



ELSEVIER

Transforming clinical decision support and education through data science and innovation

December 1, 2022



Elia Lima Walton, MD

Director Data Science and Clinical Analytics Health



Agenda

About Us, Our Mission, How We Operate, Our Community

Combining Power of Data Science to Content

Data Science Projects to Solve our Customers' Problems

Our Mission

- Elsevier helps researchers, educators, and healthcare professionals advance science and improve health outcomes for the benefit of society.
- We do this by facilitating insights and critical decision-making for customers across the global research and health ecosystems.



Who we are

A global information analytics
business specializing in science
and health



ELSEVIER

What we do it

We help you solve your
challenges, for the
benefit of humanity

What we do

We help institutions and
professionals progress
science, advance
healthcare and improve
outcomes

A unique combination

Combine content with technology,
supported by operational efficiency, to turn
information into actionable knowledge

Supporting Our Five Main Customer Segments

 Clinicians	'Consider this treatment for this patient'	
 Researchers	'This article answers your questions'	
 Governments	'This is the research to invest in'	
 Pharmaceutical companies	'This is the novel treatment you should pursue'	
 Medical and Nursing Students	'This is the area you need to improve to succeed'	

Elsevier Flagship Products

At Elsevier we facilitate insights and critical decision-making for our global customers.

