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@paulaotero

Development and Usage Patterns of a Home-grown Drug Information Tool

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AIDH IMIA

Introduction

- *Medication errors are the leading cause of injury and avoidable harm in health care systems worldwide.*
- *The majority occurring at the drug prescription stage. These errors are largely due to lack of knowledge about drugs.*
- *Prescription quality increases when physicians have access to independent sources of information. Access to drug information can enhance prescription quality, reduce length of hospital stay and lower risk-adjusted mortality rates*

Hospital Italiano de Buenos Aires (HIBA)

- ***HIMSS Level 7+ and JCI accredited organization*** *with an in-house developed health information system.*

HIMSS Analytics STAGE 7 EMRAM

Hospital Acreditado por Joint Commission International

Hospital Italiano de Buenos Aires (HIBA)

- *Network of two non-profit academic hospitals and 25 outpatient clinics in the Buenos Aires metropolitan area,*
- *7400 healthcare professionals.*
- *In-house-developed health information system*
  - *web-based, problem-oriented EHRs;*
  - *a terminology server referenced to SNOMED CT;*
  - *and a PKB.*

eDrugs

- *Is an interactive drug information tool*
- *Offers information on drugs, and a drug interactions checker (prescription simulator).*
- *It retrieves information from a homegrown Pharmacologic Knowledge Base (PKB)*

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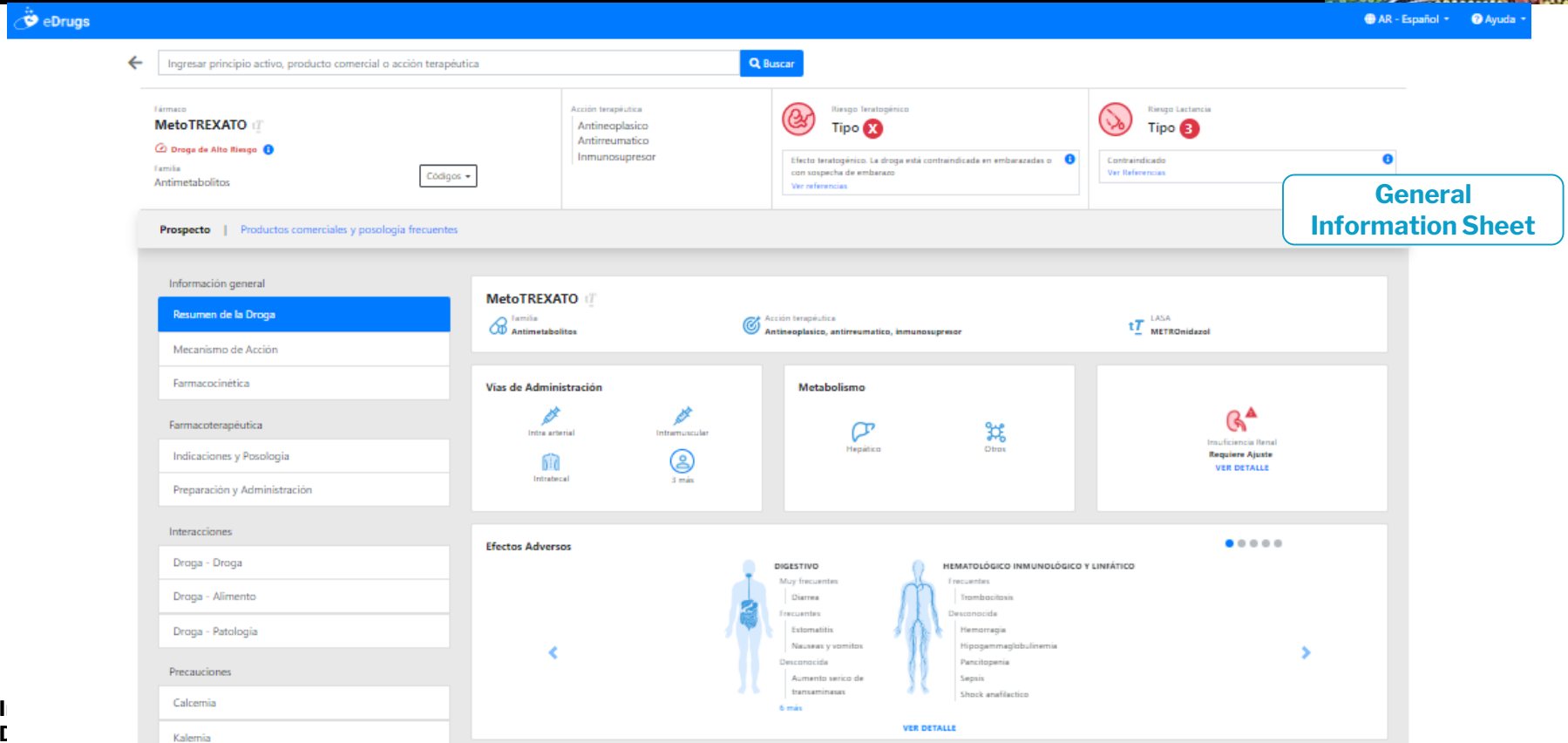

