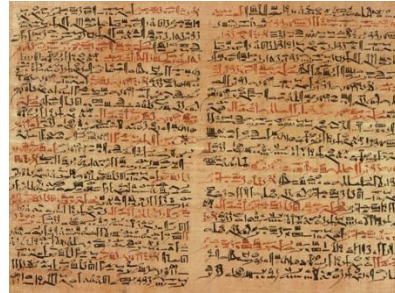# Generative AI Documentation for the Operating Room

YONGSIK KIM, M.D.

PUZZLE-AI, SEOUL, KOREA
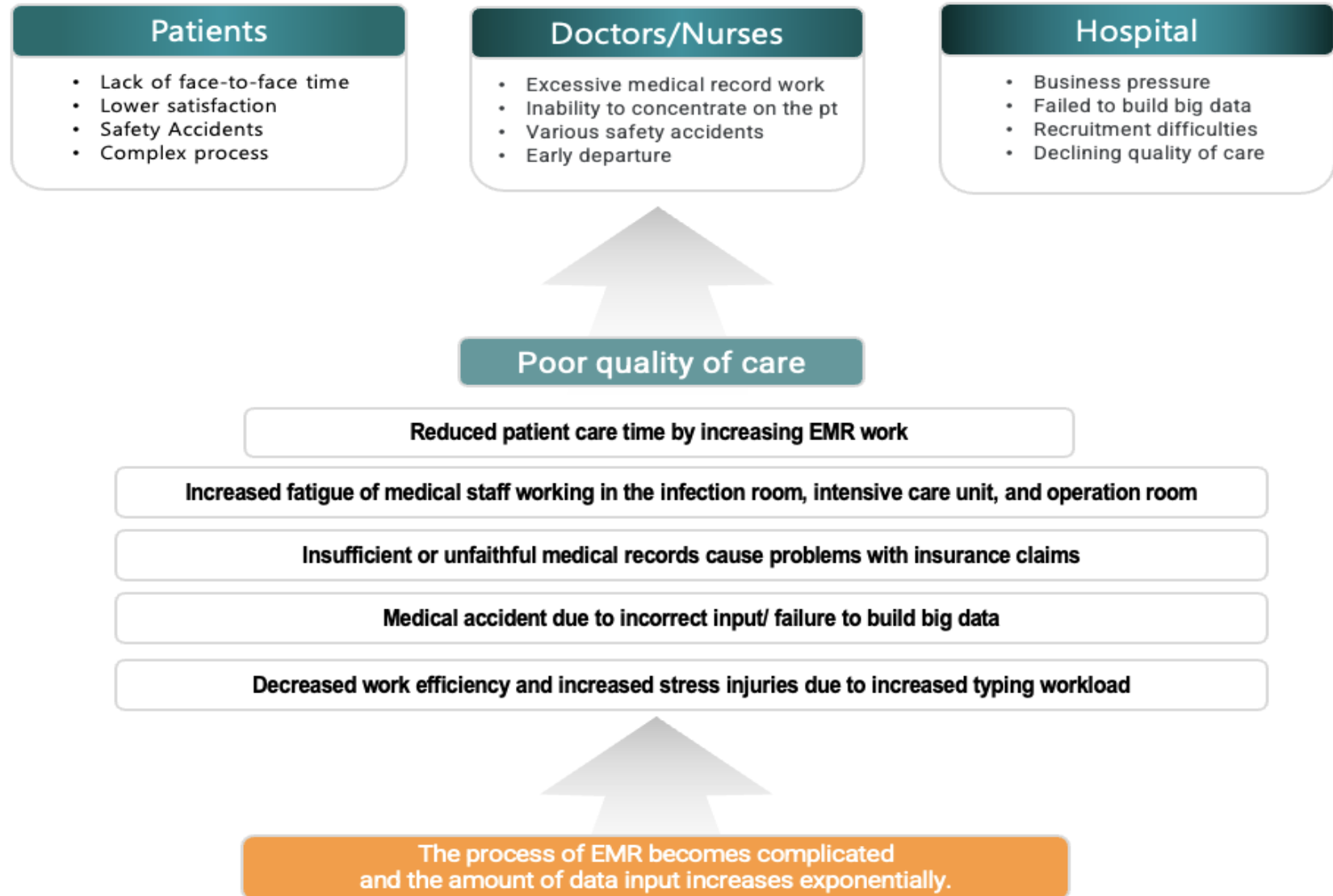
The essence of medicine lies in documentation.

Without records, there is no medicine.

