

FHIR APIs in Healthcare

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Data to Decisions: AI in Healthcare

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Learning Objectives

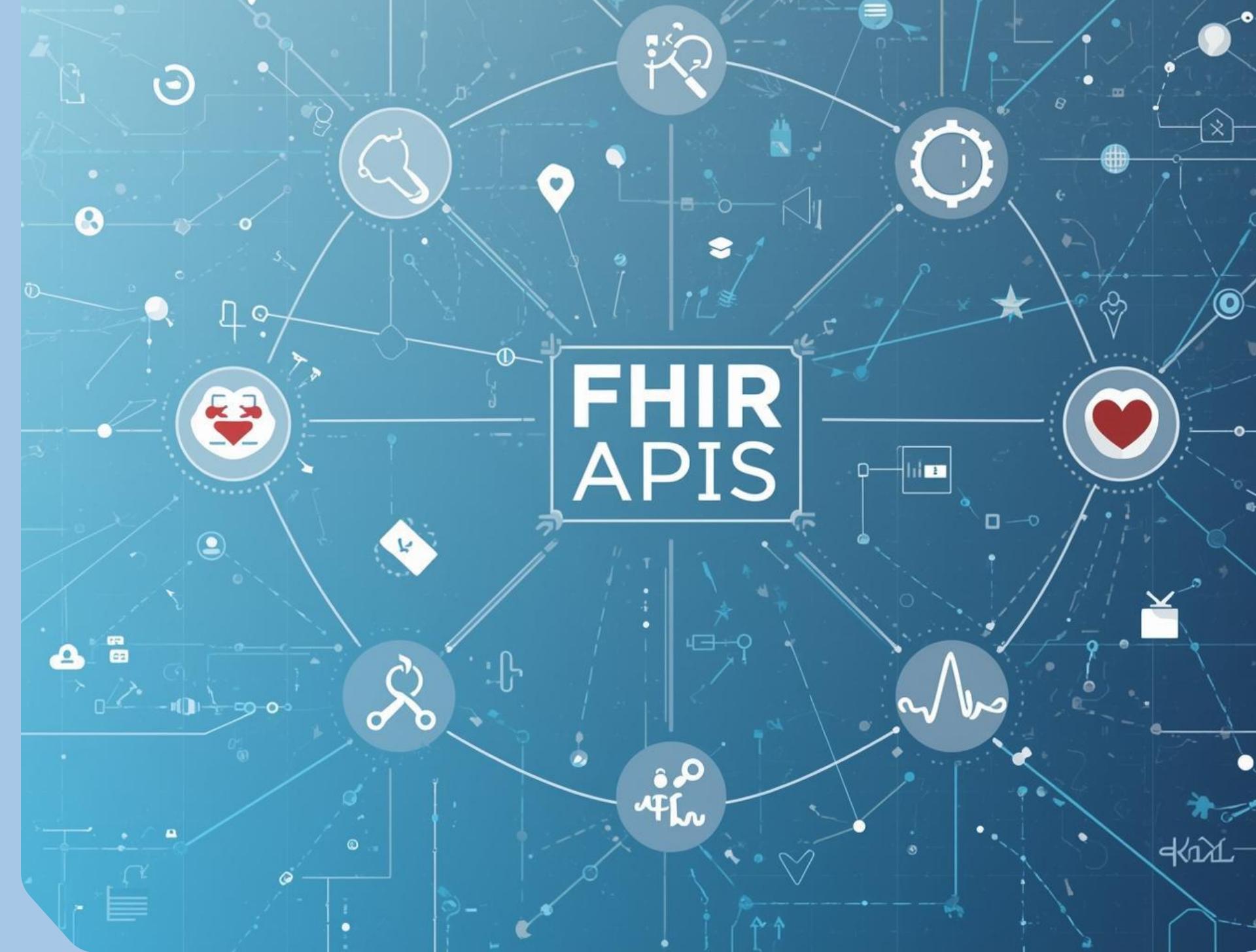
By the end of the session, students will be able to:

1. Explain what **FHIR** is and why it matters for modern healthcare
2. Describe how **FHIR APIs enable interoperability & AI tools**
3. Understand how EHR data becomes usable for **clinical decision support & AI**
4. Recognize current and future **clinical use cases**

Understanding FHIR APIs in Healthcare

Key Concepts and Architectural Benefits

Exploring FHIR APIs for enhanced healthcare integration



Why Should Physicians Care?