General Information Sheet

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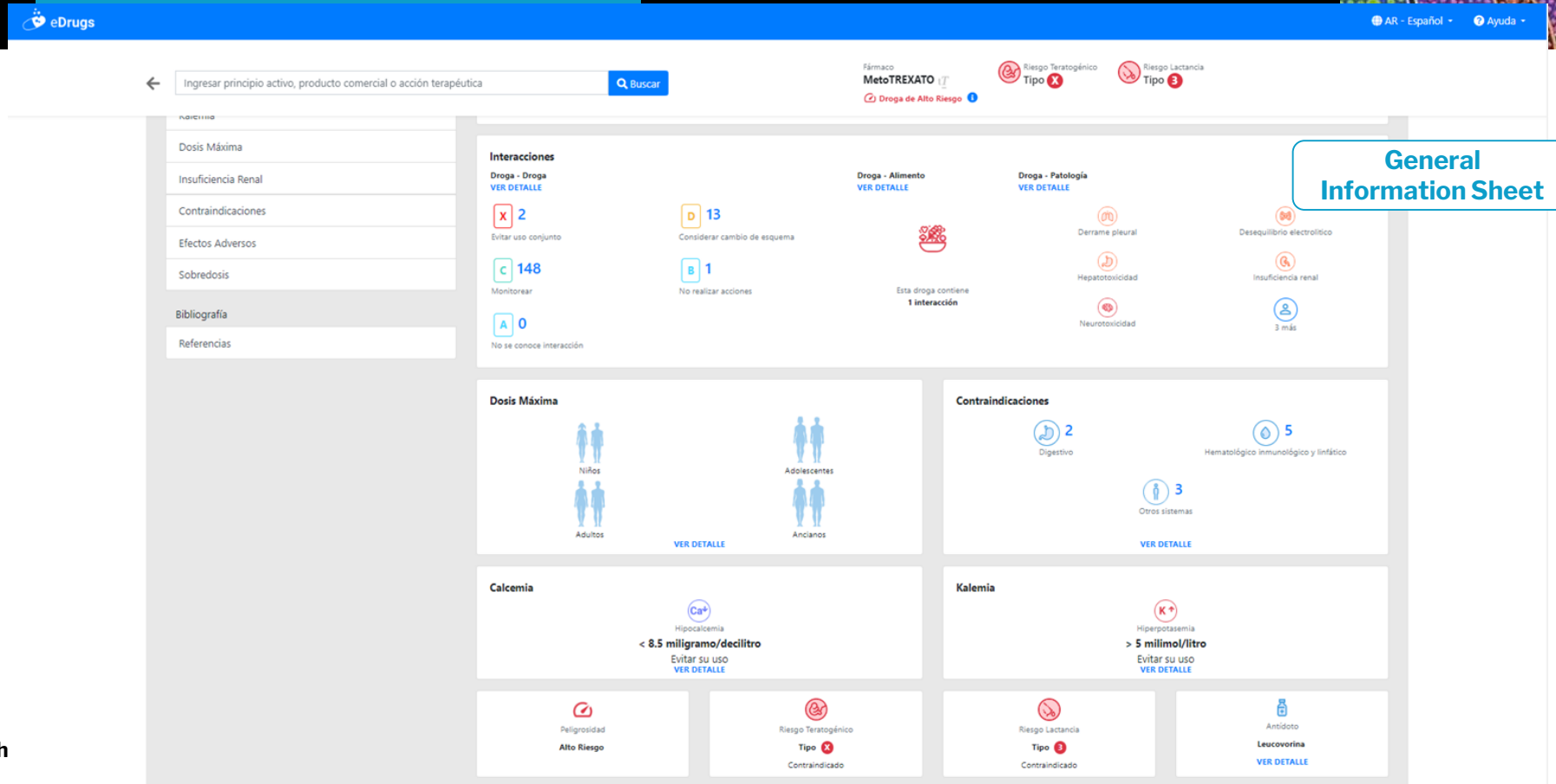