Sherpath®

ClinicalKey® Student

ClinicalKey®

ScienceDirect®

PharmaPendium®

SciVal



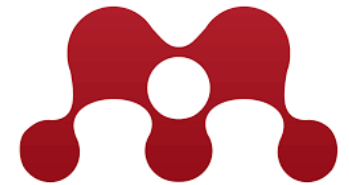
Embase®

Pure



3D4MEDICAL

Science-Metrix



Reaxys®

Arezzo



SciBite
an ELSEVIER company

STATdx®

MENDELEY

SSRN

Scopus®

Shadow Health®

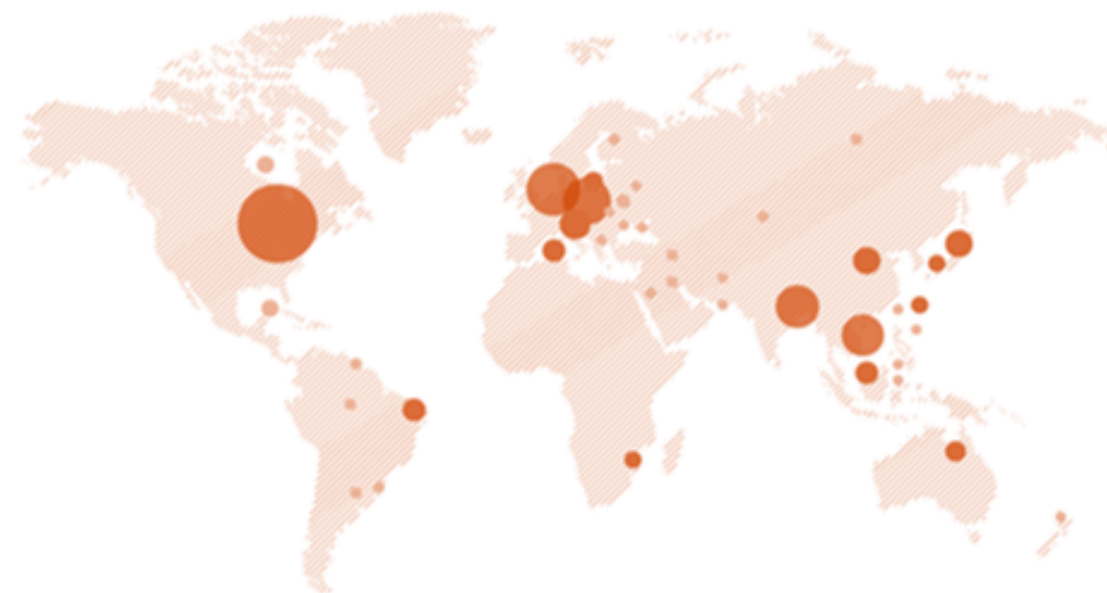


ExpertPath™



Elsevier's Data Science Community and Global Organization

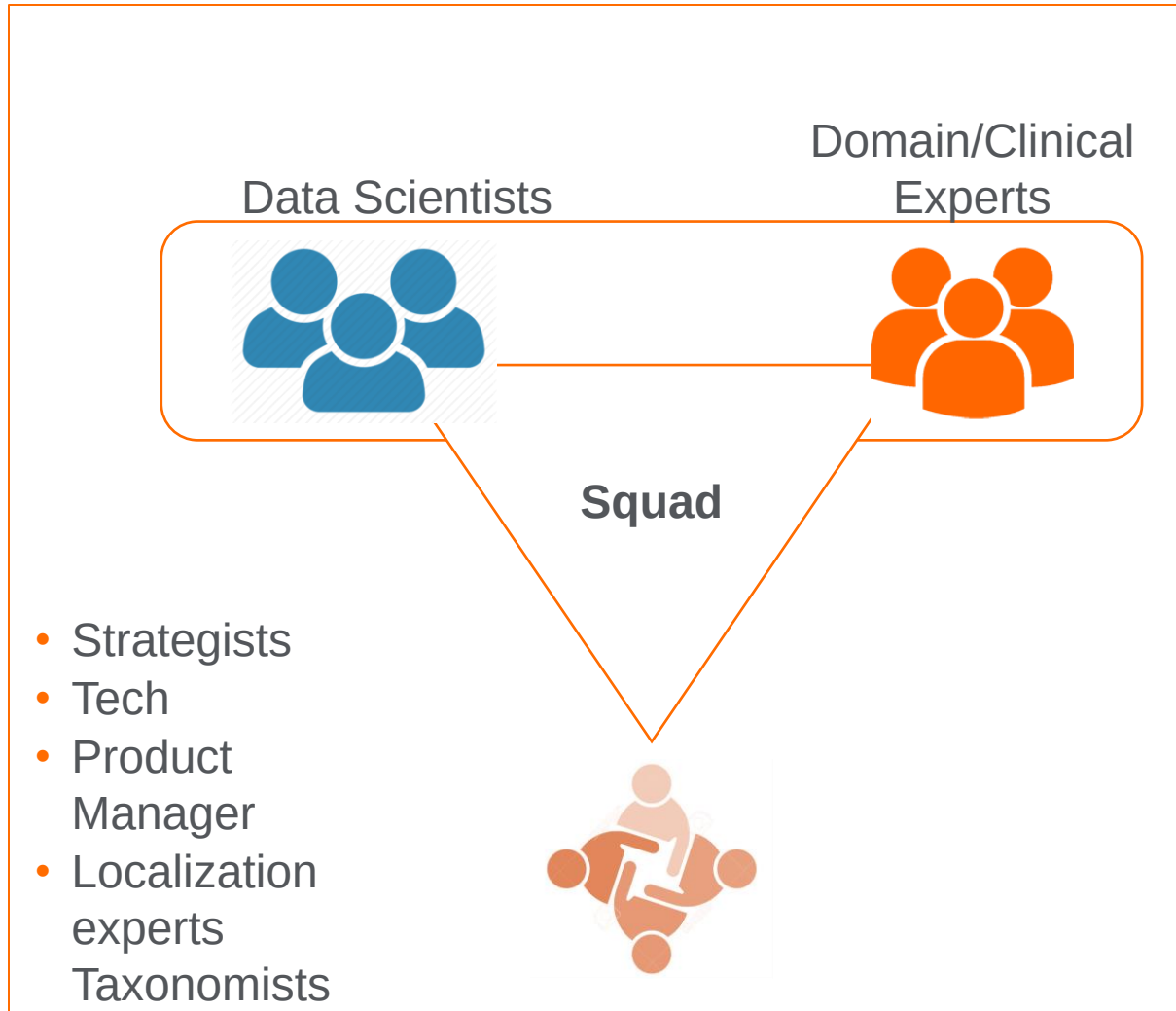
- 250+ **data scientists** and **clinician specialists**
- Several Global Collaborations with Universities in the United States, Europe, and India
- Main hubs in:
 - Amsterdam
 - London
 - Philadelphia
 - Chennai
 - Bengaluru
- Artificial Intelligence Lab in Amsterdam
<https://discoverylab.ai/>
- We have **>90 collaborations** with universities, companies and hospitals around the globe utilizing all forms of data science to help our customers achieve actionable insights



Employees: ● 1-30 ● 100 ● 200

Elsevier has **8,700** employees and serves customers in 180+ countries

Data Science Health, Who We Are and How We Operate



- We are organized locally and globally
- Support Health initiatives globally with data science, clinical, and localization expertise
- Manage extended bench of external contractors and suppliers
- Execute on innovative projects aligning with internal external collaborators

