

Useful Definitions for Ultrasound Workflow and Emerging Technologies

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Admit, Discharge, Transfer (ADT) System

A patient administration system that houses important identifying information including full name, date of birth, medical record number, and contact information. This information can be shared with ultrasound machine worklists or middleware applications. The ADT can be used to create an encounter-based ordering workflow system for POCUS studies.

Capacitive Micromachined Ultrasound Transducer (CMUT)

A microelectronic mechanical system that converts electrical energy into ultrasound waves. In contrast to traditional piezoelectric transducers, CMUTs utilize changes in capacitance to generate sound waves and receive returning echoes. CMUTs are cheaper to produce, occupy less physical space within the probe, and have a larger fractional bandwidth than their piezoelectric counterparts.

Computerized Physician Order Entry (CPOE)

An application that allows users to enter orders that communicate with the EMR, RIS, pharmacy, and POCUS middleware. The CPOE can be used to create an order-based workflow for POCUS studies.

Digital Imaging and Communications in Medicine (DICOM)

A standard file format and medical directory structure for healthcare imaging. Each DICOM file includes the recorded images along with other data, including patient identifiers, study date and time, hospital, department location, and which ultrasound machine was used. Images are transmitted from the ultrasound machine to middleware applications as DICOM files.

Health Level 7 (HL-7)

A set of international standards for the transfer of clinical and administrative data between healthcare software applications to simplify interoperability. The 7 in HL-7 refers to the seventh layer of the open Systems Interconnection (OSI) model, the “application layer”. Electronic Medical Record (EMR), PACS, and middleware applications communicate patient data and requests to one another via HL-7 communications.

Hospital Information Systems (HIS)

A comprehensive information system designed to manage and facilitate a hospital’s medical, administrative, financial, and legal processes. The HIS is composed of multiple software elements including the electronic medical record (EMR), computerized physician order entry (CPOE), radiology information system (RIS), picture archiving and communication system (PACS), and middleware

Lightweight Directory Access Protocol (LDAP)

An industry standard vendor neutral application protocol for accessing directory information services. This protocol allows various software applications to pull information from a centralized directory of user information, letting providers access software from different vendors (the ultrasound machine, middleware, EMR, ect) using a single username and password.

Middleware

A PACS system designed to support point of care ultrasound workflows. Middleware applications communicate with ultrasound machines, the hospital PACS system, and the EMR to facilitate image archival and report generation. Middleware also supports quality improvement review, archival of educational studies, and provider tracking for credentialing.

Observation Result (ORU)

A HL-7 communication that transmits observations and results (including ultrasound reports) from a producing system (the ultrasound machine or middleware) to an ordering system (a CPOE or EMR).

Order Entry (ORM)

A HL-7 communication that transmits information about an order from the ordering system (CPOE or EMR) to the producing system (ultrasound machine) and/or other applications (Middleware).

Picture Archiving and Communication System (PACS)

A digital storage repository for hospital imaging received from multiple modalities including CT, MRI, and ultrasound, these systems generally do not have a mechanism for storing educational non-diagnostic studies or performing quality improvement review. Middleware systems can transfer ultrasound images to the PACS for review by other providers throughout the hospital who may not have access to the middleware application.

Radiology Information System (RIS)

An information system designed to manage and facilitate patient registration, scheduling, worklists, result documentation, and result transmission for the radiology department. This RIS is part of the larger HIS and works in tandem with the EMR and PACS software. In order to document POCUS results in the EMR or PACS, hospital workflows may require the patient to be registered and scheduled through the RIS.

Regular Expression (RegEx)

A sequence of symbols or characters expressing a pattern that is searched for within a longer block of symbols or characters. Barcode scanners use regular expression patterns to pull information from hospital barcodes, which can be used to auto-populate patient identifier fields on the ultrasound machine.