Clinical Framing

- Every AI tool, dashboard, CDS system → depends on **data access**
- Today's medicine = **software-mediated care**
- FHIR is the **language that makes healthcare data usable**

- Labs, medications, vital signs, notes → AI models
- Order sets, alerts, risk scores → built on APIs



What is FHIR?

FHIR = Fast Healthcare Interoperability Resources

A modern standard for exchanging healthcare data



Why does FHIR exist?

1980s - Interoperability in healthcare began

- To connect systems **WITHIN** a hospital itself - not between hospitals

Now data in many places besides the hospital

- Payers have multiple systems
- Patients have mobile devices, home devices, wearables
- Genomic sequencing labs

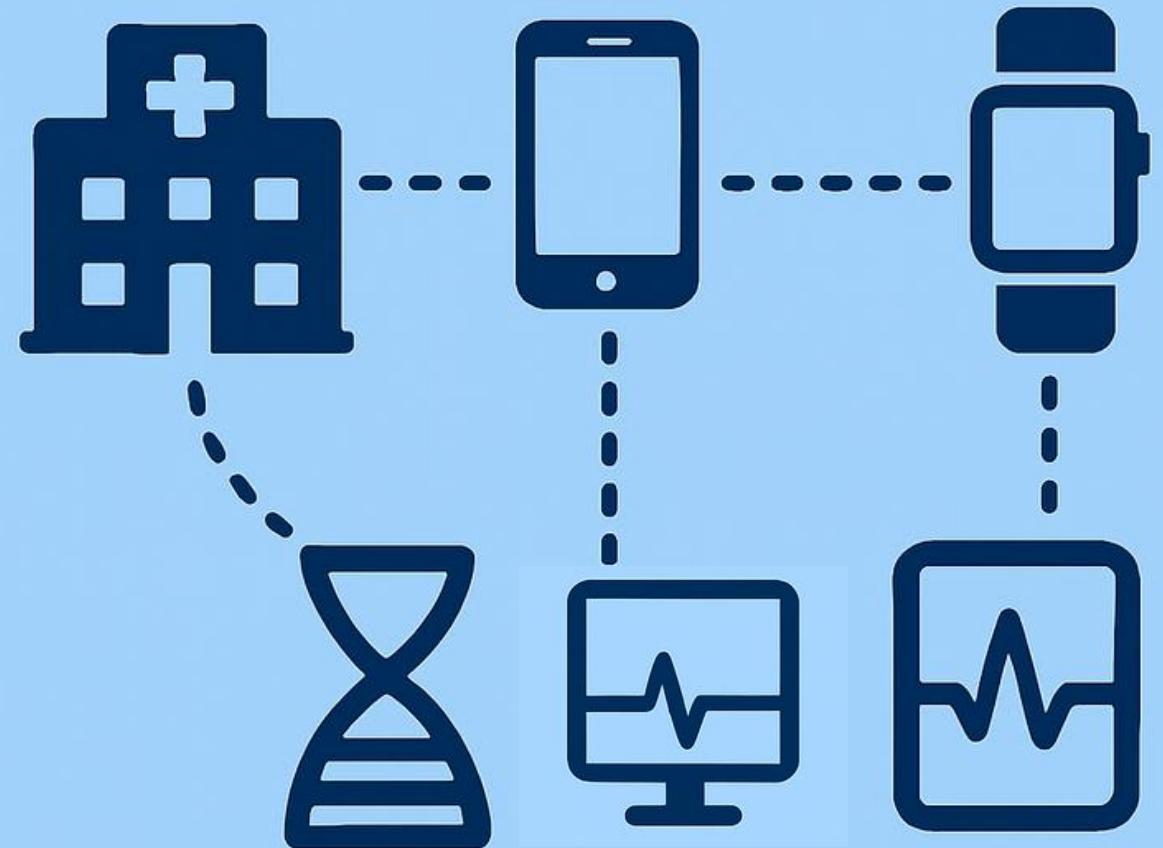
1980s: 10 facts per complex decision

2020: ~1000 facts per complex decision

- Individual can handle 5 facts on average

HL7 Task Force

- To create a healthcare data standard from scratch



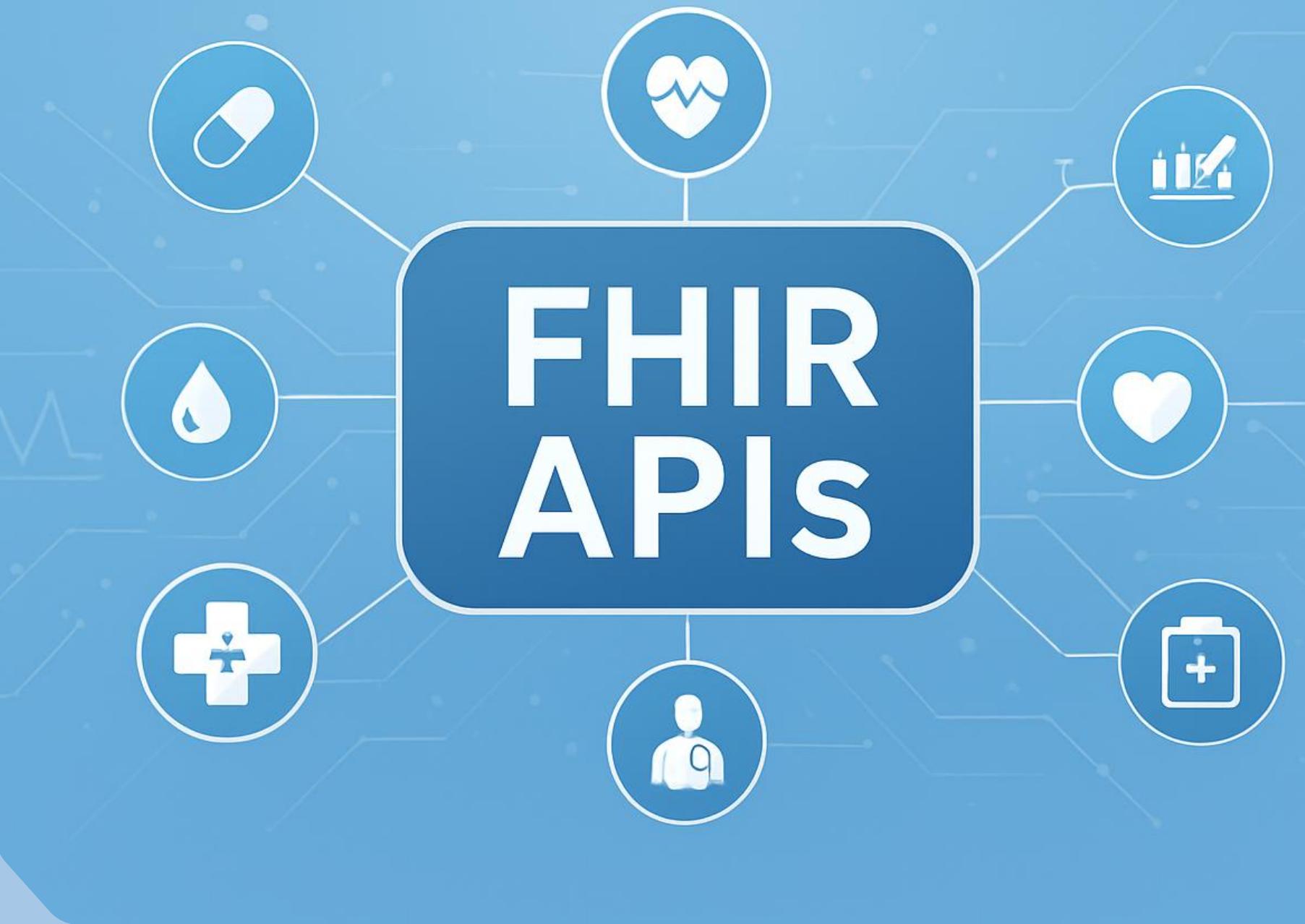
The Problem FHIR Solves

Old World

- HL7 messages
- PDFs, faxes, proprietary systems

New World

- Real-time data
- Apps
- Interoperability
- AI-ready information

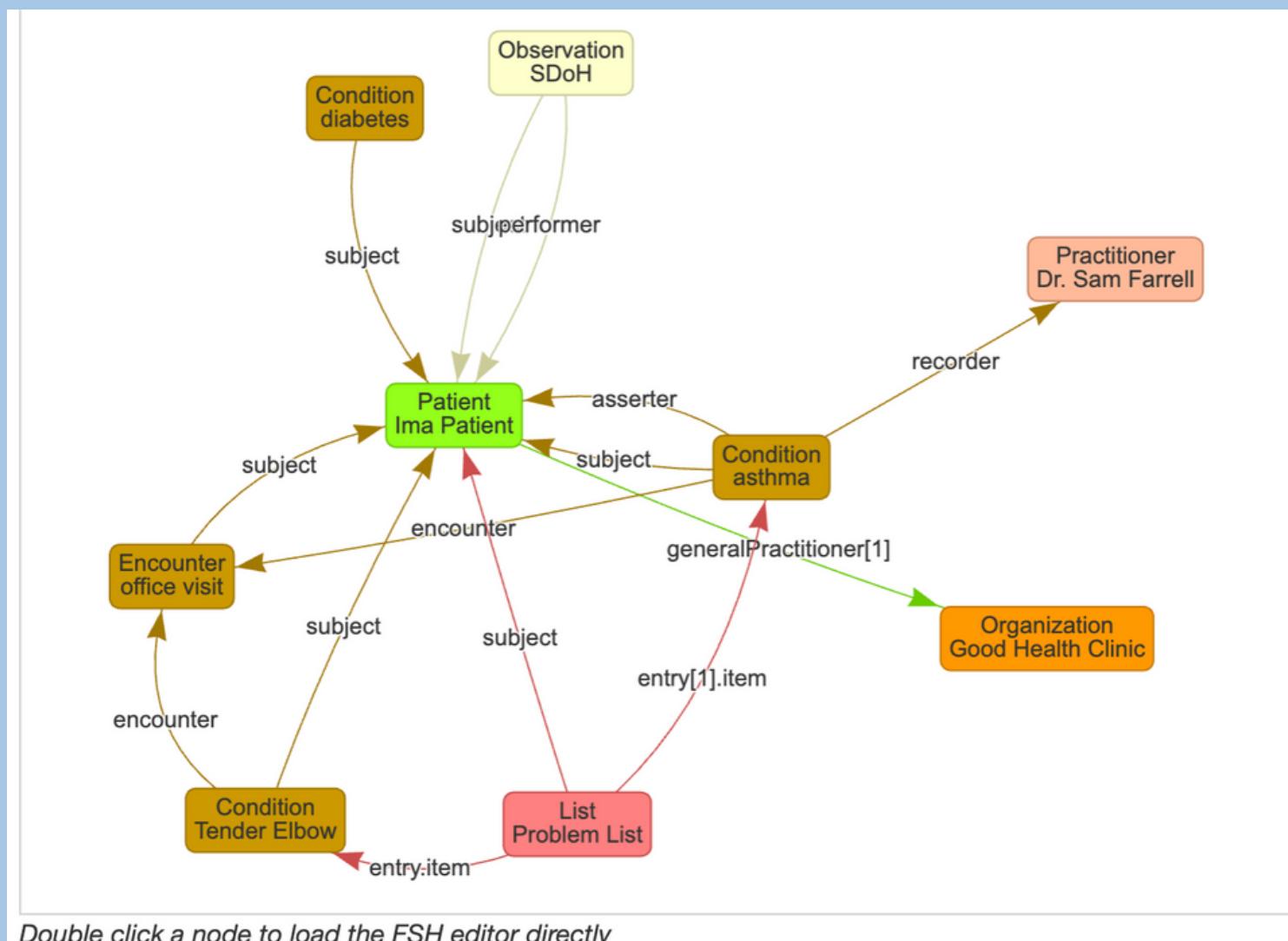


FHIR Resources

FHIR breaks the medical record into standard building blocks:

- Patient
- Observation
- Medication
- Encounter
- Condition
- Procedure

LEGO blocks of healthcare data



FSH JSON XML

```
{
  "resourceType": "Observation",
  "id": "cfsb1769037069039",
  "subject": {
    "reference": "cfsb16482464370490"
  },
  "status": "preliminary",
  "code": {
    "coding": [
      {
        "code": "LP115936-9",
        "system": "http://loinc.org",
        "display": "Have you ever smoked cigarettes"
      }
    ],
    "performer": [
      {
        "reference": "cfsb16482464370490"
      }
    ],
    "valueCodeableConcept": {
      "coding": [
        {
          "code": "785889008",
          "system": "http://snomed.info.sct"
        }
      ],
      "text": "e-cigarette user"
    }
  }
}
```

What is an API?

