

emtelliPro[®] for Clinical Applications

Point-of-Care Insights for Safer, Faster Care

The emtelliPro Natural Language Processing (NLP) engine easily integrates with point-of-care clinical applications to uncover insights buried within text-based documents and equip care providers with the tools and knowledge needed to improve the safety, quality, and efficiency of care delivery.

Deep Clinical Insights

Using advanced NLP, emtelliPro analyzes clinical information and scanned documentation within the EMR to deliver relevant and actionable clinical knowledge in real time.

Faster, Simpler Chart Review

Build a variety of search and visualization tools that enable care providers to quickly review the patient chart, supporting more efficient and effective treatment planning and monitoring:

- Quickly search or sort the patient record using narrative queries (e.g. “does Mrs. Smith have cancer?”) or according to diagnostic terms, synonyms, and codes to easily locate clinical indicators, diagnoses, and comorbidities
- Easily compare clinical conditions and cross-specialty findings in a single, easy-to-navigate view to identify medical correlations
- View the complete patient history in a timeline that provides an at-a-glance view of relevant tests, diagnoses, and their temporal relations

The screenshot shows an 'Inbox' interface with a date filter for '2020-03-07'. It displays a list of patient records with highlighted abnormal findings:

- 2176-06-28: Isabelle White 76 F, CT HEAD W/O CONTRAST, Radiology. **CRITICAL: putaminal hemorrhage**
- 2176-06-25: Isabelle White 76 F, CT C-SPINE W/O CONTRAST, Radiology. **ABNORMAL**
- 2176-02-09: Alanna Stuart 65 F, CT CHEST W/O CONTRAST, Radiology. **CRITICAL: pulmonary edema**
- 2176-01-25: Alanna Stuart 65 F, CT CHEST W/O CONTRAST, Radiology. **ABNORMAL**
- 2176-01-24: Alanna Stuart 65 F, CT CHEST W/O CONTRAST, Radiology. **ABNORMAL**

The detailed view on the right shows the 'IMPRESSION Section Abnormalities' table:

Finding	Sentence	Diagnosis
putaminal hemorrhage	Right putaminal hemorrhage.	disorder

Below the table, the 'Full Report' section includes:

- *ABNORMAL!**
- INDICATION:** Fall, hit head. Rule out bleed.
- FINDINGS:** In the right putamen, there is a round 1.0 cm hyperattenuating lesion consistent with hemorrhage. It does not cause significant mass effect. The ventricles are normal. No other site of hemorrhage is seen. Grey/white matter differentiation is preserved. Brain volume is normal.
- The orbits are normal. No fracture is seen. Soft tissue swelling overlies the frontal bone, consistent with a small subgaleal hematoma.
- IMPRESSION:** **Right putaminal hemorrhage.**

This 'smart inbox' app demonstrates how emtelliPro can be used to highlight abnormal findings and follow-up recommendations in text-based diagnostic reports, helping providers read these reports more quickly and accurately, potentially avoiding medicolegal issues from missed diagnoses.

Elevate Quality and Training

Automate analysis and tracking of quality-based indicators within medical records and reports with specialized tools that can be used as the basis of, or to enhance quality and continuous improvement programs:

- Proactively flag discrepancies between admission reports, consult notes, treatment plans, discharge diagnoses, etc. to support quality-based review and continuous improvement
- Easily analyze data by searching for and extracting reports containing relevant clinical terms, synonyms, abbreviations, and codes
- Simplify resident and fellow training programs by automatically tracking condition or procedure based metrics against defined targets in a consolidated trainee dashboard

