

APPLIED HEALTH INFORMATICS

Foundations of Health Informatics

Interoperability & Integration

Presenter: Chamberlain Nwanne, PhD



Memorial Sloan Kettering
Cancer Center

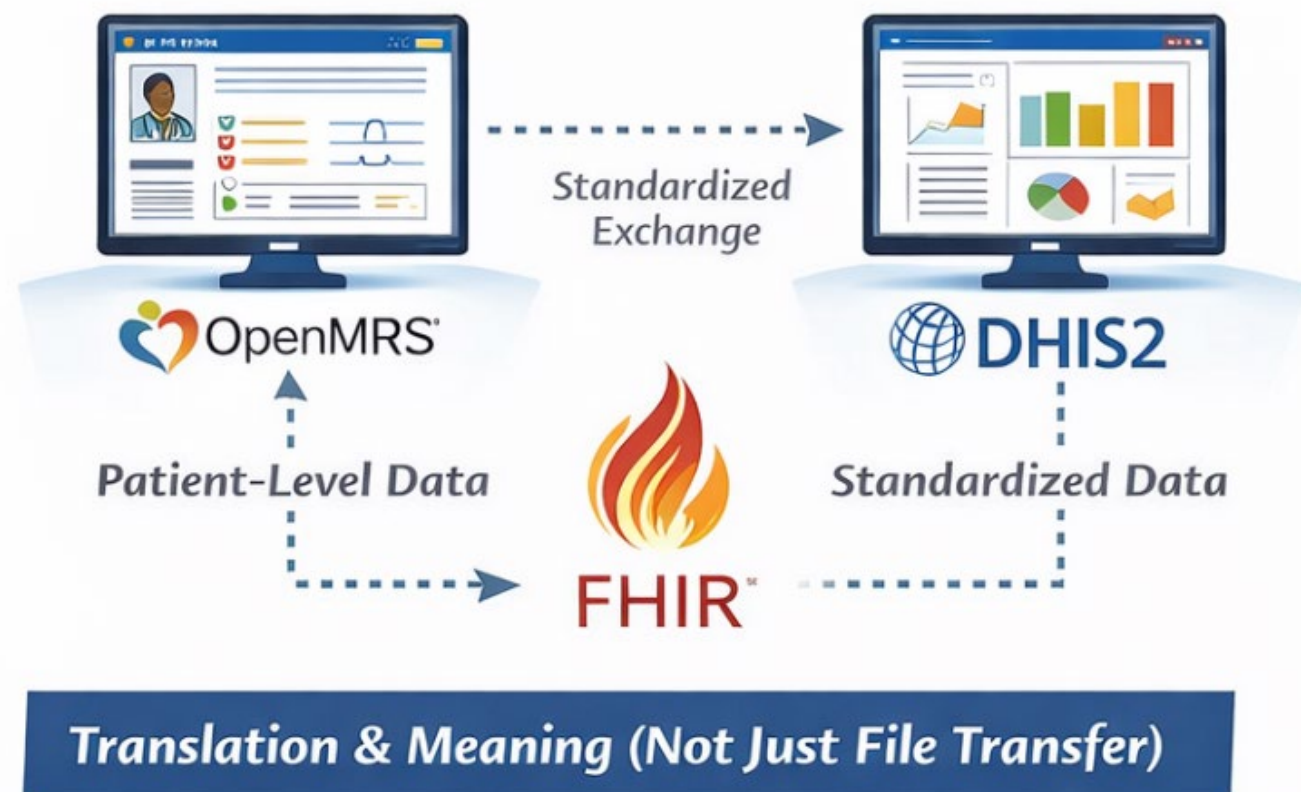


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Interoperability & Integration - Overview

- ❑ Why systems must communicate
- ❑ Data standards and interoperability
- ❑ Oncology and LMIC focus

Interoperability Flow: *Patient-Level Data to Aggregate Reporting*



Interoperability & Integration – Key definitions

- ❑ Interoperability: The ability of different systems to share data and use it correctly.
- ❑ Integration: The process of connecting systems so data can move between them.
- ❑ Fragmentation: When systems are disconnected, do not share information and do not communicate, creating isolated data silos.