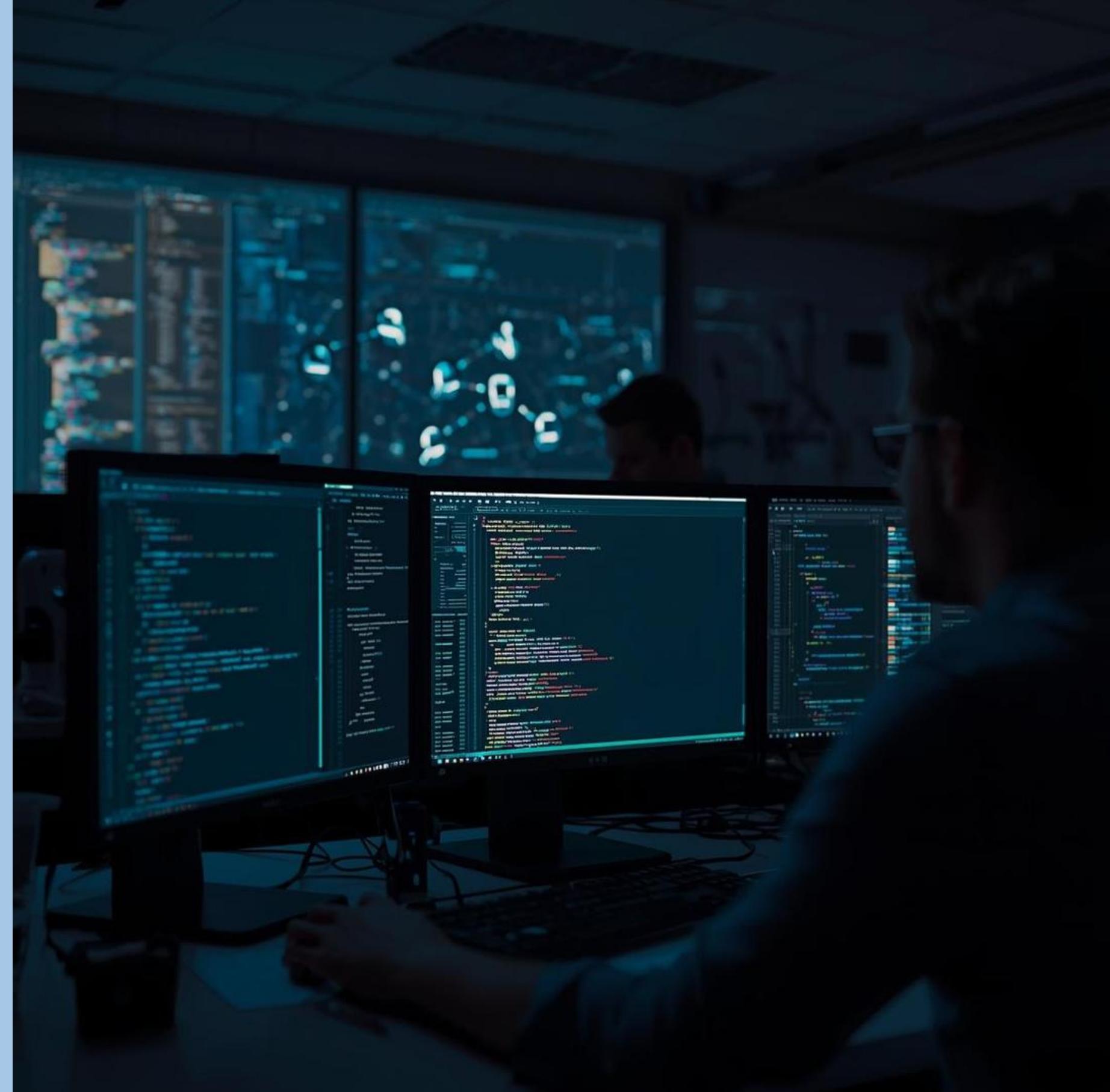
Application Programming Interface

A URL-based way to access clinical data

→ allows two different software programs to communicate with each other and exchange data

Examples

- Google maps
- Paypal
- Social media
- Weather apps
- Travel booking



Security Considerations

Ensuring safe use of FHIR APIs



Security Concerns

- 1) Who gets in
- 2) What they're allowed to see
- 3) What happens to the data afterward

Authentication and authorization mistakes

- Overbroad scopes
- Confusing “authentication” with “authorization”
- Weak client authentication

Data exposure and privacy leakage (even when “working as designed”)

- FHIR resources can expose sensitive diagnoses
- Metadata leaks
- Search/query leakage