- Philadelphia
- Houston
- Dallas
- Knoxville
- Asheville

- Amsterdam
- Barcelona

- Chennai
- Delhi/Gurgaon
- Bengaluru
- Mumbai



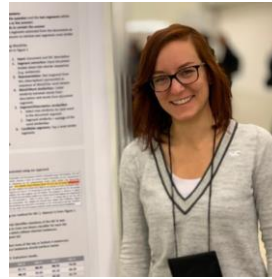
Meet the team– Data Science & Clinical Analytics



Elia Lima-Walton, MD
Director Data Science &
Clinical Analytics Health



Hina Nazir, MD
Clinical Analytics Manager



Dasha Herrmannova, PhD
NLP & Data Science
Manager



Leah Livingston, RN
Clinical Data Scientist &
Analytics Specialist



Sameer Chivukula, MSc
Senior Data Scientist



Sharvari Jadhav, MSc
Data Scientist



Harsh Sindhwa, MSc
Data Scientist



Saqib Shahzad, MEng.
Senior Data Scientist



Charlotte Tesselaar, MSc
Sr. Localization Specialist



Vidhyaa Rajee, MSc
Data Scientist



Dwipjayeta Choudhury, RN
Sr. Clinical Data Analyst



Pranita Mahajan, MEng.
Senior Data Scientist



Sangeeth Cecil Ranjit, PhD
Clinical Analytics Specialist

Roles and expertise

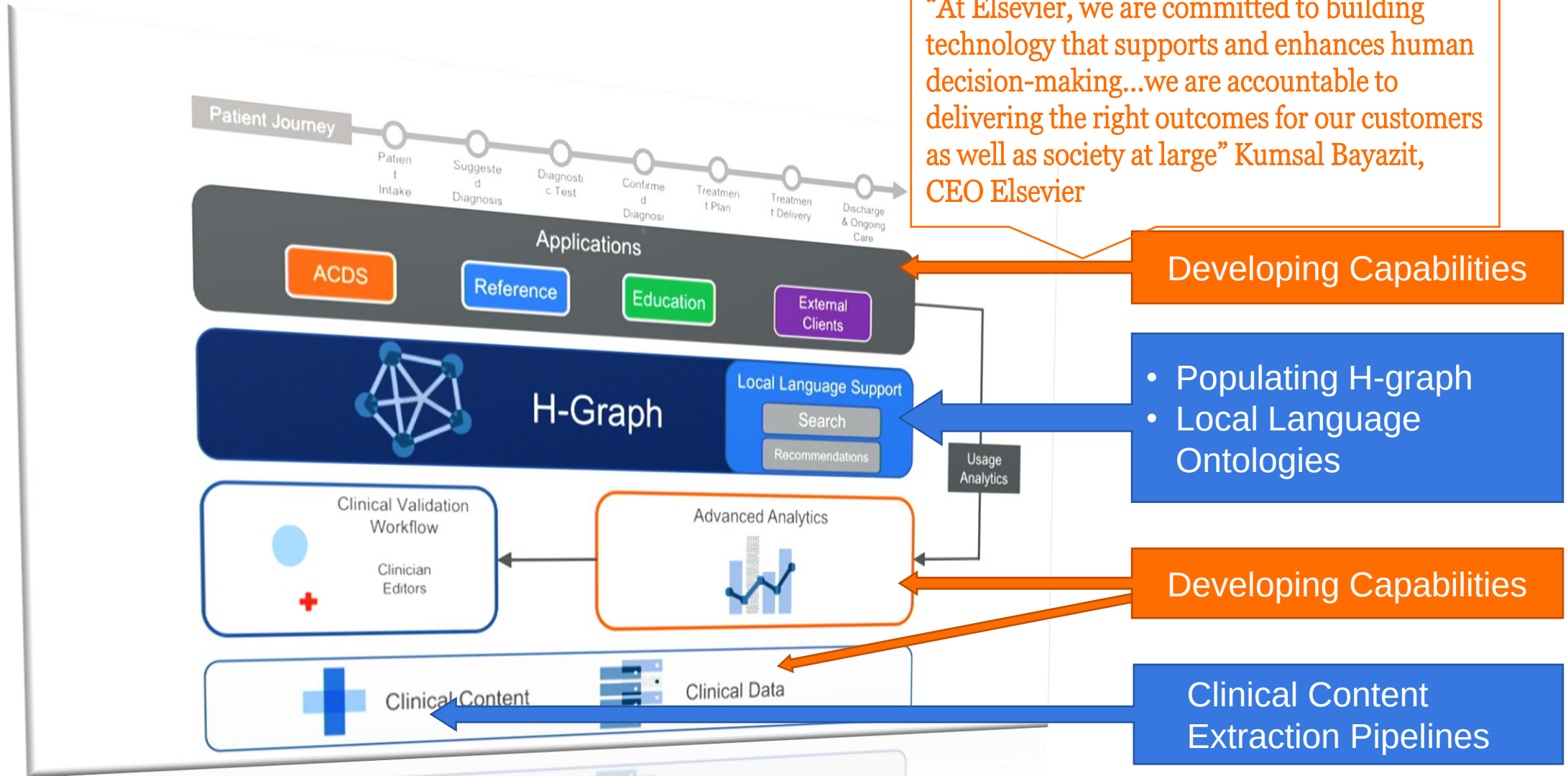
Multi-disciplinary department: Data Scientists,
Clinical Analytics Specialists, Localization
Specialist, Knowledge Management, Life
Sciences