EHR
Key Problems

Patients
- Lack of face-to-face time
- Lower satisfaction
- Safety Accidents
- Complex process

Doctors/Nurses
- Excessive medical record work
- Inability to concentrate on the pt
- Various safety accidents
- Early departure

Hospital
- Business pressure
- Failed to build big data
- Recruitment difficulties
- Declining quality of care

Poor quality of care

- Reduced patient care time by increasing EMR work
- Increased fatigue of medical staff working in the infection room, intensive care unit, and operation room
- Insufficient or unfaithful medical records cause problems with insurance claims
- Medical accident due to incorrect input/ failure to build big data
- Decreased work efficiency and increased stress injuries due to increased typing workload

The process of EMR becomes complicated and the amount of data input increases exponentially.

The Importance of Medical Records in the Operating Room

→ Surgical records ensure **patient safety** by confirming procedures and preventing errors.

→ They provide a **legal and ethical record** of what occurred during surgery.

→ Records support **team communication** and continuity of care.

→ They allow **quality improvement** and training by analyzing surgical outcomes.

Operating Room Checklist

Responsibilities by Role

Phase	Surgeon	Anesthesiologist	Scrub Nurse	Circulating Nurse
Preoperative	• Confirm patient ID, surgical site, procedure, consent • Mark surgical site • Verify imaging/tests, surgical plan • Document risks & plan	• Pre-anesthetic assessment (history, allergies, ASA class) • Airway evaluation & anesthesia plan • Check fasting status & labs • Machine/drug check • Record baseline vitals	• Verify sterility of instruments & field • Prepare surgical set & sutures • Initial sponge/needle/ instrument counts • Document readiness	• Confirm ID, consent, allergies • Ensure equipment/blood/ implants ready • Assist positioning & skin prep • Record pre-op checklist
Intraoperative	• Perform 'time-out' before incision • Record intraoperative findings & steps • Document complications/events	• Continuous monitoring (vitals, oxygenation) • Record anesthetic drugs, fluids, transfusions • Document intra-op complications	• Maintain sterile field • Ongoing counts (sponge/needle/ instrument) • Record specimens sent • Document implants/equipment	• Maintain patient safety & environment • Provide non-sterile supplies/equipment • Record intra-op nursing notes • Verify counts with scrub nurse
Postoperative	• Document operative note (procedure, findings, technique, EBL, specimens) • Verify final counts • Post-op orders (meds, drains, wound care)	• Record emergence & extubate on details • Document post-op vitals & pain management • Handover to recovery staff	• Final sponge/needle/instrument count • Document equipment used • Sharps disposal & safety check	• Safe transfer to recovery area • Record post-op checklist (drains,dressings,positioning) • Complete operative record & incident reports

Ongoing Problems Linked to Medical Records in Operating Room

Recently, South Korea's Ministry of Health and Welfare revised its enforcement regulations to mandate that ==the names and roles== of medical personnel entering the operating room, as well as ==the date, method, details, duration, and progress of the surgery,== must be recorded.

We are solving this problem with an AI-based medical documentation system.

→ Voice commands and speech recognition for hands-free documentation

→ LLM-based summarization, form generation, and template input

→ Automatic EMR entry through AI agents

→ AI-powered clinical decision support: symptom analysis, patient identification, transfusion & blood sampling verification, CPCR support

