts	**Electronic Scripts Pilot Started on 6/26/06**								**Total Since**
Treatment Facility 1	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**July**
Total New Prescriptions	1209	1004	1049	1163	1154	963	1151	1005	6485
PCP Total New Prescriptions	1209	1004	1049	1163	1154	963	1151	1005	6485
PCP Non Schedule II New Prescriptions	1045	957	1015	1127	1100	920	1094	953	6209
PCP Total Do Not Send New Prescriptions	96	143	61	36	29	49	26	21	222
PCP Total New Electronic Candidates	949	814	954	1091	1071	871	1068	932	5987
PCP Total Electronic NEWRX Scripts	0	88	839	1045	1002	801	981	900	5568
PCP Percentage Successful Electronic NEWRX Scripts	0%	11%	88%	96%	94%	92%	92%	97%	93%

									Total Since
Treatment Facility 2	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**July**
Total New Prescriptions	523	502	381	480	448	327	395	352	2383
PCP Total New Prescriptions	338	303	229	310	301	248	326	254	1668
PCP Non Schedule II New Prescriptions	299	297	224	300	282	239	317	248	1610
PCP Total Do Not Send New Prescriptions	13	42	63	21	15	12	25	28	164
PCP Total New Electronic Candidates	286	255	161	279	267	227	292	220	1446
PCP Total Electronic NEWRX Scripts	0	65	153	274	266	226	291	218	1428
PCP Percentage Successful Electronic NEWRX Scripts	0%	25%	95%	98%	100%	100%	100%	99%	99%

									Total Since
Both Treatment Facilities	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**July**
PCP Total New Electronic Candidates	1235	1069	1115	1370	1338	1098	1360	1152	7433
PCP Total Electronic NEWRX Scripts	0	153	992	1319	1268	1027	1272	1118	6996
PCP Percentage Successful Electronic NEWRX Scripts	0%	14%	89%	96%	95%	94%	94%	97%	94%

- Total New Prescriptions = new medication orders entered into the Achieve Matrix CPOE application. This includes modified orders, which creates a cancel for the original order and a new order for the changed order.
- PCP Total New Prescriptions = new orders sent to Preferred Choice Pharmacy. Some orders at Treatment Facility 2 went to another pharmacy (via electronic fax) because the resident had a default pharmacy other than PCP. These orders have been removed from the PCP Total New Prescriptions value since these orders were not attempted to be sent using e-Prescribing.

- PCP Non Schedule II New Prescriptions = Schedule II orders cannot be sent using an electronic SCRIPT – so these orders were removed from the PCP Total New Prescriptions.
- PCP Total Do Not Send New Prescriptions = These are orders that are entered into the Achieve Matrix CPOE application by the user to add to the resident's chart, but the user indicated do not send this order to the pharmacy.
- PCP Total New Electronic Candidates = PCP Non Schedule II New Prescriptions minus PCP Total Do Not Send New Prescriptions. This is the net amount of the new orders that are eligible to be transmitted electronically.
- PCP Total Electronic NEWRX Scripts = The number of orders that were successfully transmitted to PCP.
- PCP Percentage Successful Electronic NEWRX Scripts = the success rate of the eRX transmission process.

A.8 Appendix

NCPDP SCRIPT 8.1 Variances

Due to the LTC environment differences, the pilot team made the following variances to the NCPCP SCRIPT 8.1 in the LTC e-Rx study.

Drug Information

Name	Field	Description
Quantity	DRU-020-01	Since the quantity to distribute does not apply to LTC, the Achieve application does not request that a user enter it. Therefore, Achieve would have no applicable value to send in this field. In the SCRIPT transaction, this field will always contain a 00.
Quantity Unit	DRU-020-02	There would never be a quantity unit because a quantity is not sent. If this order is a Profile Order or an order that does not need to be sent to the facility, Achieve places DNF in this field, which stands for Do Not Fill.
SIG	DRU-030-02, 03	The pilot team standardized how this information is placed within this field. This is a concatenation of Amount to Administer, frequency, and special instructions. Field limitations of 140 cause problems with space. There are issues related to the SIG outlined elsewhere in the document, causing the need for Codified SIG.
PRN	DRU-060-01	Since refills are not part of the LTC workflow, this field is used to indicate if this is a PRN order or not. The PRN represents that the medication should be taken AS NEEDED. It does not represent Refills as Needed.

