



# Trauma Outreach Program

## Denver Health | Denver, CO

Denver Health's mission is "Level One Care for ALL." One example of this commitment is demonstrated with its highly successful Trauma Outreach Program. Patients seen initially at outlying facilities requiring vital trauma care are often transported to Denver Health. Thanks to a solution developed through a collaborative effort between Denver Health and Merge Healthcare, one real success of the Outreach Program is realized even before the patient arrives.

Denver Health utilizes medical imaging technology provided by Merge to electronically receive trauma patients' medical images while these patients are still en route to the Rocky Mountain Regional Trauma Center at Denver Health. This allows the trauma team to start evaluating a patient's condition and coordinating a treatment plan before the patient's arrival, saving valuable minutes and enhancing the time-critical nature of trauma care.

### + CUSTOMER PROFILE

- 500 bed integrated public safety net institution
- 5,300 employees
- Level I Trauma Center
- 11 ambulatory clinics
- 12 school based clinics

### + CUSTOMER CHALLENGE

- Expedite transfer of trauma patients
- Facilitate remote analysis of patient's condition when located in non-Level I hospitals
- Reduce delays in transportation of patient
- Standardize how exams are sent and how physicians view images from remote facilities
- Reduce work related to importing studies
- Ensure that DICOM images from non-Merge PACS systems at remote facilities to be seamlessly imported into Denver Health's PACS without manual intervention

### + BENEFITS

- Interfacing with 7 major PACS vendors
- Averaging 500+ studies per quarter utilizing the gateway
- Prevents unnecessary transfers
- Images viable enterprise wide
- Trauma team can plan care before patient arrival
- Time savings eliminates many process steps
- Eliminated duplication of studies/exams

### Challenge

Debra Carpenter, as Trauma Program Manager, is responsible for developing Denver Health's Outreach Program and expanding the availability of Level One trauma care. Ensuring timely access to medical information accompanying patients when they arrive at Denver Health is a key aspect of the Outreach Program. Ms. Carpenter knew one area of improvement dealt with medical images captured at the initial treating hospital, as the films often have to travel between various departments such as the Emergency Department and Radiology.

As a first step, Denver Health implemented technology that would allow it to import medical images digitally using CDs. While transportation of medical images on CD was easier and an improvement over film, this solution still had some pitfalls. Some CDs could not be imported into Denver Health's Radiology PACS system due to compatibility issues between different PACS systems and could not be viewed. This resulted in having to repeat Radiology procedures, which meant lost time, inconvenience to the patient and added medical expense. Additionally, it was soon realized that CDs share similar transportation and handling challenges as film.

After struggling with CD imports, Ms. Carpenter consulted the Denver Health IT department to consider options for improving this process. The trauma team and IT joined forces and pulled together a group led Imaging Informatics Manager, Vince Doyle, to examine how they could use technology to improve the management of medical images for transfer and referral patients. The goal was to streamline the existing process, improve access to images, expedite the transfer of trauma patients and ultimately, improve patient care. More directly, they looked for a way to import outside studies into Denver Health's Merge PACS system while automatically identifying them as outside studies to ensure that data integrity was maintained for Denver Health's patients' images.

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Wade R. Smith, M.D., FACS  
Director of Orthopaedic Surgery, Denver Health

## Finalizing Requirements

Mr. Doyle had a background in PACS and teleradiology and believed there was a better way to address medical images associated with in-transit trauma patients and the unique requirements associated with their workflow. Specifically, Denver Health wanted a solution that would allow DICOM images from non-Merge PACS systems at remote facilities to be seamlessly imported into Denver Health's PACS without manual intervention. While the technology to transmit studies through a facility's VPN network security was nothing new, the question was, “How do you import outside studies, properly identify them as such, maintain data integrity within your PACS, automate as much of this as possible—and here's the catch—do all of this before the patient has physically arrived?”