Think of fragmentation as many notebooks that never talk to each other.

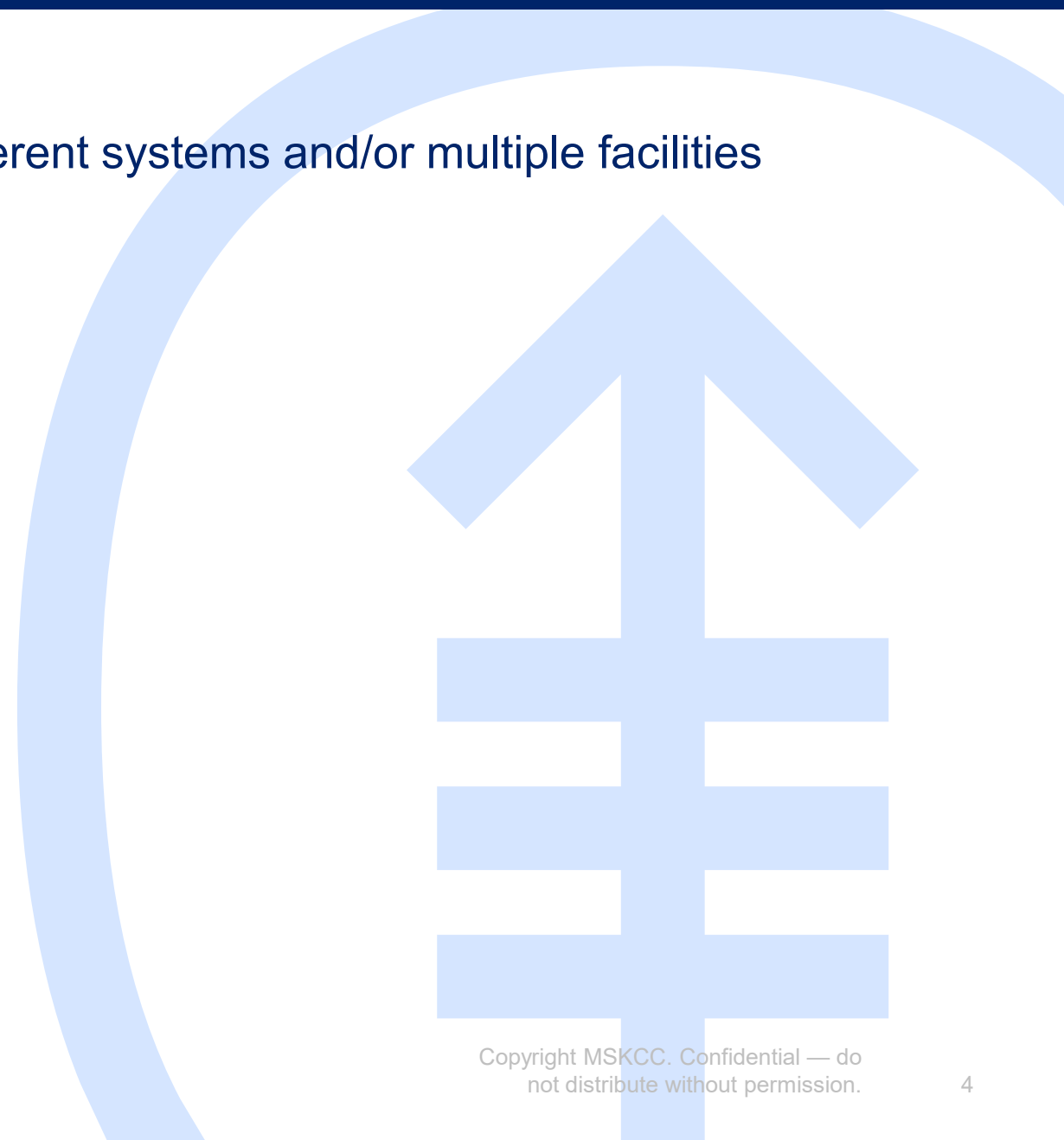
Interoperability & Integration: Fragmented Health Systems