Resident Benefit Information

Name	Field	Description
Medicaid Number	COO-010-01	The Medicaid ID of the resident. If the resident has a Medicaid Id, this id is passed to the pharmacy here.
Medical Record Number	PTT-050	The nursing home assigned medical record number of the resident. Achieve and the Partner Pharmacy agreed to use the resident's Medical Record Number to uniquely identify all residents. This number combined with the facility id creates a unique id for each resident.
Primary Payer	COO-020	The primary nursing home payer type for the resident: IP, MC, MA, C1, ZZ. We are sending a coded value in this field to indicate the primary payer for this resident.
Responsible Party	COO-050	First and last name of the individual listed as the responsible party for the resident.
Responsible Party Address	PTT-060	The Address section of the PTT segment is not used for the resident, since the address of the facility is already known to the pharmacy. This section is utilized for responsible party instead.

Resident Location Information

The pharmacy is required to deliver the medication to a particular location within a facility. This requires transmission of the facility, unit, room, and bed of that resident.

Name	Field	Description
Facility/Unit/Room/Bed	PTT-060-06	Address Line 2 is used to identify the actual location of this resident

The pharmacy software needs to know the naming convention utilized by the facility's software application for this information in order to correctly map it to the pharmacy system prior to implementation.

Additional Information

This is sent in the LTC environment to assist with the identification of a prescriber, nursing facility, and CPOE user that verified the order.

Name	Field	Description
Physician Identifier	PVD-020-01	A common identifier between the nursing facility and the pharmacy is UPIN. For the pilot, both parties agreed to supply this value with every Script. This identifier could be replaced by NPI once it is widely available.
Verifier Identification	PVD-090	At the facility, a SCRIPT may be verified by a nurse. If so, this nurse is listed on the script in this field.
Routing Information	UIB-060-01	Physicians are uniquely identified by the installation and user id concatenated together.

Changed Orders

Name	Field	Description
Original Order Reference	UIH-030-01	Original order ID is sent in the NEWRX and the CANRX message for the change. The NEWRX holds the changes requested. The CANRX holds the earlier order being modified.
Change Type	REQ-030	Changes are classified as Major and Minor. A major change code of C1 is sent if the order is dramatically changed (e.g. dose). A minor code of C2 is sent for minor instruction changes (e.g. frequency).

Discharge Information

Name	Field	Description
Discharge Reason/Date Discharge Codes: D1 = Discharge – Expired D2= Discharge – Return Not Expected D3 = Discharge – All other Reasons	REQ-030	We concatenate the defined discharge code and a discharge date in the following format: Discharge Code "-" and Discharge Date (MM/DD/YYYY)
Order Id's	UIH-020-01	As with any cancel, the facility will send an order id for the resident. This will be a representative order for the resident which helps the pharmacy determine the correct resident.

A.9 Appendix

NEWRX and CANRX SCRIPT Transaction Errors

During the pilot, Achieve tracked the number and types of transmission errors for the NEWRX and CANRX NCPCP SCRIPTS that occurred in their transaction gateway, which was developed to send/receive transactions to/from RxHub. The table below outlines these SCRIPT errors that occurred during the pilot.

Type Of Error	June	July	Aug	Sep	Oct	Nov	Dec	Total Errors	% errors
New Rx's	201	1094	1332	1285	1035	1279	1114	7340	
Cancels	35	395	369	456	406	439	347	2447	
Total Scripts	236	1489	1701	1741	1441	1718	1461	9787	
Sender Not Authorized	8	0	0	1	3	6	3	21	0.2%
Communication Errors	21	165	39	1	0	96	6	328	3.4%
SIG Exceeded 140 Characters	1	30	16	0	0	0	0	47	0.5%
Script Format Error	6	8	0	0	0	0	0	14	0.1%
Total	36	203	55	2	3	102	9	410	4.2%
Percentage in Error	15.3%	13.6%	3.2%	0.1%	0.2%	5.9%	0.6%	4.2%	

Error descriptions are noted below:

Error	Description	Result	Follow-up
Sender Not Authorized	The user sending the prescription has not been registered within the RxHub Network before a Script was sent.	Sender would get a message indicating the user needs to be registered. Achieve support would then register the prescriber.	For the pilot, this registration process is manual; therefore it is possible for a user to forget to request a new user be added. For production, this process will be automated so these errors will not exist. Also, the application will be modified to not allow this transaction to get sent without the registration first taking place.
Communication Errors	The transaction failed to reach its destination due to communication issues between Achieve and RxHub or RxHub and RNA.	Sender would get a resident message indicating the message failed. They would then tell Matrix to fax the message to the pharmacy.	During Pilot, the participants would release new versions of software and make hardware changes. These would cause systems to be down. For production, this process will be more restricted.
SIG Exceeded 140 characters	The NCPDP Script format only allowed for 140 characters for the SIG. If this was exceeded, the transaction failed.	Sender would get a resident message indicating the message failed. They would then tell Matrix to fax the message to the pharmacy.	Matrix was modified to not allow these orders to be sent electronically. Also this indicates a need for Codified SIG.
Script Format Error	The recipient received a Script message that was not the expected format.	Sender would get a resident message indicating the message failed. They would then tell Matrix to fax the message to the pharmacy.	This was an early issue with how the script was built by Matrix. It was corrected and the team has not since seen the issue.