Data Science and Health expertise: Machine
Learning, Natural Language Processing,
Machine Translation, Optical recognition, Clinical
Analytics, Medicine, Nursing, Hospital Admin,
Pharmacy and Drug Development

Supporting Patient, Student, and Researcher's Journey

Elia Lima-Walton, MD
Elsevier
November 28, 2022

“At Elsevier, we are committed to building technology that supports and enhances human decision-making...we are accountable to delivering the right outcomes for our customers as well as society at large” Kumsal Bayazit, CEO Elsevier



Combining the Power of our Trusted Medical Content with Data Science

Key capabilities which we prioritize and develop:

1) Search

- Concept/taxonomy alignment and information retrieval

2) Integration

- Standardization of metadata, normalization, new technologies

3) Globalization/Localization

- Focus on the global customer, adapting products, content, and initiatives to locale and culture

Unique Assets and Capabilities to Extract Information from Clinical Records and Medical Curricula

Use Cases

Deidentify text records
Commercialize health data
Risks, predictive analytics
Coding and reimbursement
Extract knowledge from literature
Map insights to patients
Mapping educational curricula

Problems to Solve

Convert unstructured into structured data from

- clinical notes
- radiology reports
- pathology reports
- lab reports
- biomarkers
- education alignment

Standardize data from multiple hospitals
(SNOMED, ICD 10, CPT, LOINC, ATC, NDC, ...)
Contextualize and interpret data