Radiologist Positive Cases per Diagnosis for CT & MR Studies									
CT Studies: 518 MR Studies: 546									
RADIOLOGIST		Alvina Smith	Andrew Glasco	Troy Weisnat	Lorenzo Okune	Jameson Gerhd	Chaya Kemmerl	Myrtle Stollenb	Jerrold Schmek
Total Cases		111	101	80	95	110	118	97	127
Training Year		PGY-2	PGY-2	PGY-2	PGY-3	PGY-3	PGY-3	PGY-4	PGY-4
Chest	Target								
Pleural Effusion	10	5	2	7	2	4	4	3	10
Pneumomediastinum	5	0	0	0	0	0	0	0	0
Pneumonia	50	3	1	0	2	0	3	3	0
Pneumothorax	6	2	1	0	0	0	0	1	1
Pulmonary Embolism	10	1	0	0	0	0	0	0	0
Chest Totals		11	4	7	4	4	7	7	11
Abdomen	Target								
Appendicitis	50	0	0	0	0	0	0	0	0
Ascites	10	0	1	2	4	1	3	2	3
Diverticulitis	20	0	0	0	0	2	0	0	0
Ischemic Colitis	5	0	0	0	0	0	0	0	0
Hydronephrosis	20	0	0	0	0	1	0	1	1
Kidney Stone	5	1	0	1	2	2	0	1	0
Inguinal Hernia	10	0	0	0	0	0	0	0	0
Abdomen Totals		1	1	3	6	6	3	4	4

The emtelliSuite Trainee Scoreboard illustrates how emtelliPro could be used by academic departments to enable competency-based training by automatically tracking the number of actual diagnoses (rather than just counting the number/type of exams) seen/made by the trainee to improve educational outcomes and ensure that knowledge “blind spots” are avoided.

Automatic Data Curation

Structure EMR text data in real time to eliminate the effort and error associated with manual record review and empower physicians with a more actionable patient chart:

- Proactively highlight and prioritize abnormal terms, actionable diagnoses, follow-up recommendations, and incidental findings
- Automatically extract and incorporate structured data from faxed orders and requisitions into the patient record
- Automatically curate key indicators from clinical or encounter notes into the problem list and patient history

DATE	FINDING	REPORT TYPE	REPORT DESCRIPTION	REPORT ID	REPORT SECTION	DICTIONARY	
10	2141/10/28	pulmonary edema	Radiology	CT CHEST W/O CONTRAST	2222222	IMPRESSION	SNOMED-CT
11	2141/11/18	pyelonephritis	Radiology	CT ABDOMEN W/CONTRAST	3333333	IMPRESSION	SNOMED-CT
12	2140/08/25	sle	Radiology	CT HEAD W/O CONTRAST	4444444	IMPRESSION	SNOMED-CT
13	2142/06/01	small-bowel obstruction	Radiology	CT HEAD W/O CONTRAST	8888888	IMPRESSION	SNOMED-CT
14	2140/07/19	subarachnoid hemorrhage	Radiology	CT HEAD W/O CONTRAST	5555555	IMPRESSION	SNOMED-CT
15	2141/12/25	subcutaneous hematoma	Radiology	US ABD LIMB, SINGLE ORGAN	9999999	IMPRESSION	SNOMED-CT
16	2139/10/09	thrombosis of the svc	Radiology	CT PELVIS W/CONTRAST	9898988	IMPRESSION	SNOMED-CT

The emtelliSuite Clinical Helper demonstrates how emtelliPro can analyze EMR data in real-time to automatically curate relevant indicators into the patient history and problem list while proactively flagging actionable findings for physician review.

Endless Possibilities for Clinical Apps

The emtelliSuite platform provides a diverse collection of tools, sample code, and apps that demonstrate the power and potential of medical NLP to simplify and accelerate integration with the emtelliPro NLP engine, allowing technology partners to easily augment and extend the capabilities of the EMR and other clinical applications.

Clinical Summary Tools



- **Clinical Helper** - demonstrates how emtelliPro can analyze EMR data in real-time to automatically curate relevant indicators into the patient history and problem list while proactively flagging actionable findings for physician review



- **Clinical Timeline** - showcases how emtelliPro can provide a complete, at-a-glance timeline of the patient history including clinical tests and diagnoses



- **Clinical Dashboard** - visualizes how apps could leverage emtelliPro output to create a unified, easy-to-navigate view of all of a patient's conditions including a diagnostic timeline; family, medication, and procedure histories; disease categories; and known conditions

Search Tools



- **emtelliSearch** - see how emtelliPro can intelligently search for diagnoses, conditions, and procedures in a patient's chart, no matter how large or detailed



- **Comparison Search** - shows how emtelliPro can be used to allow users to search for multiple diagnoses or conditions within the same patient, to identify cohorts of patients for further research or evaluation



- **Category Search** - demonstrates how emtelliPro can enable searching across logical groupings of disorders, such as 'Cancer', 'Trauma', or 'Mental Illness'. When integrated with a medical voice recognition (VR) interface, Category Search enables speech-driven queries using such as "Has Mr. Smith ever had cancer?"