A.10 Appendix

Resident Medication Order Review

1. The resident medication order count was obtained by using the Matrix CPOE software's data to determine the total number of active prescription orders for each resident for these two months.
    a. This gross order count per resident may have contained PRN orders.
    b. This gross order count per resident may have contained duplicate medication orders if a resident had two orders for the same medication (e.g. a medication with both routine and PRN directions).
    c. The gross order count mechanism used was the same for both months.
2. The table below notes the change in resident orders per month for the two months.
    a. There was a 1.54% decrease in the number of active medication orders per resident per month.
    b. There was a 2.39% decrease in the number of residents with 9 or more active medication orders per month.
    c. These slight decreases suggest a possible positive affect on quality and patient safety, but the pilot could not determine what caused these decreases.
    d. The primary reason that the pilot study did not show a more pronounced affect on these measurements was that 95% of the orders were entered into the CPOE system by agents of the prescriber – not the prescriber.
        i. Agents of the prescriber's primary responsibility have traditionally been to accurately record prescriber orders – not to evaluate clinical alerts from the CPOE system.
        ii. Anecdotal feedback indicated that increasing CPOE entry by prescribers is one of the keys to positively affecting the quality of care and patient safety because the CPOE clinical alerts should be presented to the prescriber in order to more proactively affect the resident's medication management.

Resident Order Analysis of Both Treatment Facilities

	May	December	Decrease	% Decrease
Average Active Orders/Resident/month	13	12.8	0.2	1.54%

Number of residents with 9 or more active orders/month:

	May	December		% Decrease
# of residents with 9+ orders	188	198		
total residents	234	254		
% of residents with 9+ orders	80.34%	77.95%		2.39%

A.11 Appendix

Analysis, Results and Discussion

Data Collection Periods

- Baseline: 4/6-5/26 (Pre-pilot)
- Phase 1: 7/25-10/25
- Phase 2: 11/6-12/1

Software Implementation Go Live Dates:

- Phase 1: 6/26
- Interim release of readmission-related feature: 9/8
- Phase 2 : 10/20

Facility Data Analysis

New Orders

New orders incorporated a number of tasks that were diverse including: Delete Order, Enter Order, Review Order, and Sign off order. An analysis model that incorporated number of medications as a covariate was used in the group comparison. A significant group effect (Prob 0.0306) was found with the average time for the Treatment group being approximately 15 seconds longer than the Comparison group.
All of the tasks for new orders were analyzed. For the task Entering Orders there was a significant relationship between the number of medications and time, thus number of medications was used as a covariate in the analysis. A significant facility effect (Prob = 0.0095) was found but no difference was found between groups. Treatment Facility 1 was found have a slightly higher mean time for entering orders than the other facilities. Comparison Facility 4 had the lowest mean time for entering orders. From analysis of the plot of time by facility the amount of time required to enter orders was found to increase positively with the number of medications - yet after 15 medications the time leveled off.

Refills

Scanning of refills took place only in the treatment facilities as part of the e-Prescribing system. A Wilcoxon Rank Sum test was conducted to compare the typical time spent in scanning at the two treatment facilities. Significant differences in typical amount of time for scanning between the two facilities were found with Treatment Facility 1 being higher. This finding was considered in the analysis that follows.
Analysis was conducted to determine if differences in the typical amount of time required for Labeling vs. Scanning across the groups/periods/facilities existed. This analysis required modifications to the initial nested linear model that had been developed because Task (Labeling vs. Scanning) was included in the model. Labeling was done in both Groups, but Scanning was only done in the Treatment group. Thus, a new variable called GroupTask was created for use in the model. Ideally, interaction terms would have been included in this model; however, due to the sparseness of the data this was not possible.
Marginal differences between Facilities in the amount of time required to complete labeling and scanning (Prob = 0.0532) were found. No statistical differences between the treatment and comparison groups for the label/scan task were found. A comparison of the mean and distribution by task and facility indicated that the label task required greater time at Treatment Facility 1 than did the scanning at the same facility. The mean time for scanning at the two treatment sites was less than the mean time for the labeling task at Comparison Facility 3 and Treatment Facility 1 (pre e-Prescribing). Labeling at Comparison Facility 4 has the shortest mean time and probably reflects the limited documentation of this task at the site.