Our Solutions

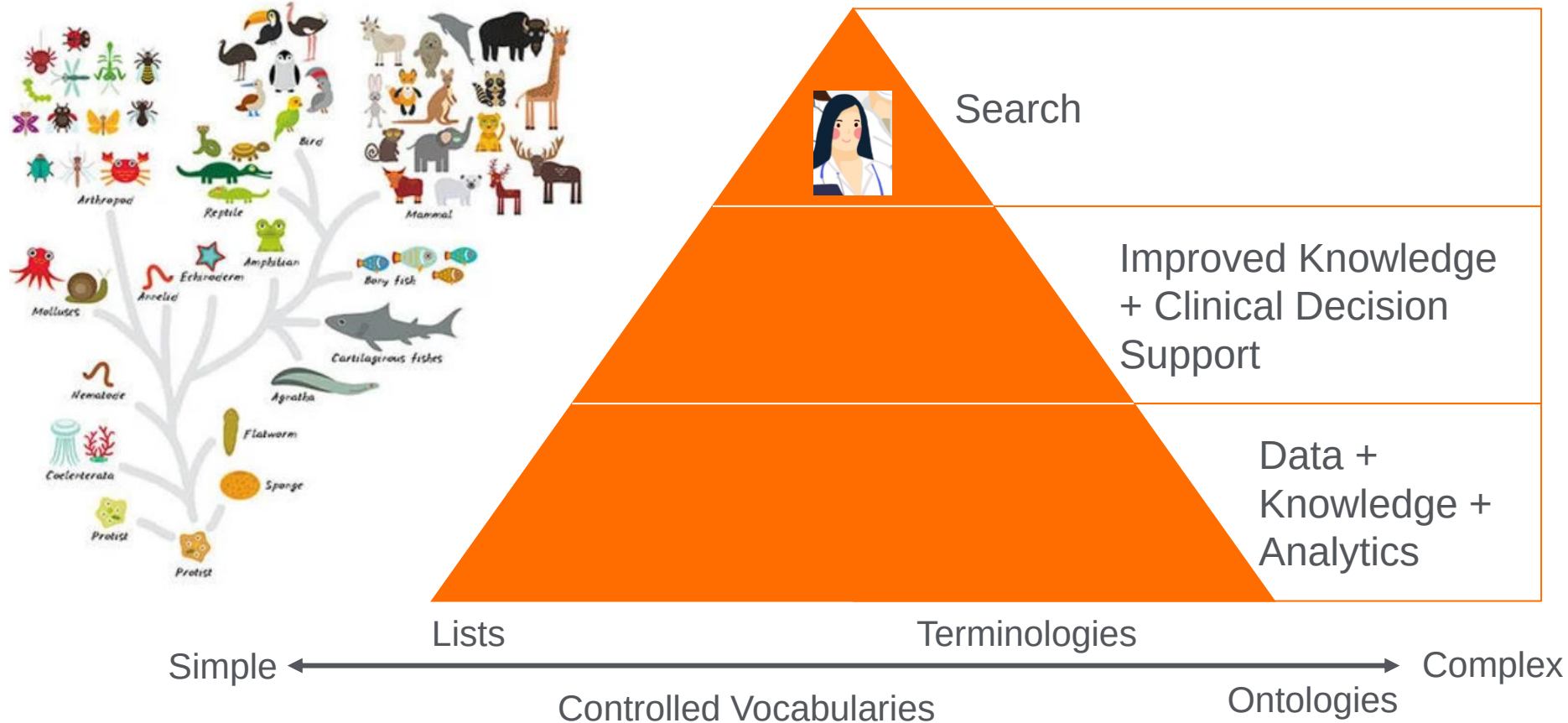
NLP

taxonomies

knowledge graph

Taxonomy Powering Search and Product

Taxonomy: Science of identifying and naming species and arranging them into classification



Objective

Clinicians, researchers, students, and educators need concise actionable answers. Identify and prioritize key concepts embedded in content to aide in improved information retrieval.

Introducing Elsevier's Medical Taxonomy

- **Multilingual:** English, French, Spanish, German, Brazilian Portuguese
 - Arabic, Chinese, Somali, Nepali, Armenian, in pilot
- **Concept-based:** All terms, synonyms, translations, mappings are related to one unique identifier (“IMUI”)
- **Ontology:** Provides semantic relationships between concepts (symptoms of a disease, treatment procedures of a disease, complications of a disease etc...)
- Explicitly mapped to **international medical standards** (*SNOMED-CT, ICD-10-CM, LOINC, CVX, etc.*) and Elsevier's internal vocabularies (Gold Standard, Dorland's).
- Continuously curated by team of clinical medical terminology experts, available via API
- Is at the heart of our knowledge graph, connecting concepts and relationships supported by evidence in content, unlocking knowledge through scalable, easily-navigable information services.
 - Knowledge graph has **400K+** medical concepts, **900K SYN** with over **220K semantic relations**, **90K symptoms**, **46K drugs**, **75K diseases**, **63K procedures** and extensive mappings to industry vocabularies and multi-language support.

Introducing Elsevier's Taxonomy and Knowledge Graph

Parents

- Breast disorders (IMUI:2805667)
- Cancer of the thorax (IMUI: 8258010)
- Neoplasm of breast (IMUI: 8258030)
- Malignant neoplasm (IMUI: 2791003)