General Information Sheet

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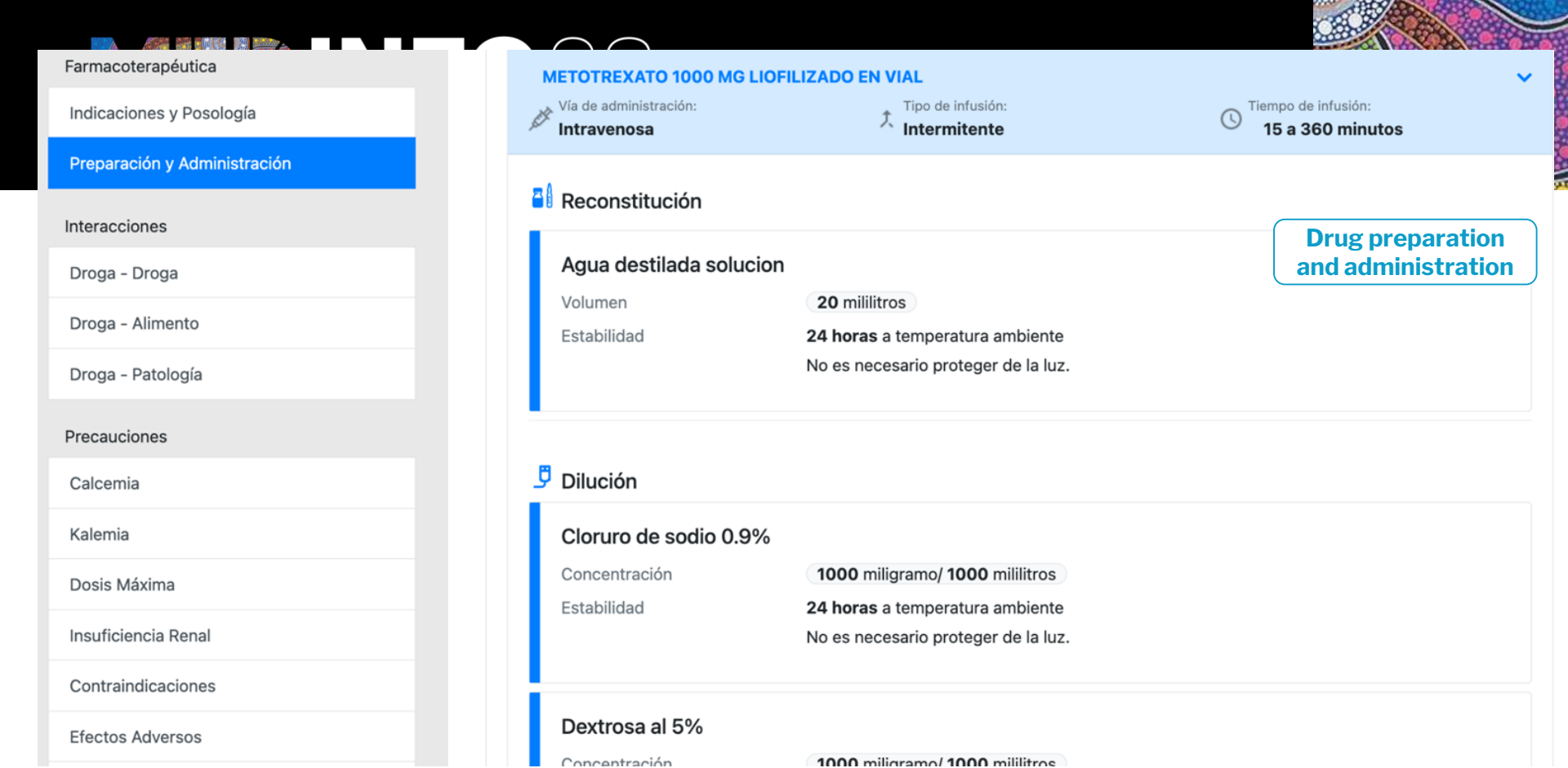
Farmacoterapéutica
Indicaciones y Posología
Preparación y Administración
Interacciones
Droga - Droga
Droga - Alimento
Droga - Patología
Precauciones
Calcemia
Kalemia
Dosis Máxima
Insuficiencia Renal
Contraindicaciones
Efectos Adversos
METOTREXATO 1000 MG LIOFILIZADO EN VIAL
Vía de administración:
Intravenosa
Tipo de infusión:
Intermitente
Tiempo de infusión:
15 a 360 minutos
Reconstitución
Agua destilada solucion
Volumen
20 mililitros
Estabilidad
24 horas a temperatura ambiente
No es necesario proteger de la luz.
Drug preparation and administration
Dilución
Cloruro de sodio 0.9%
Concentración
1000 miligramo/ 1000 mililitros
Estabilidad
24 horas a temperatura ambiente
No es necesario proteger de la luz.
Dextrosa al 5%
Concentración
1000 miligramo/ 1000 mililitros