Other Variables

Further analysis was conducted to compare the treatment and comparison groups for time on task using data categories. The small number of occurrences of several of the data code tasks necessitated combining tasks to create categories. The data code tables below show the categories created for the research and their frequency distribution. The distribution of the "time" variable strongly skewed right so a transformation of time to a $\log_{10}$

was used in the analysis. A nested linear model that considered all effects treated as fixed effects, and number of medications as a covariate was used in the analysis process for variables of interest. Analysis also considered differences between facilities (1-4) and groups (treatment and comparison).

Further Categorization of Data Codes

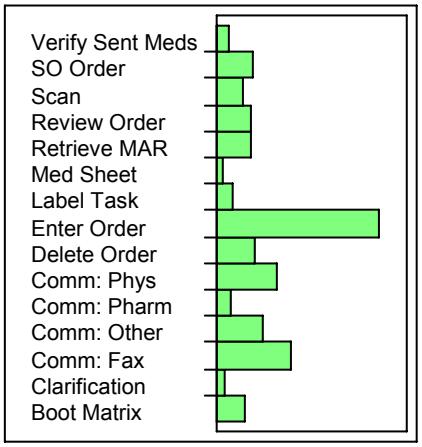
The codes for all of the observed tasks related to medication ordering were reviewed for occurrence. Those codes with a small number of occurrences were combined in meaningful categories. The categories and the codes that comprised the category are as follows:

Categorized code	**Initial task code**
Verify Sent meds	Verify sent meds
SO Order	SO Order
Scan	Scanning: Check Scanning Orders Scanning: Sent order Scanning: Set up Wand hold
Review Order	Accuracy Check: order Review Review order
Retrieve MAR	Retrieve MAR
Med Sheet	Med Sheet in Med Book Print Flow sheet Retrieve Med Sheet
Label Task	Label task
Enter Order	Enter Order MAR Enter Order Matrix Enter Order Med Sheet Update Med Sheet
Delete Order	Delete order MAR Delete order Matrix Delete order Med Sheet
Communication: Physician	Communication: Page Physician Communication: Person Physician Communication: Phone Physician Communication: Written Physician
Communication: Pharmacy	Communication Phone Pharmacy Communication Written Pharmacy
Communication: Other	Communication Person other Communication Phone other Communication Phone order Communication Written other Communication Written TO
Communication: Fax	Communication Fax Order Communication Fax Pharmacy Communication Fax Physician
Clarification	Clarification Person Physician Clarification Phone Clarification Phone Pharmacy
Boot Matrix	Boot Matrix

Further categorization	Data Categories
All communication	Communication Physician Communication Pharmacy Communication Other
Order	Enter Order Delete Order

The distribution of these categorized tasks is presented in the bar graph and frequency tables below.