Different hospitals use different HIS and RIS solutions with disparate medical record number schemes and other exam identifiers. Denver Health considered how images from these outside hospitals could be imported into its production system, particularly when one considers the patient may or may not be transferred to Denver Health. If the patient was indeed transferred, there were potential patient identifier issues with similar medical record numbers belonging to different patients. One option considered was transmitting the study through a VPN directly to a stand-alone workstation dedicated to viewing outside studies. This option was quickly discarded as the reality of expecting Operating Room, Intensive Care Unit, Radiology, and ED physicians to all use the same workstation to view outside images was neither optimal nor realistic.

The second option considered was using a server-based solution that had its own viewing software. The problem with this option was that it would require physicians to log into a second server that was totally independent from the production PACS system. It would also not allow side-by-side comparisons of additional exams performed at Denver Health with the outside exams taken at the remote facility. Due to these drawbacks, this option was also discarded.

Denver Health then set these requirements:

- All outside exams must be imported into the Denver Health Merge PACS, thus available from anywhere within the hospital and utilizing the same interface with which physicians were already familiar.
- Automate a process to maintain data integrity within the PACS system.
- Create internal processes to permanently store the exams if and when the patient is admitted to Denver Health.

## Solution Considerations

Pieces of the solution existed, but the pieces were incomplete. For example, Denver Health had workstations to do quality control or modify patient/exam information, but this would require manual intervention and resources committed to do the work. Mr. Doyle formulated a design plan to not only route these outside studies, but do it in an automated fashion that “massaged” the study information. This ensured the exam was easily identifiable as an outside study and did not compromise data integrity within the PACS.

Mr. Doyle stated his biggest concern was the potential for failing to store the study due to DICOM incompatibilities between PACS vendors or even from the modality vendor. He had to ensure that each and every time these studies were transmitted, that they would store properly within Denver Health's Merge PACS System.



## The Merge iConnect™ Share Solution

As a response to the Denver Health design request, the iConnect Share solution was created. It enables outside facilities to perform direct DICOM transmission of PACS images to the receiving hospital's Merge server, where patient and exam data integrity checks are automatically performed. The images are then auto-forwarded into the receiving hospital's enterprise PACS where authorized physicians are able to view these studies using their existing PACS workstations and the toolsets with which they are familiar.

Studies are transmitted securely across a VPN network and the automatic integrity checks avoid potential overlaps in patient IDs that could occur by combining data from multiple sites. By storing the outside studies in the receiving hospital's PACS system, side-by-side comparison of additional exams with the outside exams are easily enabled. In addition, the solution has the capacity for new studies to be provided back securely and electronically to the referring facility should that option be chosen.

At Denver Health, automated transfer combined with image visualization provided physician's timely access to medical imaging studies performed by outside facilities for quick determinations on patient care. It standardized the process for importing outside facility studies and physician access to images.

## The Results

Today with the Merge iConnect Share solution live and operational, Denver Health already has nine facilities in the Trauma Outreach Program sending medical images electronically. The service has been well received, from not only the referring facilities, but also internally at Denver Health. The new system demonstrates Denver Health's commitment to its referring facilities for the quality of care for their patients.

Denver Health's use of iConnect Share has now gone beyond its initial purpose and is being used in other areas, including Tumor Board. Outside studies used in a weekly Tumor Board meeting for review are now being sent electronically instead of on CD. Denver Health is also exploring the same concept with its TB Clinic, which also reviews exams from outside facilities.

In addition, Denver Health's Cardiology Department often reviews cases with a specific remote facility. The challenge with using the query/retrieve model between the two Cardiology PACS systems was the potential data integrity and similar patient identifier issues. Since iConnect Share already addresses these concerns, Denver Health is utilizing the solution as a middleware between the two Cardiology PACS systems to ensure the studies are properly identified as outside studies and to maintain the data integrity within each hospital's Cardiology PACS.

Wade R. Smith, M.D., FACS, Director of Orthopaedic Surgery stated, "This is possibly one of the most important outreach services we have developed since I have been here at Denver Health."

This new service from Denver Health was made possible by many individuals working cooperatively to problem-solve and benefit the patient, the physician and the respective facilities.

