

Integration between
electronic prescribing
system and pharmacy
information system
using CareConnect
profiles - lessons
learned

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Electronic prescribing systems and pharmacy information systems



An electronic prescribing system (e-prescribing system) is a system for prescribing and filling medical prescriptions electronically.



A Pharmacy information system (pharmacy stock management system) is a system used in pharmacies which aim is to ease the process of maintaining and organising medications, as well as storing all crucial data about them.

Electronic prescribing systems and pharmacy information systems



Medication errors:

Each year in the United States (US), 7000 to 9000, people die because of the errors related to medication management [1].

The most common errors related to medications are those that provoked adverse drug reaction. Those errors directly caused 712 deaths and contributed to 1708 deaths in 2018 in the UK. [2]



Causes of medication errors:

- Distraction of medical staff
- Distortion of prescriptions
- Medications with similar names
- Incorrect instructions

[1] A. J. Wheeler, S. Scahill, D. Hopcroft, and H. Stapleton, "Reducing medication errors at transitions of care is everyone's business," *Aust. Prescr.*, vol. 41, no. 3, pp. 73-77, Jun. 2018.

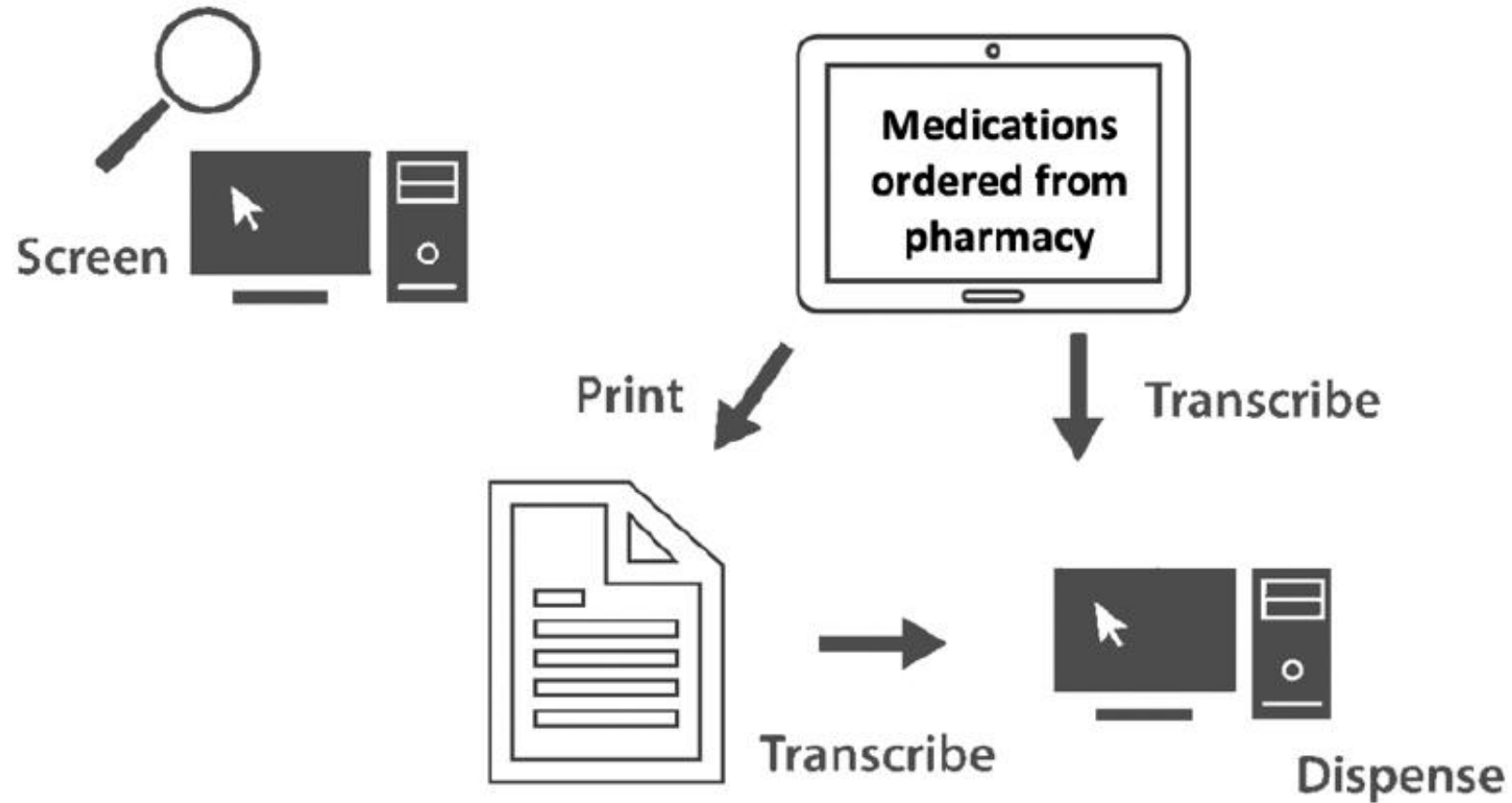
[2] R. A. Elliott et al., "Prevalence and economic burden of medication errors in the NHS in England", p. 174, 2018.