Quality Assurance Tools



- **Follow-Up Detector** - highlights how emtelliPro can be used to automatically flag actionable recommendations or incidental findings from within diagnostic reports to ensure timely adherence and follow-up



- **Delta Analyzer** - showcases how emtelliPro can be used to look for concordant or discordant diagnoses between pairs of related reports - e.g. a surgical report vs a pathology report, or an emergency department radiology report compared with a discharge summary - to evaluate provider performance against a gold standard



- **Trainee Scoreboard** - illustrates how, using emtelliPro, academic departments could move to competency-based training by automatically tracking the number of actual diagnoses (rather than just counting the number/type of exams) seen/made by the trainee to improve educational outcomes and ensure that knowledge "blind spots" are avoided

DATE	PATIENT ID	DOCUMENT TYPE	SENTENCE	REASON	PROCEDURE	TIMEFRAME	
8	2019-09-02	998309	Radiology: CT	Followup CT in 2-16 months to document resolution is recommended and to exclude either a chronic infection or coexisting bronchoalveolar cell carcinoma.	carcinoma, infection	CT	2-16 months
9	2018-11-27	755279	Radiology: CT	In absence of known primary malignancy, recommend three month followup CT scan to confirm stability.	malignancy	scan	three month
10	2019-04-03	159445	Radiology: CT	As the patient is high risk, with a prior primary malignancy and emphysema, follow-up chest CT in 6 months is recommended, alternatively a PET-CT may be performed.	emphysema, malignancy	chest CT	6 months
11	2019-08-26	745112	Radiology: CT	Given patient's high-risk status of emphysema, a CT chest in 3 months after drainage of right pleural effusion is recommended for further evaluation.	emphysema, pleural effusion	CT chest	3 months after
12	2019-08-29	699799	Radiology: CT	3. Stable nodules including a 7-mm nodule that requires a one-year follow-up examination in 2019-4-27 to confirm two-year stability.	nodule, nodules	examination	one-year

The emtelliSuite Follow-up Detector demonstrates how emtelliPro easily identifies follow-up recommendations in diagnostic reports, and structures them for ease of use in applications to help prevent 'lost-to-followup' events with patients.

Empower your EMR with Next-Gen Technology

emteLLiPro's deep learning-based NLP technology can be easily integrated into analytics, EMR, and other clinical applications to enable identification, extraction, and correlation of information from unstructured orders, reports, notes, and scanned documents to unlock insights hidden within discrete and narrative data elements.

Under the Hood



- Process all types of medical text with high precision and recall, aided by our deep learning models that parse the often-confusing text of medical imaging reports



- Extract and codify medical terms using standard or custom ontologies (e.g. SNOMED, RadLex, MEDCIN, etc.)



- Summarize and sort diagnoses from clinical reports by ontology, diagnosis, diagnostic category, report date, and report type or segment



- Intelligently search for diagnoses within a single patient's chart or from an entire patient population of EMR records

Straightforward Integration with I.T. Systems

- Vendor-agnostic; compatible with multiple data sources including reports stored in databases, or on disk as text files or PDFs
- Ready for secure cloud-based or on-premise deployments
- Multiple SDKs, including Python, Java, C#, and PHP for integration with apps and existing systems
- Client software that automates post-processing ETL and allows report processing and database population with a single command
- Supports nearly all popular relational databases for storage of emteLLiPro output
- Highly secure; HIPAA BAA option for cloud-based processing

Easy to Use Development Tools

- The emteLLiPro Visual Client allows users to visualize the output of emteLLiPro, seeing the relationships between words and identified annotations and assertions
- The emteLLiPro Database is a highly normalized, RDBMS-based database that simplifies app creation or BI software usage using well-known SQL

The emteLLiPro Visual Client gives users a graphical view of the emteLLiPro output from a single report, helping understand the entities, assertions, and relations identified during processing.