❑ In many LMIC settings:

- Labs, clinics, registries, and hospitals use different systems and/or multiple facilities
- Data must be entered multiple times
- Information is lost during transfers
- Information is maintained in **Data Silos**

❑ Why Fragmentation is a Problem

- Data must be re-entered
- Important information is lost
- Poor coordination of care
- Delays in treatment



Data Standards - Overview

Standards are rules for how information is recorded and shared.

❑ They do three important things:

- Make data consistent
- Make data understandable
- Make data shareable

Standards ensures consistency and usability and help systems understand data consistently

❑ Types of Standards

- Terminology standards (ICD, SNOMED): Standard names and codes for diseases.
- Messaging standards (HL7, FHIR): Rules for sending data between systems.
- Structure standards: How forms and fields are organized.

Without standards, interoperability fails.

Types of Standards

❑ Terminology

- Standard names for diseases Ex: ICD codes.
- ICD – standard diagnosis codes
- SNOMED – clinical terminology
- HL7/FHIR – standards for data exchange

❑ Messaging

- How systems exchange data.
- Example: FHIR APIs.

❑ Structure

- How data is organized.
- Example: standardized forms.



Interoperability

Definition: Ability of systems to exchange AND use data

❑ Levels of Interoperability

- Foundational – systems can send data
- Structural – data has a standard format
- Semantic – data has shared meaning

Semantic interoperability is the hardest to achieve but most important.

❑ Why Interoperability fails

- No standards
- Manual workflows
- System mismatch

Interoperability Example

- ❑ OpenMRS stores patient-level clinical data.
- ❑ FHIR transforms data into a standard structure.
- ❑ DHIS2 collects summarized data for reporting and planning.

This shows how data moves from care delivery to national reporting.



System Integration - Connecting systems to work together

Types of integration

❑ Manual integration

- Paper → Excel → DHIS2
- Leads to delays/errors

❑ Automated integration

- EHR → API → Reporting
- Faster and accurate
- Requires significant investments in infrastructure

❑ System Architecture example:

- OpenMRS → FHIR → DHIS2
- Standardization enables sharing

In LMICs, the goal is not perfect automation, but reliable, sustainable integration.

Integration in LMIC Settings

- ☐ Manual integration – paper and Excel
- ☐ Semi-automated integration
- ☐ Limited by connectivity and workforce



Key Take – Home Messages

- ❑ Health systems are data systems
- ❑ Good care depends on good data flow
- ❑ Interoperability reduces fragmentation
- ❑ Small improvements can have big impact