Identification & Verification

Patients & Medical professionals identification

Transfusion verification

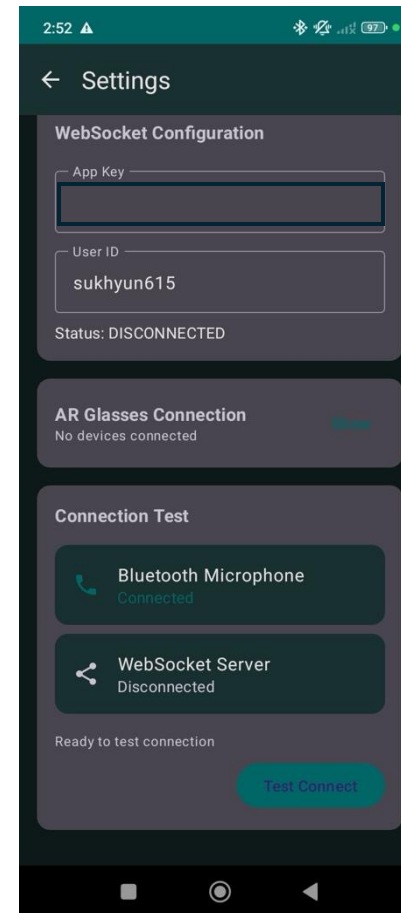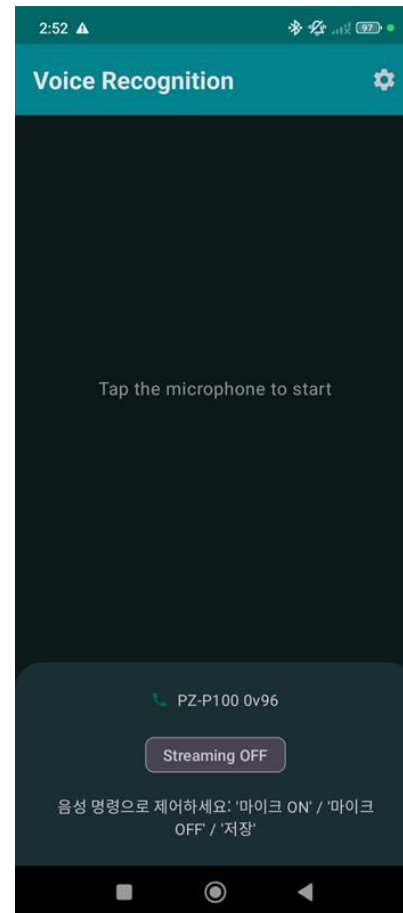Blood sampling verification

Medication verification
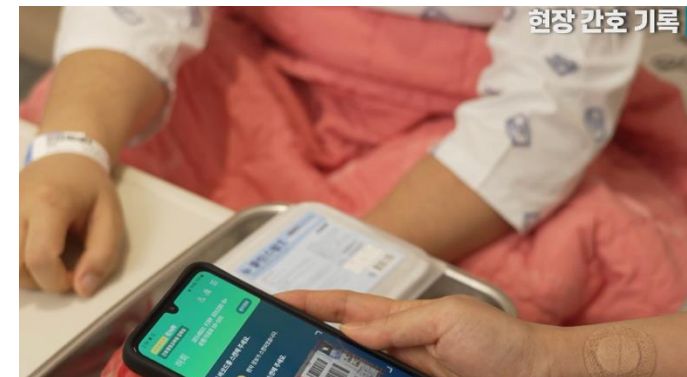
Hands-Free Documentation

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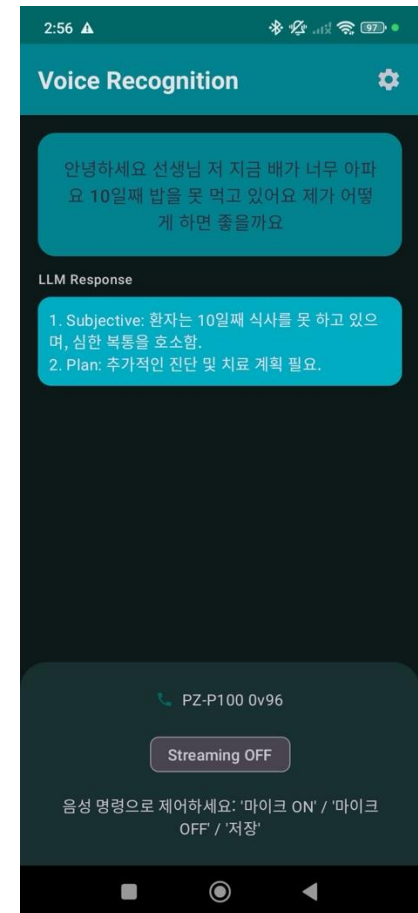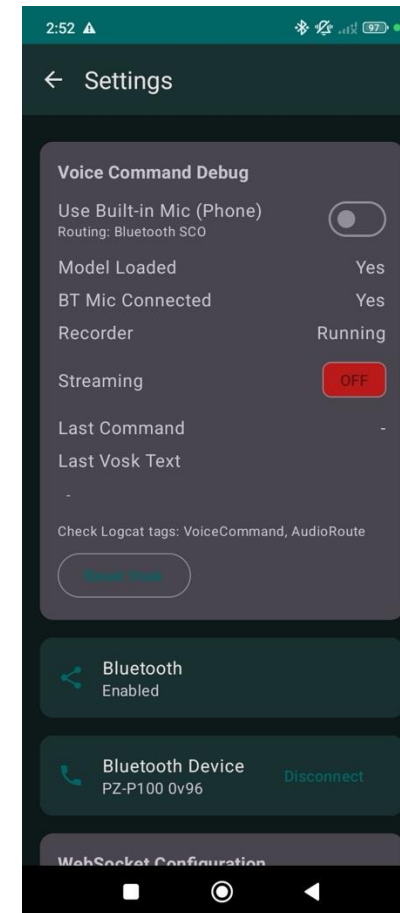
LLM based summarization, generation and template input