Task Distributions

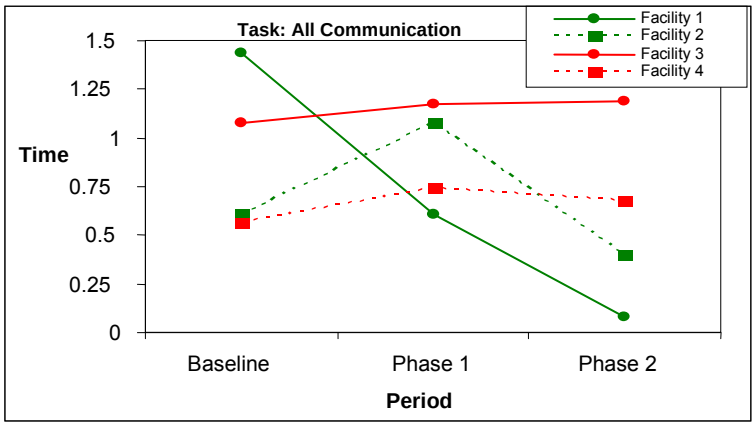


Frequencies

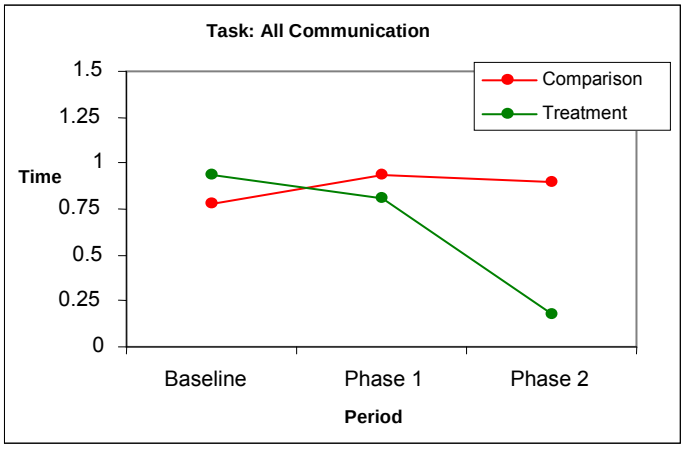
Level	Count	Prob
Boot Matrix	27	0.04874
Clarification	8	0.01444
Comm: Fax	69	0.12455
Comm: Other	42	0.07581
Comm: Pharm	13	0.02347
Comm: Phys	55	0.09928
Delete Order	36	0.06498
Enter Order	149	0.26895
Label Task	16	0.02888
Med Sheet	7	0.01264
Retrieve MAR	31	0.05596
Review Order	31	0.05596
Scan	25	0.04513
SO Order	34	0.06137
Verify Sent Meds	11	0.01986
Total	554	1.00000

Task Category: Communication

This task category combines the time spent on tasks that related to phone, written, or in person communication with pharmacy, physician/NP or other. Analysis indicated that Treatment Facility 1 had a statistically higher average time than other facilities at Baseline yet the average time dropped dramatically from baseline to Phase 2. See the graph below for comparison of facilities.

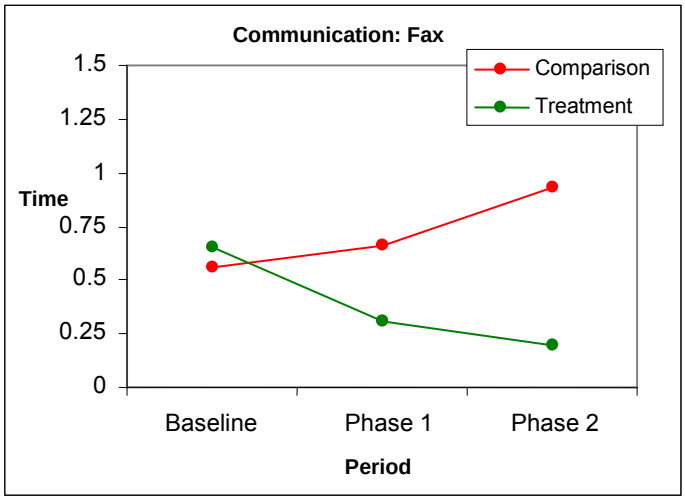


Further analysis of the Treatment and Comparison groups (instead of individual facilities) was completed. The time for the comparison group did not change over time; however, there is a significant decrease in average times for the Treatment group.



Task Category: Fax Communication

Fax communication represented numerous observations at all facilities. The time for communication via fax was not related to number of medications eliminating number of medications as a covariate in the model. Differences between facilities and differences between the Treatment and Comparison groups were found. In addition, the group by period interaction was marginally significant suggesting the effect of group may be different for the different periods. The Treatment group had a significantly lower typical Communication Fax time than the Comparison group at Phase 2. All other differences were not statistically important.



Other Task Categories

No effect of the e-Prescribing system on other task categories that were compared over time between the treatment and comparison groups was found. These task categories included:

- Communication: Other (which includes Communication: Person, Communication: Phone, and Communication: Written).
- Communication: Pharmacy
- Communication Physician
- Deleting orders
- Entering orders
- Reviewing orders
- Verifying orders

Pharmacy Data Analysis

The effect of e-Prescribing on typical amount of time spent for various tasks at the pharmacy was explored. Those tasks with sufficient data for purposes of analysis of changes over time (baseline; phase 1 and phase 2) were: sorting faxes, insurance rejections, new admissions, new/change orders, refill orders.

There was not enough evidence to suggest that the e-Prescribing system affected the typical time spent on any of the tasks. There were several observations worth noting.

1. The number of occurrences requiring fax sorting was reduced after the implementation of e-Prescribing system, with only 2 observations noted in Phase 2 as compared with 7 observations at baseline.
2. There was a moderate reduction at Phase 2 in typical time spent per medication and a reduction in the variation in time spent per medication for insurance rejections. At Baseline (n=4) the mean time was 2.14 minutes (SD=1.37) while at Phase 2 (n=4) the mean time was 1.05 minutes (SD=0.48).
3. There was an increase in time for spent per medication from baseline (n=8; mean = 0.55; SD=0.20) to Phase 1 (n=10; mean 0.74; SD 0.37) and Phase 2 (n=10; mean =0.74; SD 0.24) for new admissions. Aside from the outlier present at Phase 1, the variation is similar across the period.
4. There was a slight decrease in typical time spent per medication and a moderation decrease in the variation in time spent per medication from baseline to Phase 1 and 2 for new/change orders. See table below for means and standard deviations.