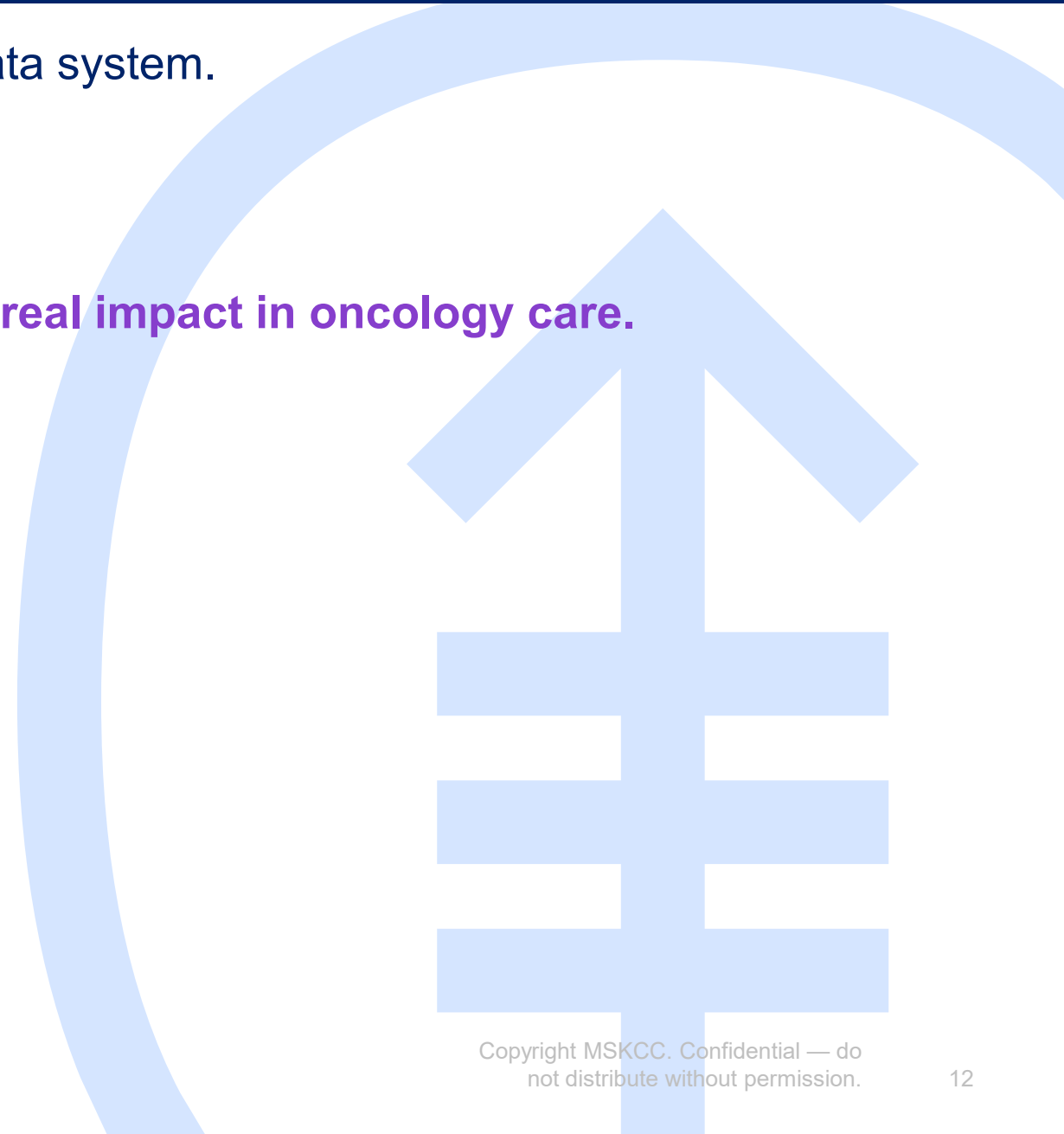
Summary

This unit helps you see healthcare as a connected data system.

Strong data flow supports good care.

Interoperability reduces fragmentation.

Even small informatics improvements can create real impact in oncology care.



Reflection on Fragmented Oncology Data - Discussion topic 3

In a regional health system, three separate systems are used:

- ❑ The oncology clinic uses an Electronic Health Record (EHR)
- ❑ The pathology lab records results in Excel spreadsheet
- ❑ The cancer registry uses DHIS2

Pathology reports are printed and delivered manually to the clinic. Later, a data clerk enters selected information into the cancer registry. Because systems are not linked, some diagnosis codes differ, staging fields are incomplete, and the same patient appears twice in national reports.

A. Understand fragmentation:

- i. Where is data being duplicated or re-entered?
- ii. At which points is information lost or changed?

B. Define interoperability:

- i. Which type of interoperability is missing (foundational, structural, or semantic)?
- ii. What problems occur because systems do not use shared standards?

C. Standards and integration

- i. How could simple data standards improve this situation (even without full automation)?
- ii. What role could a standard format or agreed-upon form play?

D. LMIC-appropriate solution

- i. Propose one integration improvement that fits a low-resource context (manual or semi-automated).



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