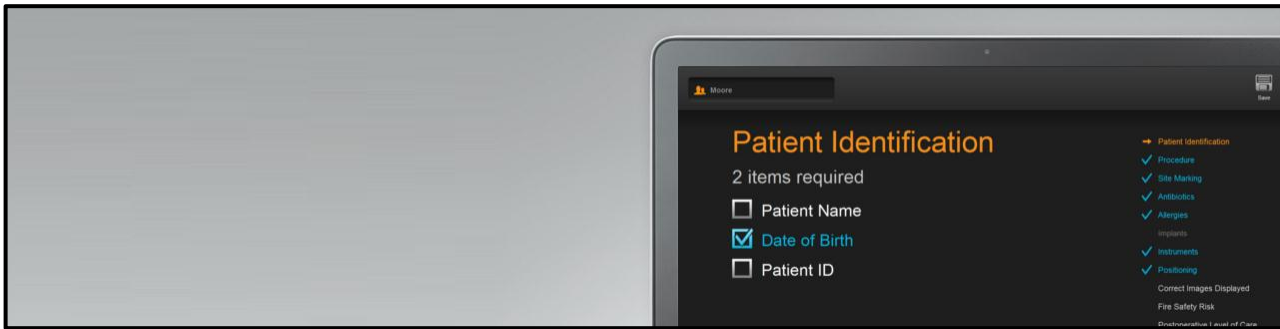


BRAINLAB HL7 INTEGRATION IN OPERATING ROOM SETUPS

Technical White Paper

This white paper describes how to leverage information from hospital information systems to simplify daily routine in the operating room. HL7 messages are used to extract patient scheduling information and simplify entering the correct patient name and ID. Through Brainlab Buzz, the patient demographics are provided to further devices in the OR. Documentation from the surgical procedure (images, screenshots and PDF reports) are provided through HL7 to the hospital information system for centralized documentation storage.



Introduction

Computers in the operating room (OR) have usually had access to either one of two domains of hospital information technology: digital images from radiology (PACS/DICOM) or administrative information from the hospital information system (OR scheduling, admission/discharge, billing and lab order management).

In the second domain (hospital information system) HL7 (Health Level 7) is an important component. HL7 is a standardized interchange format for electronic health information. It is also the name of the standardization organization for HL7. Messages in HL7 format transfer data throughout the hospital with administrative data, billing and lab results.

Brainlab has up to today been connected to the digital images from radiology. Now, Brainlab is providing connections to the hospital information system to increase efficiency and convenience in the OR both before and after the procedure:

- Enter Patient Record – making patient management easier
- One Patient for all Devices – extending easy patient management to non-Brainlab devices
- Clinical Documentation – simplifying access to documentation generated by Brainlab or other devices in the OR

Enter Patient Record

A frequent source of errors in the OR is entering patient demographics (name, ID and birth date). Sometimes it is even necessary to enter it multiple times, e.g. at the ultrasound, C-arm and navigation system. How can entering a patient record in the operating room be improved? Ideally, by eliminating it completely. No matter how fast entering a name or searching a database is, it is not faster than immediately selecting a patient out of a short list.

If an electronic scheduling system for the operating room is available, it can provide the information required to simplify patient name entry. In the scheduling software, nurses or administrative personnel schedule patients for each OR. This is usually done on computers outside the OR, e.g. in preparation for next day's surgeries. Typically a scheduling system stores patient ID, patient name, birth date, scheduled operating room as well as date and time for the procedure.

Through HL7 messaging a device in the OR, e.g. surgical navigation system, can be provided with this scheduling information. It is sufficient for the HL7 message to contain patient demographics and OR identifier. Alternatively, hospital servers (physical or virtual servers) can receive the scheduling information for ORs and forward it to devices. As soon as the devices in the OR are online, they display the scheduled patients for selection by the OR staff. If a surgery is rescheduled, the event-based HL7 messages are re-sent and provide the devices in the OR with the most recent scheduling information.

Brainlab devices integrate via HL7 messages to enable this. Configuration is straight-forward. In cooperation with the hospital IT, a common message format is defined. The Brainlab HL7 receiver is configurable to most message variants and usually hospital standard messages can be used. Hospital IT and Brainlab agree on the server that shall receive the HL7 messages. Test messages are sent to verify the connection before enabling the live connection to the OR scheduling system. The Brainlab HL7 receiver can be installed on virtual hospital servers.

In case of a failure in the HL7 transfer, the Brainlab devices revert to a fail-safe normal patient search mode. As soon as the HL7 communication is re-enabled, the preselection becomes active again.

TODAY'S PATIENTS	
DOE, JOHN	ID: 1564324189
DOE, JANE	ID: 1564324488
DEMO, JOHN	ID: 1564342333
DEMO, JANE	ID: 1233432455

Figure 1: Selecting Patient in the OR from a List

One Patient for all Devices

With documentation generated by many devices in the OR (and more demographics entered), maintaining consistency cause high costs. Patient reconciliation is a time-consuming and tedious activity. In the OR, demographics should automatically be consistent and correct for any reports, images or videos created during the procedure.