Period	n	Mean	Std Dev
Baseline	11	1.18	0.83
Phase 1	15	0.89	0.44
Phase 2	11	1.05	0.59

Further analysis was conducted to determine the effect of number of medications for time spent for the above mentioned tasks. Time spent on task was significantly associated with number of medications in a positive direction indicating that as the number of medication increases so does the time spent on the task (except for the task of insurance rejections). Yet there was no evidence to suggest that the e-Prescribing system has any impact on the relationship that exists between number of medication and time spent on a task.

Satisfaction with e-Prescribing

Research staff members responsible for the timed event data collection also conducted the interview data regarding satisfaction with the e-Prescribing system. Data were collected on one day approximately two weeks following the completion of the observation of timed events at the two facilities in which the system was implemented. Those staff members working on the day of data collection were asked to participate in an interview. Informed consent was obtained prior to the initiation of the interview. Thirteen nursing staff members participated and two pharmacy staff participated. Interview questions focused on the participants level of satisfaction with the e-Prescribing system overall, aspects of the system that facilitated and hindered the medication ordering process and what was/would be helpful to have in the system training.

Nursing Staff Satisfaction

Participants were asked to rate their level of satisfaction with the e-Prescribing system on a scale from 0-10 with 0 being "very dissatisfied" and 10 being "very satisfied". Nursing staff ratings ranged from 0 to 8 with an overall mean of 4.15 indicative of a slightly dissatisfied rating. The ratings by the staff of the two facilities differed with the rating at one facility staff as neutral (5.16) and at the other facility as somewhat dissatisfied (3.28).

A variation in the perspective of the staff was evident in that some described the use of the e-Prescribing system as a hassle and others indicated it made their work easier. There were several reasons cited for their perception of being a hassle. The majority of the reasons were related to the failure and dependability of the system. The system was perceived to add additional steps to the medication order process as verification or follow up on the submission of an order was necessary. There was a sense of being unsure if the e-Prescribing system actually transmitted the order necessitating the follow up. Repetition of the e-Prescribing steps related to system problems was mentioned as requiring more staff time by several who were interviewed. One staff stated "Can't be assured it went and if you're going to get the med….time involved in rechecking". As problems were encountered it was frustrating trying to solve the problems and not knowing if it was a system failure or some aspect of the process that they were doing incorrectly. One staff stated "it's a hassle; we're already putting in doctor's orders in Matrix so why not leave it that way. You do it, then you have to go back and recheck and a lot of time it wasn't working and then I had to make phone calls and call other floors to see what they did to correct it."

Those identifying the use of the e-Prescribing as positive indicated that the system cut out a step of the medication ordering process. Repeatedly, the elimination of the use of the fax machine was mentioned as a positive aspect of the system. Busy signals and jamming were cited as problems of the use of fax machines that were eliminated with the use of the e-Prescribing system. The system was identified as easy to use with little difficulty in learning the process.

Staff participated in the training of the use of the e-Prescribing at different levels. Several attended the training session and found it helpful in learning the use of the system. Several learned the process from those who had attended the training; while others read through the directions in the handbook. Trouble shooting was an area that staff indicated they would like more training on. The handbook was cited as helpful. A respondent indicated that she was able to read the book when a problem arose and was able to problem solve – but it was time consuming. One staff stated "Handbook sometimes hard for people to understand if not computer literate. Like error screens- hard to match screen with hand book instructions." Several indicated that they took notes on the steps of the process and followed their notes. It was recommended to have a document with the steps listed that could be posted for all staff using the process. Several indicated that having all staff trained in the process would have been beneficial as those who did not attend needed to learn from others, or did not even attempt to use. Return demonstrations were noted as a recommendation to the training process.

Pharmacy Staff Satisfaction

Participants were asked to rate their level of satisfaction with the e-Prescribing system on a scale from 0-10 with 0 being "very dissatisfied" and 10 being "very satisfied". Pharmacy staff ratings were a 3 and a 0. These ratings indicated that these two staff members are very dissatisfied with the system.

Both respondents indicated that the e-Prescribing system makes refills easier. Yet they each clarified their responses. One indicated it is easier when it worked and the other noted that refills are easier when they could be processed without required clarification, and had prepopulated demographics for new admissions.