- Preparación y Administración

Interacciones

- Droga - Droga
- Droga - Alimento
- Droga - Patología

Precauciones

- Calcemia
- Kalemia
- Dosis Máxima
- Insuficiencia Renal
- Contraindicaciones
- Efectos Adversos
- Sobredosis

Bibliografía

Principios activos	Severidad	Recomendaciones
acitretina	X	Riesgo **Hepatotoxicidad** Recomendación **Evitar uso conjunto con metotrexato** En caso de indicar Acitretina - Controlar: ◦ Alteraciones del hepatograma + más info sobre la interacción
etretinato	X	Riesgo **Hepatotoxicidad** Recomendación **Evitar uso conjunto con metotrexato** En caso de indicar Etretinato - Controlar: ◦ Alteraciones del hepatograma + más info sobre la interacción
bcg intravesical	D	Riesgo **Disminucion del efecto terapeutico** Recomendación **Evitar uso conjunto con metotrexato** + más info sobre la interacción

Drug - drug interactions

Droga - Patología

Ver todos los riesgos (8) | Severo (6) | Moderado (2)

Patología	Recomendaciones
derrame pleural	Riesgo **Severo** Descripción La eliminación del metotrexato se reduce en pacientes con derrames en el tercer espacio (p. Ej., Ascitis o derrame pleural) y los niveles de metotrexato pueden elevarse durante un período prolongado, lo que aumenta la toxicidad. Recomendaciones - **Monitoreo Clínico** Retire el líquido del tercer espacio antes del tratamiento y controle los niveles séricos de metotrexat y los signos y síntomas de toxicidad por metotrexato. - **Ajuste de dosis** Puede ser necesario reducir o suspender la dosis.
desequilibrio electrolitico	Riesgo **Moderado** Descripción La hipercalemia, la hiperfosfatemia, la hiperuricemia, la hipocalcemia y la disminución de la diuresis pueden ser indicativas del síndrome de lisis tumoral inducido por metotrexato. Deben tomarse las medidas apropiadas (p. Ej., Hidratación agresiva y alopurinol) para prevenir o aliviar los desequilibrios electrolíticos graves y la toxicidad renal durante y después de la administración de quimioterapia en

Drug - pathology interaction

Dosis Máxima

Grupos etarios

Todos los grupos etarios | Niño | Adolescente | **Adulto** | Anciano

Maximum dose information

Adulto

Vía
Oral

Problema
enfermedad neoplasica

Dosis Máxima
En el tratamiento de la enfermedad neoplásica, la dosis máxima tolerada de metotrexato varía significativamente de 80 a 900 mg/m2 IV sin terapia de rescate con leucovorina y de 900 a 30,000 mg/m2 IV con rescate de leucovorina. La dosis intratecal máxima de metotrexato es de 15 mg.

Problema
artritis reumatoidea

Dosis Máxima
20 miligramo por semana

Grupos etarios

Todos los grupos etarios | Lactantes De 1 A 12 Meses | Niño | Adolescente | **Adulto** | Anciano

Kidney adjustment information

Adulto

Por resultado

Clearence de Creatinina	Recomendación	
< 10 ml/min	**Evitar su uso**	
10 - 50 ml/min	dosis (% de reducción): **50**	**Usar con precaucion**
> 50 ml/min	**No requiere ajuste**	

Objective

To describe the **design**, **development** and **architecture** of an **electronic drug information tool** integrated into the health information systems, in a tertiary level academic hospital.