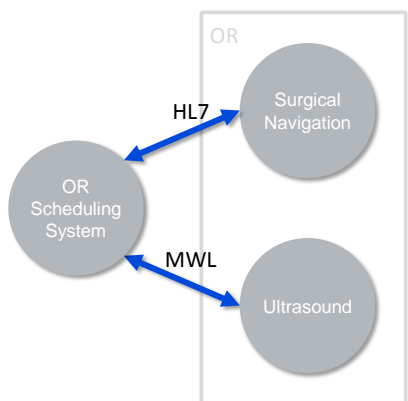


Figure 2: Different Protocols for Transferring Patient Demographics

As detailed in the previous section, an electronic scheduling system for the operating room can provide the information required to select a patient from a list. This information can be used whenever new screenshots, reports or videos are created. Fortunately, it is not required to configure all of them as HL7 receivers to take advantage of the scheduling information across all devices in the OR.

Two protocols are available to send patient demographics in the OR: HL7 and DICOM Modality Worklist (MWL). HL7 is used by hospital information systems. MWL has its origin in worklists provided to imaging modalities (e.g. providing CT scanners with patient lists) but can also be used to transmit patient demographics. MWL has a slight advantage in that it is more standardized than HL7. Therefore it requires less customization.

Some devices in the OR, e.g. operating room microscopes, do not provide HL7 interfaces and cannot communicate directly with the OR scheduling system. However, they may provide DICOM MWL interfaces. To bridge the gap between OR scheduling systems and these devices, interface engines can be used. They provide MWL to devices in the OR with patient scheduling information.

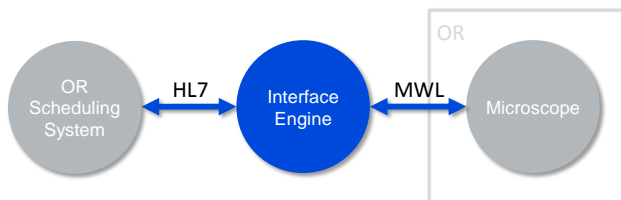


Figure 3: Using an Interface Engine to Translate HL7 to MWL

Alternatively, one device in each OR can act as master modality worklist patient record keeper. All other devices in the OR use MWL interfaces to retrieve the patient demographics from the record keeper. The record keeper provides a worklist that contains only a single patient, thereby making selection even easier.

Brainlab Buzz and Brainlab Server software provide solutions for small and large multi-OR scenarios. The Brainlab HL7 receiver translates HL7 scheduling messages to OR-specific modality worklists. On Brainlab Buzz, the information hub in the OR, a patient is selected in the Buzz user interface. Brainlab Buzz then provides a modality worklist server that contains a single patient. Other devices in the OR need only to establish a connection with Buzz to retrieve the current patient's demographics.

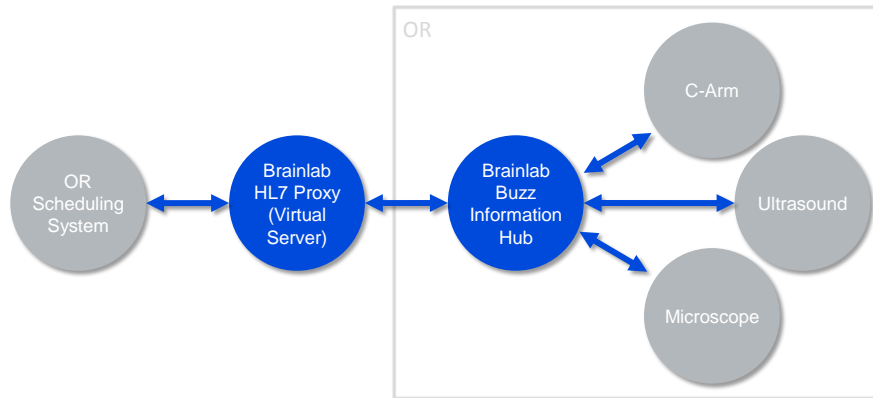


Figure 4: Brainlab Buzz and Brainlab HL7 Proxy Translate HL7 to OR-Specific MWL

OR documentation

The OR is almost unique in that a single procedure generates data from a vast amount of equipment and personnel: patient verification steps, anesthesia documentation, allergies, tissue management, disposables and equipment management, image scans, timings, medications, photos, screenshots, PDF reports and videos. Faced with the task of storing this information digitally most hospitals turn to the hospital information system.

Brainlab provides a solution for storing image data, screenshots and PDFs generated with Brainlab devices in DICOM format. Going forward, Brainlab plans to enable its devices to receive HL7 messages with information on the patient and the OR session (e.g. ADT messages) and use this information to store back OR documentation. At the end of the procedure, the Brainlab device can store image data, PDFs and videos to a defined storage location in either DICOM or a native format and notifies the hospital information system with a new HL7 message. (Available today with the Brainlab application Checklist.)

Brainlab Buzz can act as a DICOM image receiver in the OR. Images or screenshots can be sent from other devices (e.g. operating room microscopes) to Brainlab Buzz and forwarded to the Brainlab server. Thus, it is sufficient to integrate Brainlab with the hospital information system to automate the documentation of all image-generating devices in the OR.

Summary

Brainlab server and Buzz provide scalable and simple solutions to leverage digital OR information with HL7. They make daily routine for OR personnel easier and more efficient, improve documentation quality, and provide a central information hub in the OR.

Glossary

ADT – Admission, discharge and transfer message. A common HL7 message type.
 DICOM – Digital Imaging and Communication in Medicine. A standardized format for sending and storing medical images.
 HIS – Hospital Information System. A computer system that manages medical and administrative information in a hospital.
 HL7 – Health Level 7. Interchange format for electronic health information
 MWL – DICOM Modality Worklist. Format for providing a worklist through DICOM.
 ORM – Order Management. A further HL7 message type.
 PACS – Picture Archive and Communication System. A computer system for storing and viewing medical images.