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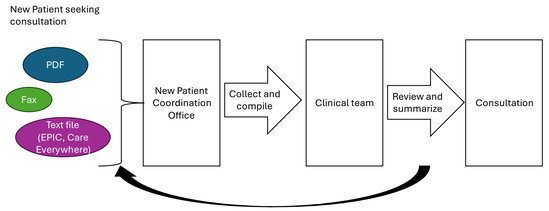
Artificial Intelligence (AI)-Generated Electronic Medical Record Summarization in Breast Oncology

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BACKGROUND

Current workflow



- Pre-charting for oncology patients requires manual review of electronic medical record (EMR) documentation
- EMR documents can exist in various formats, especially if patient has had workup at an outside institution
- Review of outside records can be time consuming
- Use of AI to summarize pertinent oncology components may enhance the process of pre-charting
- Goal: Develop and clinically validate an AI agent to write history of present illness (HPI) summaries of patients with breast cancer

METHODS

- Text recognition technology + Retrieval-Augmented Generation (RAG) + generative AI (GPT-4o)
- Prompt engineering to guide GPT-4o in creating oncology-specific summaries
- AI generated HPI graded on 5-point Likert scale (human HPI as ground truth): clarity (organization of information), contextual relevance, accuracy of information, completeness of information (HPI contains key information that oncologists would anticipate from human HPI)

Usual Workflow

- 50 consecutive breast cancer patients
- Outside records compiled as single PDF
- Human generated HPIs using PDF

versus

Test Workflow

- Same PDF records as usual workflow
- AI generated HPIs using PDF
- Two breast surgeons compare human vs AI generated HPIs

RESULTS

- Overall clarity and relevance of the AI HPIs were high
  - Average clarity 4.01
  - Average relevance 3.87
- AI accurately stated pt age in 94% of HPIs
  - Discrepancies attributed to birthday timing since initial workup
- All patients had a mammogram, 86% had an US, and 36% MRI
- Accuracy of imaging report summaries varied by modality (Table 1)
- Among the 85 biopsies, the biopsy modality was missing in 39.8%;
  - AI HPI stated 'core biopsy' rather than specifying imaging method of biopsy
- Two HPIs misrepresented past medical history.
- Among 12 patients requiring additional workup, 41.7% of AI HPIs appropriately identified pending studies.

Figure. Example of AI Generated History of Present Illness Summary

HISTORY OF PRESENT ILLNESS:
[redacted] is a [redacted] Age [redacted] postmenopausal woman presenting for evaluation of newly diagnosed left breast cancer. Diagnosis confirmed via stereotactic biopsy on 9/30/2024 revealed poorly differentiated invasive ductal carcinoma (IDC), grade 3, ER-/PR-/HER2 positive, with associated high-grade ductal carcinoma in situ (DCIS), grade III, and calcifications. Family history includes breast cancer in multiple paternal relatives: grandmother, three aunts, and a niece. No prior breast cancer treatments, including radiation therapy, endocrine therapy, or chemotherapy, are documented. Surgical consultation is pending [redacted]t.pdf, pages 5, 16, 17, 18, 19, 22].

Reference page and file listed for ease of verification

IMAGING:
[redacted] Date [redacted] Bilateral Screening Mammogram: Indeterminate calcifications in the upper outer anterior left breast. Right breast and bilateral axillae unremarkable [redacted] Chart.pdf, pages 22–23].
[redacted] Date [redacted] Left Diagnostic Mammogram: Indeterminate pleomorphic calcifications spanning 2.7 cm in the anterior upper outer left breast [redacted]t.pdf, pages 20–21].
[redacted] Date [redacted] Bilateral Breast MRI: Clumped segmental nonmass enhancement measuring 4.5 x 4.1 x 1.8 cm in the upper outer quadrant of the left breast, correlating with biopsy-proven malignancy. Linear nonmass enhancement extends posteriorly to the nipple-areolar complex, measuring 3.3 x 1.9 x 0.7 cm. Biopsy clip seen at the superior aspect. Recommendations for second look ultrasound or MRI-guided biopsy if no sonographic correlate is found. Right breast and axillae are unremarkable [redacted] Chart.pdf, pages 11–14].

PATHOLOGY:
[redacted] Date [redacted] Right Breast US-guided Core Biopsy: Benign fibrocystic changes with focal calcifications. Post-procedure mammogram confirmed Hydromark T3 clip placement [redacted] Chart.pdf, pages 24–27].
[redacted] Date [redacted] Left Breast Stereotactic Core Biopsy: Poorly differentiated ductal adenocarcinoma, grade 3, ER-/PR-/HER2 positive, with high-grade DCIS (grade 3) and calcifications. Post-procedure mammogram confirmed Hydromark T4 clip placement [redacted] Chart.pdf, pages 5–6, 16–19].

GENETICS:
Family history includes paternal grandmother diagnosed with breast cancer at age 30, niece diagnosed at age 42, and multiple paternal aunts with breast cancer. A paternal aunt also had uterine cancer. Genetic counseling conducted on 10/09/2024; genetic testing results not yet documented [redacted] Chart.pdf, pages 22, 31, 33, 35, 37].

DETAILED MEDICAL HISTORY:
The patient has hypercholesteremia managed with atorvastatin, osteopenia diagnosed via DEXA scan in 2020, degenerative disc disease treated with micro lumbar discectomy in 2019, and osteoarthritis of the right thumb treated with arthroplasty in 2018. Gynecological history includes uterine polyps, cervical dysplasia, and uterine ablation in 2004/2005. Other conditions include obesity (BMI 31.18), glaucoma treated with tear duct stenting in 2022, and depression managed with citalopram [redacted] Chart.pdf, pages 38–43].

RESULTS

Table 1. Incidence of accurate and complete information in AI generated History of Present Illness (HPI) summaries.

	Accuracy	Completeness
Mammogram (n=50)	47 (94%)	46 (92%)
US (n=43)	37 (86%)	39 (90.7%)
MRI (n=18)	15 (83.3%)	8 (44.4%)

Table 2. High accuracy of pathology reporting by AI generated HPI summaries.

Pathology (n=85)	Accuracy
Histology	97.6%
Receptors	89.8%
Tumor grade	95%

CONCLUSIONS

- RAG-enabled GPT-4o demonstrated a high level of accuracy in breast cancer record summarization for pre-encounter preparation.
- AI shows promise for clinical integration.
- Human review is necessary
- Iterative prompt engineering, integration into clinical workflow, and evaluating the effectiveness of AI-assisted breast oncology medical record summarization is ongoing.

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