Operative Note

Surgeon / Assistant	Dr. Kim (Surgeon), Dr. Park (Assistant)
Start Time of Surgery	2025-10-06 09:00
End Time of Surgery	2025-10-06 12:40
Surgical Site	Pancreas – distal portion
Operation Name	Distal pancreatectomy
Surgical Method	Open laparotomy
Operative Findings	Mass in distal pancreas, no metastasis
Specimens	Pancreatic mass tissue
Postoperative Orders	NPO, IV fluids, antibiotics, drain care

Orthopedic Joint Replacement Surgery

Implant Record

Category	Manufacturer	Product Name / Model	Part Type	Size	Quantity	Lot / Serial Number	Notes
Femoral Component	Stryker	Triathlon® Knee System	Femoral Component	Size 5L	1	ST-2025-FM5L-044	Left Knee
Tibial Baseplate	Stryker	Triathlon® Tibial Baseplate	Tibial Baseplate	Size 5	1	ST-2025-TB5-031	Cemented
Tibial Insert	Stryker	X3® Polyethylene Insert	Polyethylene Liner	11 mm	1	ST-2025-TI11-029	Cruciate-retaining
Patellar Component	Stryker	Asymmetric Patella	Patellar Button	32 mm	1	ST-2025-PT32-018	Cemented
Screws / Pegs	Stryker	-	-	-	-	-	Not used
Bone Cement	Stryker	Simplex® P with Tobramycin	Bone Cement	40 g	2	ST-2025-BC40-056	Antibiotic-loaded
Others	-	-	-	-	-	-	-

OR Nursing Record Template

Item	Description	Example
Patient Name / ID	Auto input (linked to EMR)	Hong, Gil-Dong / 2025-000123
Operation Name		Distal pancreatectomy
Date & Time of Surgery		2025-10-06 09:00–12:40
Surgical Team / Primary Surgeon		General Surgery / Dr. Kim
Scrub Nurse		Nurse Lee
Anesthesiologist		Dr. Park (Anesthesiology)
Total Suction Volume	Total collected in suction (blood + irrigation fluid)	1200 mL
Irrigation Fluid Volume	Amount of irrigation used (NS, D/W, etc.)	800 mL
Blood Loss (From suction bottle)	(Total suction – irrigation fluid)	400 mL
Used Sponges / Gauze Count	Types and numbers of sponges used	Large 10, Small 20
Sponge/Gauze Weight (After use)	Difference in weight before vs. after (1g ≈ 1mL)	380 mL
Total Estimated Blood Loss (EBL)	Suction + gauze estimate combined	780 mL
Blood Component Loss Evaluation (optional)	Refer to Hb/Hct pre/post values	Hb ↓ from 13.2 → 10.8 g/dL
Transfusion	Packed RBC / FFP / Platelets, etc.	PRBC 1U transfused
Recorder (Sign)	Scrub nurse's signature	

Surgical Specimens

AI agent

Automatically inputting LLM-summarized and generated records into the EMR

Puzzle Gen

9710795

2년 전부터 양쪽 시력이 떨어지셨다고요 골밀 안압은 각각 14 16 였나다 약력은
높으쪽고 전방에 이상은 없는데 양목 모두 핵성 백내장이 있습니다나 안저 검사상
이상은 없습니다 결론적으로 우선 핵성 백내장에 대해서 오른쪽 눈부터 백내장
수술하시는 게 좋겠어요 수술 전에 피검사 소변 검사 등 수술 전 검사를
시행하겠습니다

SOAP

S & O :
Decreased visual acuity for x 2yrs

IOP 14/16mmHg
Cornea : clear
AC: deep & cell(-)
Lens thick nucleosclerosis
Fds: flat

A : S.cat (OD)

P : K+P(OD)
Preop. lab

Medication History

Decreased visual acuity for x 2yrs

IOP 14/16mmHg
Cornea : clear
AC: deep & cell(-)
Lens thick nucleosclerosis
Fds: flat

S.cat (OD)

K+P(OD)
Preop. lab

AI technology for fast, accurate, safe, and complete OR documentation is already available. The real challenge is bringing it into clinical practice without delay.