Third-party app ecosystem risks

- Downstream storage
- Data minimization failures
- Re-identification risk

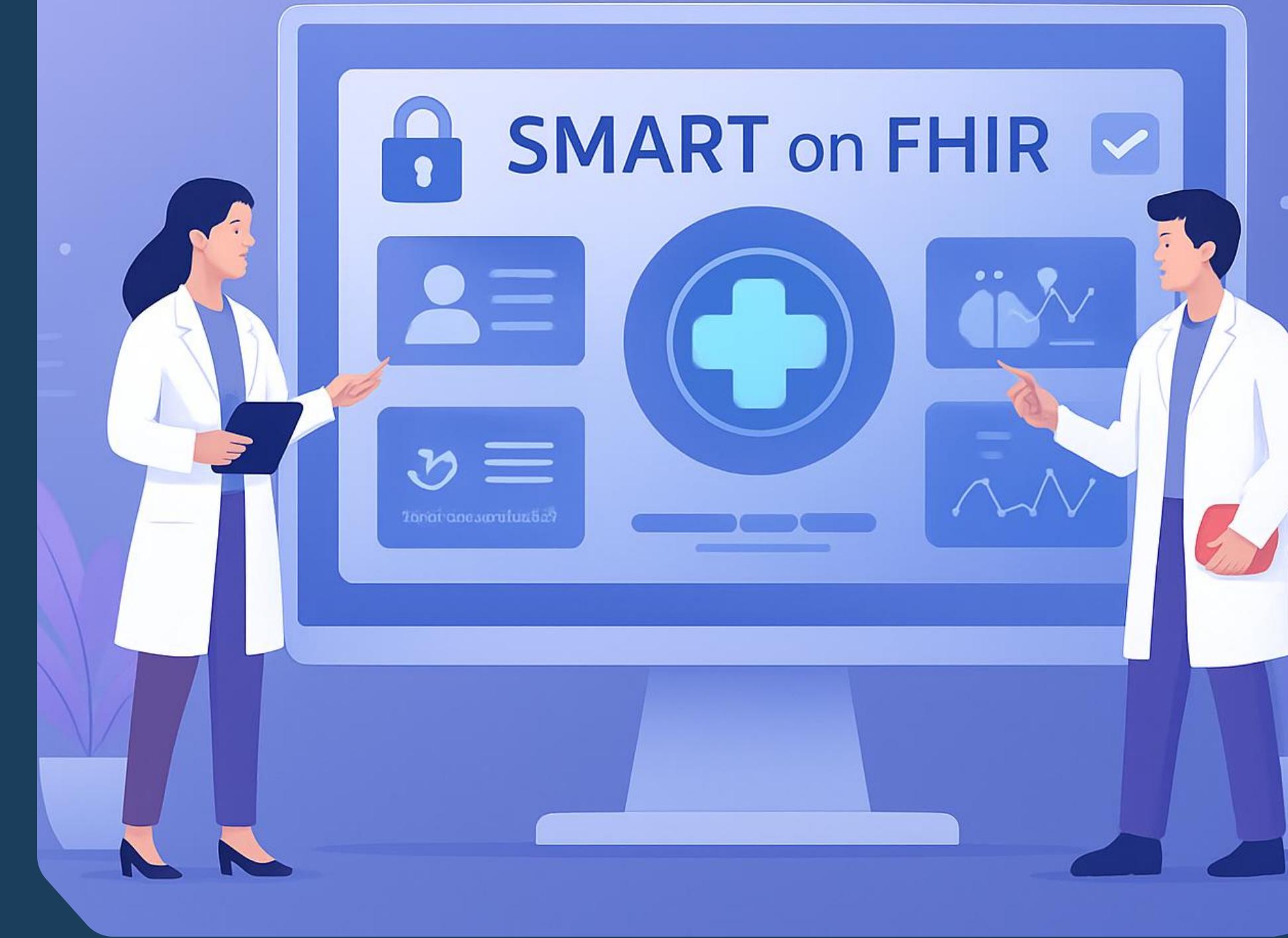
SMART on FHIR

Substitutable Medical Applications, Reusable Technologies

Open standard that lets healthcare apps securely access and exchange data from Electronic Health Records (EHRs) and other systems

Provides:

- Secure login
- App authorization
- Permission control



Building a FHIR Data Architecture

In-Class Exercise

<https://learning.intersystems.com/course/view.php?id=2525>



Case: Chest Pain in the ED

A 62-year-old male presents with chest pain.

- Vitals, labs, ECG, meds, and past history are automatically retrieved via FHIR into an AI-based decision support tool.
- The tool calculates:
 - 30-day MACE risk: 18%
- Suggests: “Activate high-risk chest pain pathway”

Discussion Questions

1. What **FHIR data elements** were likely used?
2. How would **missing or incorrect data** affect this output?
3. Would you **trust** this tool? Why or why not?
4. Who is **responsible** if the AI is wrong?

Knowledge Check

1. Which FHIR resource would contain a patient's potassium result?

- A. Condition
- B. Procedure
- C. Observation
- D. Encounter

2. Why is FHIR important for AI development?

- A. It improves billing
- B. It reduces documentation burden
- C. It makes healthcare data computable and interoperable
- D. It replaces clinicians

3. What does SMART on FHIR provide?

- A. AI model training
- B. Clinical decision rules
- C. Security and authentication
- D. Data storage

Knowledge Check

4. Name one potential risk of AI in medicine related to data.
5. In your clinical experience, which workflow could most benefit from FHIR-enabled AI tools?

Wrap-Up & Career Relevance

Final Takeaways

- FHIR is the plumbing of digital medicine
- AI depends on interoperable, high-quality data
- Clinicians who understand this will shape the future

Career Tie-In

- Clinical informatics
- Digital health
- AI research
- Health system leadership