Several aspects of the e-Prescribing system were identified by the respondents as making their jobs more difficult. Processing refills that were rejected was identified as the biggest problem of the system being very time consuming. Combination orders, specifically Warfarin and Prednisone tapers, were mentioned as very difficult to process using the system. Another area that was identified as an aspect of e-Prescribing that made their work more difficult was discontinuation of a medication. Orders would be discontinued in the pharmacy system yet the facility would have the order as active. Lack of explanation for the difference was noted as very time consuming. Submission of an order to discontinue a medication when it should have an order change was identified. There was a lack of trust that orders were entered correctly or completely, especially for new admissions. Other areas identified as making their jobs more difficult were when old notes would stay on the delivery tickets and having reports print with one order per page.

Both staff members participated in training session and indicated that the training session was helpful. The handouts used in the training session were reported as helpful. More information on the meaning of the codes used was identified as information to add to the training. As was true with the nursing staff a "cheat sheet" that summarizes the process to use e-Prescribing would be useful. A suggestion that follow-up training be conducted was provided.

Discussion of Results

Nursing Facilities

Results of this study indicate that a potential for time savings by nursing staff and pharmacy staff through the use of e-Prescribing exists. The short timeframe of this pilot test limits the findings of this study. In order for the three phases of data collection to occur the time period from implementation of the system to the time of data collection was less than two weeks in several instances. The comfort level of the staff in using the system was not established prior to the data collection being initiated. This is reflected in repetition of tasks by the staff as well as in the comments of the staff regarding level of satisfaction with the e-Prescribing system. Staff expressed the felt need to duplicate tasks using the system as they were unsure of the dependability of the system.

Time spent on several tasks was found to be significantly different between the two groups. Total time spent in communication of orders as well as the time faxing medication orders was less for the treatment group as compared to the comparison group. The time difference for faxing an order was on average one minute less for the treatment group as compared to the comparison group. If this time is multiplied by a potential one new order per day for one year the time saved is 365 minutes. Based on the salary of a licensed practical nurse of $11/hour, the cost savings would be approximately $67/year. Yet the savings to the facilities could be significant when considering the number of medication orders received in one day.

There were differences between the levels of satisfaction expressed by the nursing staff at the two treatment sites. These differences reflect the initial dependability of the system. It was apparent that one of the treatment sites had more frustration with the e-Prescribing system and actual time observed reflected system failure more frequently. As the system becomes more dependable the repetition of tasks would be anticipated to decrease and the staff satisfaction would increase. A longer period of implementation of the system before data collection is recommended.

The lack of difference in time spent on order changes between the two groups after the implementation of the e-Prescribing system is not surprising. As physicians were not entering the medications through the system, the nursing staff continued with similar tasks before and after implementation of e-Prescribing. Thus there was no time savings.

Pharmacy

Even though the differences for the comparison and treatment groups for the pharmacy staff time on tasks was not significantly different, there was a decline in the time in fax sorting, processing new admissions, and new orders for the treatment group over time. Again the system was new to the staff, and they were just reaching a comfort level with the system. The staff also related several frustrating aspects of the system that made medications orders more time consuming.

Conclusion

In order to determine the full effects of the e-Prescribing system, a longer period of time to measure effectiveness is necessary. Staff, both nursing and pharmacy, were still learning to use the system at the time of data collection. One of the key aspects of the system that did not occur was the prescribing by physicians and/or other providers. It is imperative that prescribers incorporate e-Prescribing into their every day practices for the full effect on patient safety, quality of care, and efficiency to be achieved.

A.12 Appendix

Pharmacy e-Prescribing Workflow Model

Processing of e-Prescribing Matrix Orders

- Log on to the e-Prescribing program in the RNA Pharmacy System every 30 minutes.
- Review orders in the cue for priority.
- Process orders by resident name.
- Combine duplicate orders manually.
- At end of the e-Prescribing run, print reports for all types of orders (New, D/C, Change, & Void).
- Print labels.
- Match labels to e-Prescribing reports.
- Contact facility nurse to discuss incomplete or unclear orders.

For New Admits in e-Prescribing Cue

- Obtain copy of transfer orders.
- Verify transmission of demographic information and enter any additional information.
- Process orders as noted above.
- Notify facility of any discrepancies between e-Prescribing orders and transfer orders.

