

TeleRIS middleware solution. This project highlights three unique TeleRIS capabilities.

- ❖ Maintaining multiple patient ids and study ids for each patient and order.
- ❖ Maintaining multiple “conversational” interfaces simultaneously.
- ❖ Transforming DICOM through our partnership with DICOM Systems.

This hospital had several goals:

- Service their existing outside contracts more efficiently.
- Establish an infrastructure that made it easy to grow the business by adding additional contracts with outside facilities.
- Allow the hospital radiologists to do the reading for all these current and future outside contracts with the same RIS, PACS and dictation system they were comfortable with at the hospital.

Basically the group wanted all the patient info, orders and PACS studies from all their outside contracts brought into their existing hospital RIS, PACS and dictation systems letting their radiologists seamlessly read studies. This would require the following functionality:

- All the outside facilities’ patients would need to be given MRNs in the group’s internal hospital system.
- All the outside facilities’ orders would need to be given accession numbers in the group’s internal hospital system.
- All the outside facilities’ DICOM studies would need to get into the group’s internal hospital PACS with the new hospital MRNs and hospital accession numbers in the DICOM header of each study not the original MRNs and accession numbers from the outside facilities.
- Signed reports would need to be distributed to the outside contracted facilities via print, fax and HL7 with their original facility MRNs and accession numbers intact.

For the mammography services that the group provided to outside facilities, additional functionality was needed.

- Mammography DICOM studies would need to be identified as they were received and sent into the group’s internal hospital Hologic mammo PACS system (again with the facilities’ original MRN and accession numbers replaced with MRNs and accession numbers from the group’s internal hospital system.)
- When the group’s radiologists made annotations to the mammography study images, the group wanted to return the study with the annotations to the original outside facility. For this return, the original facility MRN and accession number would have to be put back on the DICOM study.

After a long search the group selected the ThinAir Data TeleRIS middleware solution.

The TeleRIS middleware solution consists of the typical TeleRIS single worklist functionality and HL7 integration capabilities and adds to it the following three features.

- Ability to maintain multiple patient IDs for each patient and multiple accession numbers for each order.
- Ability to run multiple “conversational” interfaces simultaneously. In our conversational interfaces, a system sends a “request” to another system to get a needed ID (or multiple IDs) – typically an MRN or accession number. Then upon receiving the “response” containing the requested ID, the system takes some action. TeleRIS can be a requester and/or a responder in a “conversational” interface and can run multiple “conversational” interfaces simultaneously.
- Ability to transform DICOM studies. ThinAir Data has partnered with DICOM Systems to provide an integration which allows our integrated systems to receive DICOM studies, hold them temporarily, change information in the DICOM header and then forward the DICOM studies to various destinations

The resulting workflow of the system looks as follows:

- ✓ The workflow begins when the remote facility either sends an HL7 ADT or order message to TeleRIS.
- ✓ TeleRIS sends a specially formed HL7 message to the group’s internal hospital Epic EMR system “requesting” a hospital MRN for this outside facility patient.
- ✓ The Epic system sends an HL7 ADT message providing TeleRIS with a hospital MRN for that outside facility patient. TeleRIS is now maintaining both the hospital MRN for the patient and the remote facility MRN.
- ✓ The remote facility sends their DICOM study to the DICOM Systems broker (DSB). DCB temporarily holds the DICOM study. (For sites that do not send HL7 ADT or order messages to TeleRIS, the Epic EMR MRN “request” is triggered at this point in the workflow.)
- ✓ DCB sends an HL7 message to TeleRIS containing all the needed data from the DICOM header of the study including the facility MRN and accession.
- ✓ Staff at the remote facility login to the TeleRIS web portal and see the order created by TeleRIS from the DICOM information. Staff validate and confirm the order in TeleRIS adding any additional needed information.
- ✓ TeleRIS sends a specially formed HL7 message to the group’s internal hospital GE RIS system. This message contains the Epic EMR MRN assigned to this patient earlier in the workflow not the remote facility MRN. The message also contains a valid GE RIS exam code which TeleRIS has automatically translated from the exam description selected by the remote facility staff. Each facility sees their own procedure description lists when in the TeleRIS portal.

- ✓ The GE RIS sends a specially formed HL7 order message to TeleRIS providing a GE RIS accession number for this study. TeleRIS is now maintaining both the hospital accession number for the order and the remote facility accession number.
- ✓ TeleRIS sends a specially formed HL7 message to DCB with the hospital MRN and accession. TeleRIS and DCB have maintained separate unique identifiers separate from MRNs and accession to keep orders in sync between our two system.
- ✓ DCB updates the DICOM header of the remote facility's study with the hospital MRN and accession and forwards the study to the group's internal GE PACS where it matches up with the order previously created automatically in the GE RIS by the TeleRIS order message. (For the mammography workflow, DCB automatically identifies mamamography studies by modality and/or procedure description. In addition to the above, DCB forwards the mammography studies to the group's internal hospital Hologic mammography PACS.)
- ✓ DCB sends message to TeleRIS when transfer of DICOM study from remote facility has finished.
- ✓ TeleRIS notifies the GE RIS of study completion so GE RIS can send order to the group's internal hospital Powerscribe system and make the study available for radiologists in the group's internal hospital GE PACS.
- ✓ Radiologists see there remote facilities' orders in the same worklists they have always used and are able to seamlessly read these cases with the same tools and workflow they are familiar with.
- ✓ The group's internal Powerscribe system sends HL7 result message to TeleRIS. TeleRIS posts the report in the portal for remote users to view. These remote users are able to find and view their patients, orders and reports using their own facility MRNs and accession numbers.
- ✓ TeleRIS sends HL7 result messages to the remote facilities. These result messages contain the facilities' own MRNs and accession numbers not the Carle hospital IDs. Autoprint and auto fax distributions also occur, on facility specific letterhead again containing the facility's original MRNs and accession numbers.
- ✓ For the mammography workflow, when radiologists do annotations in the Hologic PACS, Hologic sends the annotated study to DCB. At this point in time, the study has the MRN and accession number of the group's internal hospital systems. DCB sends a specially formed HL7 message to TeleRIS. TeleRIS responds immediately with the a specially formed HL7 message containing the remote facility's MRN and accession for this study. DCB updates the DICOM header of the study with the facility's info and forwards the study back to the original facility.

The middleware system achieves all these steps of receiving, acquiring, maintaining, changing and restoring MRNs and accession numbers automatically. The group's internal hospital staff do not have to manually register these outside patients in the hospital EMR. They do not have to manually enter the outside orders in the hospital RIS.

TeleRIS automatically emails the hospital staff when various events occur – such as receipt of a STAT order from a remote facility, or failure of an order to be validated by staff within a given timeframe or failure of an order to be read by a radiologist with a given timeframe.

While the group's radiologists are able to do all their work within their existing hospital systems, the TeleRIS system provides a single point where the hospital staff can manage all the outside contract work. The robust, custom middleware integration has enabled a platform where the hospital can continue to grow their business seamlessly with no adverse impact on their radiologists.