Methods

- **Cross-sectional study of eDrugs usage** *recording user characteristics, access to specific sections, and most frequently consulted drug categories during its implementation.*

- **Inclusion Criteria:** *all users accessing eDrugs between September 3rd and November 4th 2019.*

- **Pharmacologic knowledge base:** *drug information is entirely retrieved from the hospital's homegrown PKB, containing structured information on more than 1200 drugs, including family, therapeutic action(s), and general information*

Methods

- **eDrugs design:** *developed using Nielsen's heuristics, general principles for interaction design. The layout consists of a series of cards, which allows its adaptation to multiple screens. The design of these cards aimed at displaying drug information in an agile and action-oriented way.*

Methods

Architecture

- 3 layers:

1) the view built on Bootstrap.
2) contains the application business logic grouped in two main components: (A) the Drug summary sheet and (B)the Prescription Simulator.
1) services (A) Information retrieval service enables searching drugs by name, therapeutic actions, and generic or brand names; (B) RESTful resources that represent Drugs information content; (C)FHIR service that creates a collection of resources (Bundle) and sends it to the CDS Service; (D) CDS Services with pharmacological alerts and recommendations for the CDS Client (eDrugs).

Results

- **eDrugs was integrated into our EHR through an icon on the EHR's heading.**
- **Drug summary sheet:** includes a search field that allows searches by drug, brand names, and/or therapeutic action. Comprises a Header, a Clinical Information Tab, and a Brand Names Tab (Argentina, Chile, or Uruguay).
  - *The Header* features key information on drug name, class, classification system (ATC and SNOMED), therapeutic actions, teratogenic and breastfeeding risk. Specific iconography and a chromatic scale were used to indicate risk severity. The header can contract to remain visible.
  - *The Clinical Information tab* contains information about mechanism of action, spectrum and resistance, pharmacokinetics, medical use and dosage, and interactions, among others.
  - *The Brand Names Tab* includes information about generic drugs, brand names, and frequent dosage of each generic drug.

Results

- **Prescription simulator:** provides clinical information about potential pharmacological alerts in simulated prescription scenarios. Inputs include: *drug prescriptions; patient characteristics; patient laboratory results; pathologies and allergies.* With this information, the tool shows *interaction alerts* such as
  - *drug-drug (DDI),*
  - *drug-allergy,*
  - *drug-food,*
  - *drug-pathology,*
  - *drug-potassium / calcium blood level,*
  - *drug-creatinine clearance,*
  - *and maximum daily dose.*

Results

- A total of 1,435 identifiable users who accessed eDrugs between September 3rd and November 4th 2019 were included in the study (physicians, n=728, 51%; nurses, n=341, 29%). During the study period, a median of 81 daily users accessed eDrugs (range: 15 - 106). Most users accessed eDrugs to use the Drug summary sheet (97.0%). Accesses to the Prescription simulator represented 2.9% of all.

Results

Accessed sections	Drug searches by identifiable users (n = 5692)		
	Clinical information tab only	Brand name tab only	Both
n (%)	4870 (85.56 %)	488 (8.57 %)	334 (5.87 %)
Total modules accessed - n	10858	789	1623
Distinct modules accessed per drug search (mean)	2.05	2.05	4.3
Most accessed modules	▸ Mechanism of action and Header (48.3 %) ▸ Medical use / dosage (17.9 %) ▸ Adverse reactions (6.3 %) ▸ DDI (5.3 %) ▸ Pharmacokinetics (4.6 %) ▸ Other (17.5 %)	▸ Brand names (97.0 %) ▸ Frequent dosage (2.0 %) ▸ Generic drugs (1.0 %)	▸ Brand names (34.4 %) ▸ Mechanism of action and Header (20.6 %) ▸ Medical use / dosage (16.8 %) ▸ DDI (4.7 %) ▸ Pharmacokinetics (4.6 %) ▸ Other (19.0 %)

use of the main functionality of drugs.

Discussion

- Previous studies have reported that health professionals seek information about drug interactions, dosage and adverse reactions. **Professionals in our institution prioritize these topics as well.** The most searched-for drug groups were antimicrobials and drugs acting on the nervous system.
- **We found a relatively low use of the prescription simulator.** In our institution, DDI alerts operate as components of the EHR, without the need to use a stand-alone CDSS like eDrugs. Similarly, our hospital's EHR already displays brand names as the CPOE form is completed, which might partially explain these results.
- A potential **limitation** of this study is that the design process did not include all UXD steps. However, Nielsen's heuristics were taken into account.
- Furthermore, this study did not include an assessment of user satisfaction.

Conclusion

The **design** and **development** of **electronic drug information tools** poses various challenges on health informatics teams.

Future research should include assessments of **user satisfaction** and links between drug information tools and prescription errors.

Log data provide insights into the information priorities of health professionals, allowing further improvements to the way information is organized and displayed.

Work Team

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