Current process of ordering medications without an electronic prescribing system in hospitals



Current process of ordering medications with an electronic prescribing system in hospitals

- ▶ Current process with an electronic prescribing system in hospitals



Integration between the electronic prescribing systems and pharmacy information systems

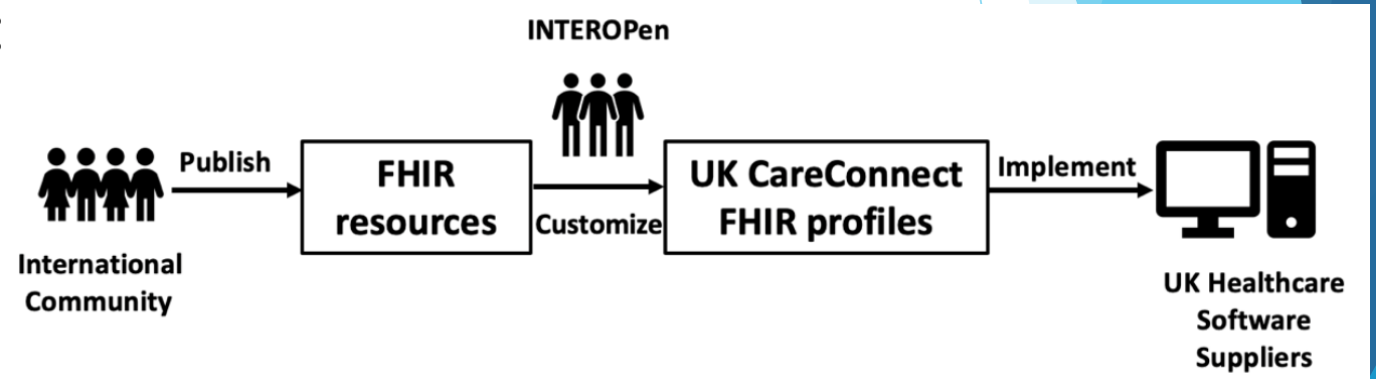


Electronic prescribing system

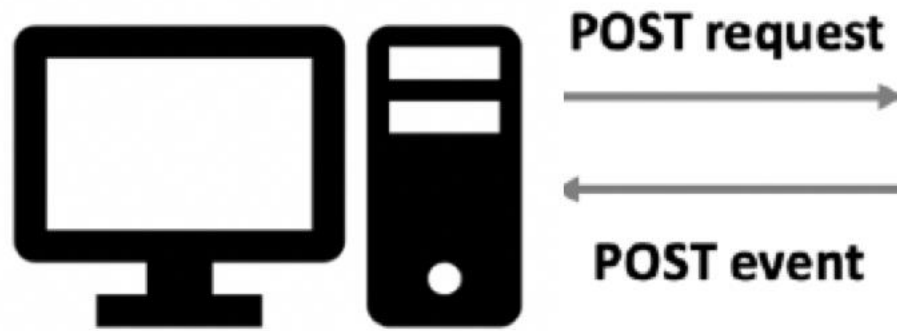
Pharmacy information system

FHIR resources and profiles

- ▶ FHIR (Fast Healthcare Interoperability Resources) standard:
 - ▶ Resources - FHIR version STU3:
 - ▶ Medication Request
 - ▶ Medication Dispense
 - ▶ Profiles
 - ▶ CareConnect-MedicationRequest-1
 - ▶ CareConnect-MedicationDispense-1
 - ▶ FHIR Dosage implementation guideline



Communication between systems



Electronic prescribing system



Act accordingly

Pharmacy information system

Positive outcomes of integration



Advantages:

No transcribing errors

Time - efficiency

Less errors due to illegible handwriting

Improved patient safety

Access to relevant clinical information

Challenges of integration

► Dosage instructions

dosageInstruction	I	0..*	Dosage
sequence	Σ I	0..1	Integer
text	Σ I	0..1	String
additionalInstruction	Σ I	0..*	CodeableConcept
patientInstruction	Σ I	0..1	String
timing	Σ I	0..1	Timing
asNeeded[x]	Σ I	0..1	Boolean CodeableConcept
site	Σ I	0..1	CodeableConcept
route	Σ I	0..1	CodeableConcept
method	Σ I	0..1	CodeableConcept
dose[x]	Σ I	0..1	Range Quantity (SimpleQuantity)
maxDosePerPeriod	Σ I	0..1	Ratio
maxDosePerAdministration	Σ I	0..1	Quantity (SimpleQuantity)
maxDosePerLifetime	Σ I	0..1	Quantity (SimpleQuantity)
rate[x]	Σ I	0..1	Ratio Range Quantity (SimpleQuantity)

How the medication should be taken

The order of the dosage instructions

Free text dosage instructions e.g. SIG

Supplemental instruction - e.g. "with meals"

Binding (example): A coded concept identifying additional instructions such as "take with water" or "avoid operating heavy machinery". (<http://hl7.org/fhir/stu3/valueset-additional-instruction-codes.html>)

Patient or consumer oriented instructions

When medication should be administered

Take "as needed" (for x)

Binding (example): A coded concept identifying the precondition that should be met or evaluated prior to consuming or administering a medication dose. For example "pain", "30 minutes prior to sexual intercourse", "on flare-up" etc. (<http://hl7.org/fhir/stu3/valueset-medication-as-needed-reason.html>)

Body site to administer to

Binding (example): A coded concept describing the site location the medicine enters into or onto the body. (<http://hl7.org/fhir/stu3/valueset-approach-site-codes.html>)

How drug should enter body

Binding (example): A coded concept describing the route or physiological path of administration of a therapeutic agent into or onto the body of a subject. (<http://hl7.org/fhir/stu3/valueset-route-codes.html>)

Technique for administering medication

Binding (example): A coded concept describing the technique by which the medicine is administered. (<http://hl7.org/fhir/stu3/valueset-administration-method-codes.html>)

Amount of medication per dose

Constraint (rng-2): If present, low SHALL have a lower value than high

Upper limit on medication per unit of time

Constraint (rat-1): Numerator and denominator SHALL both be present, or both are absent. If both are absent, there SHALL be some extension present

Upper limit on medication per administration

Constraint (qty-3): If a code for the unit is present, the system SHALL also be present

Constraint (sqty-1): The comparator is not used on a SimpleQuantity

Upper limit on medication per lifetime of the patient

Constraint (qty-3): If a code for the unit is present, the system SHALL also be present







Constraint (sqty-1): The comparator is not used on a SimpleQuantity

Amount of medication per unit of time

Constraint (rat-1): Numerator and denominator SHALL both be present, or both are absent. If both are

Challenges of integration

- Dosage instructions: Apply a thin layer of cream on the affected area.

 dosageInstruction		0..*	Dosage	How the medication should be taken
...  sequence	Σ	0..1	Integer	The order of the dosage instructions
...  text	Σ	0..1	String	Free text dosage instructions e.g. SIG
+  additionalInstruction	Σ	0..*	CodeableConcept	Supplemental instruction - e.g. "with meals" Binding (example): A coded concept identifying additional instructions such as "take with water" or "avoid operating heavy machinery". (http://hl7.org/fhir/stu3/valueset-additional-instruction-codes.html)
...  patientInstruction	Σ	0..1	String	Patient or consumer oriented instructions
+  timing	Σ	0..1	Timing	When medication should be administered

Challenges of integration

▶ Duration

- ▶ Clinical duration of the treatment, - dosage instruction -> timing -> repeat -> bounds -> duration
- ▶ Duration of the individual dose (infused over a period of time) dosage instruction -> timing -> repeat -> duration
- ▶ Supply duration - dispenseRequest -> expectedSupplyDuration
- ▶ Start and end time of the therapy - dosage instruction -> timing -> repeat -> bounds -> period



Challenges of integration

- ▶ Additional problems with interpretation of fields: e.g. statuses cancelled and rejected
- ▶ Drug databases
 - ▶ dm+d version
- ▶ Versions of FHIR
- ▶ Mapping from standard to standard (openEHR and FHIR)



Lessons learned



Importance of
the agreement
between two
integrated
systems



Importance of
creating national
guidelines for
specification of
processes

THANK YOU
FOR YOUR
ATTENTION

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