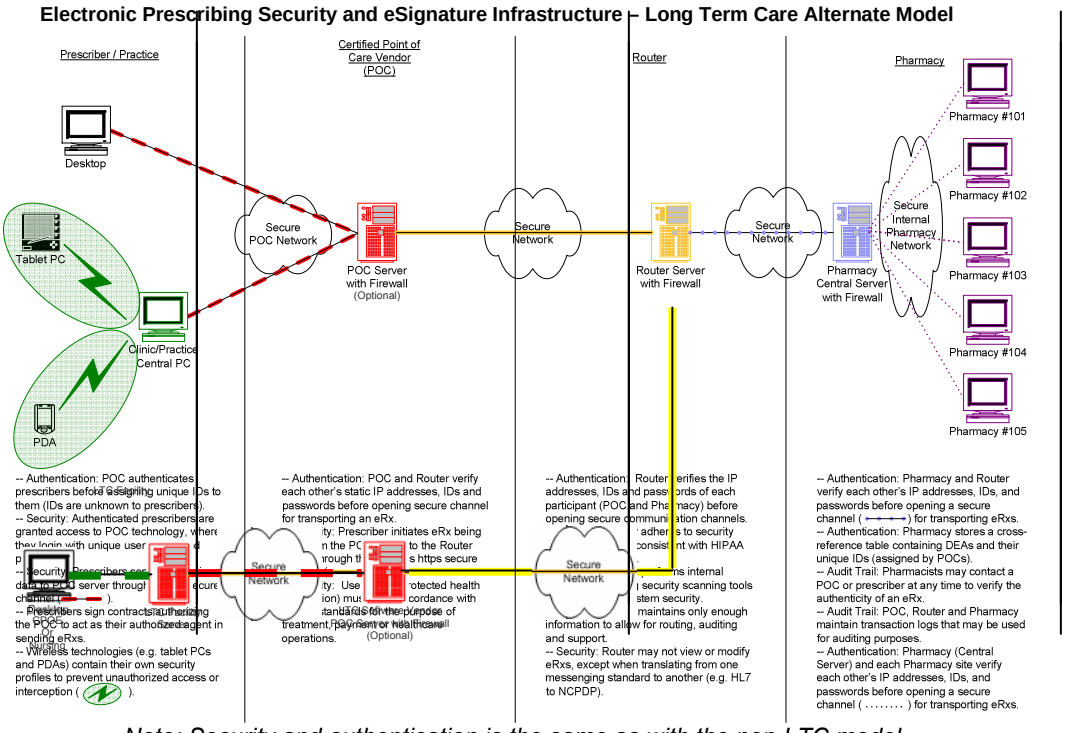
Processing of e-Rx Request Orders (Refills)

- Check e-mail for e-Rx Request messages.
- Print messages.
- Check e-Rx Request in e-Prescribing program of the RNA Pharmacy system.
- Review rejected e-Rx Request refills and process as appropriate.
- Print labels.
- Match processed labels to e-Rx Request message report.
- Process rejected claims to be filled in the future as in the paper system.
- Fill orders as in the paper system.

A.13 Appendix

Electronic Prescribing Security and eSignature Infrastructure – Long Term Care Alternate Model

The diagram below pictorially represents the LTC perspective and how security is invoked in the LTC environment.



Note: Security and authentication is the same as with the non-LTC model

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The diagram shows that the industry has implemented various touch points to mitigate technical risks. The following information provides more detailed explanation of mitigating technical security risk using this e-Prescribing model in the LTC environment.

- *Controlled Substance Routing From Prescriber System – Prescriptions for controlled substances will be routed directly from the prescriber system through the router to the pharmacy. The router will send a parallel message to the facility to update the facility's electronic record.*
- *Controlled Substance Routing From Facility CPOE System – Prescriptions for controlled substances will be routed directly from the facility system through the router to the pharmacy. The router will not send a parallel message back to the prescriber system.*
- *User Authentication - All users are authenticated before being granted access to any application, database or network involved in ePrescribing.*
- *System Authentication – All inter-network communications (Prescriber to LTC Facility, LTC Facility to Router, Router to Pharmacy) are subject to authentication based upon IP address, ID and password authentication prior to opening a secure channel.*
- *Wireless devices accessing Prescriber or LTC Facility networks will do so via secure connections and require user authentication.*
- *Prescriber devices directly accessing a LTC Facility CPOE systems do so via a secure connection and require user authentication before access is granted.*

- *Use of PHI (protected health information) is always done in accordance with HIPAA standards for the purpose of treatment, payment, or healthcare operations.*
- *Router operations adhere to all applicable HIPAA security guidelines.*
- *Router performs internal assessments using security scanning tools for network and system security.*
- *Router maintains only enough information to allow for routing, auditing and support.*
- *Router may not view or modify eRx except when translating from one messaging standard to another (e.g. HL7 to NCPDP)*
- *Pharmacy stores a cross-reference table containing DEA number and their unique IDs (assigned by the POC server).*
- *Pharmacist may contact POC or prescriber at any time to verify the authenticity of the eRx.*
- *Prescriber, LTC Facility, Router and Pharmacy maintain transaction logs that may be used for auditing purposes.*

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