IMUI: 2790981

- Lang: En

Medical Name

- Malignant neoplasm of the breast

Consumer-Friendly Name

- Breast cancer

Synonyms

- Malignant tumor of the breast
- Malignant breast neoplasm
- Breast CA

STY/STYGROUP

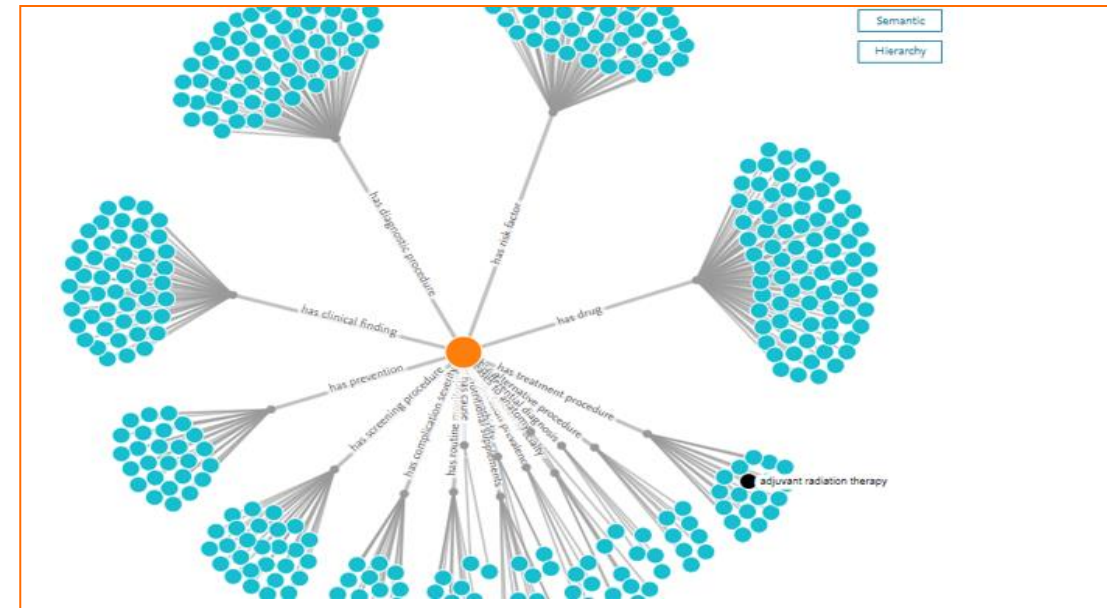
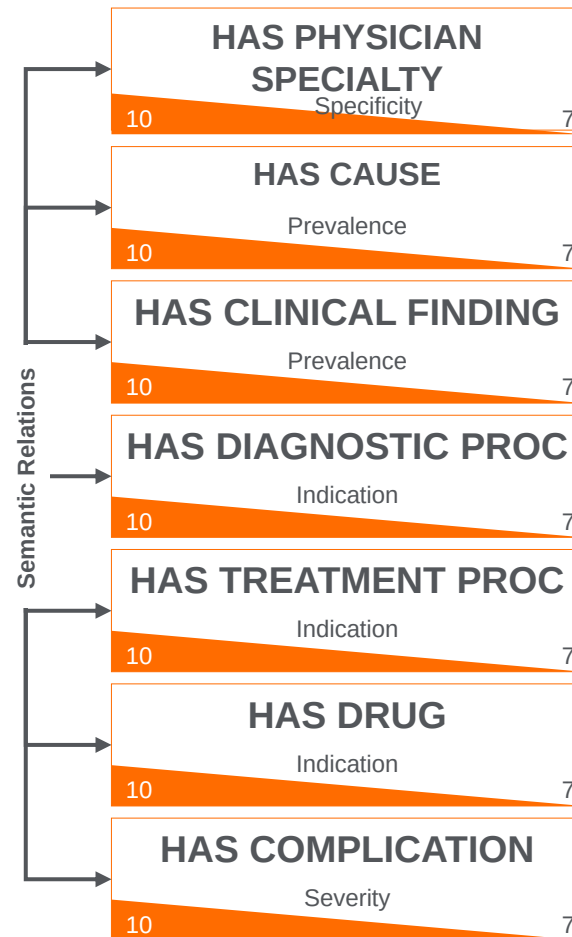
- Neoplasm process / Disease

Mappings

- UMLS – C0006142 (exact)
- ICD9-CM – 174.9 (exact)
- ICD10-CM – C50 (exact)
- SNOMED-CT – 254837009 (exact)
- MeSH – D001943 (exact)

Children

- Breast sarcoma (IMUI:8258036)
- HER2-positive breast cancer (IMUI: 8316103)
- Male breast cancer (IMUI: 8009640)
- Lobular carcinoma (IMUI: 3816091)



- What clinical findings are associated with **breast cancer**?
- How do you screen **breast cancer**?
- What is the diagnostic work-up for **breast cancer**?
- What is the gold standard treatment for **breast cancer**?
- What are common differential diagnoses for **breast cancer**?

Helping Clinicians and Students Worldwide

- ClinicalKey US
- ~20 million content assets
- Our taxonomy is used for:
 - Autocomplete search
 - More accurate search results
 - Faceted navigation (Related screening drugs)
 - Query refinement

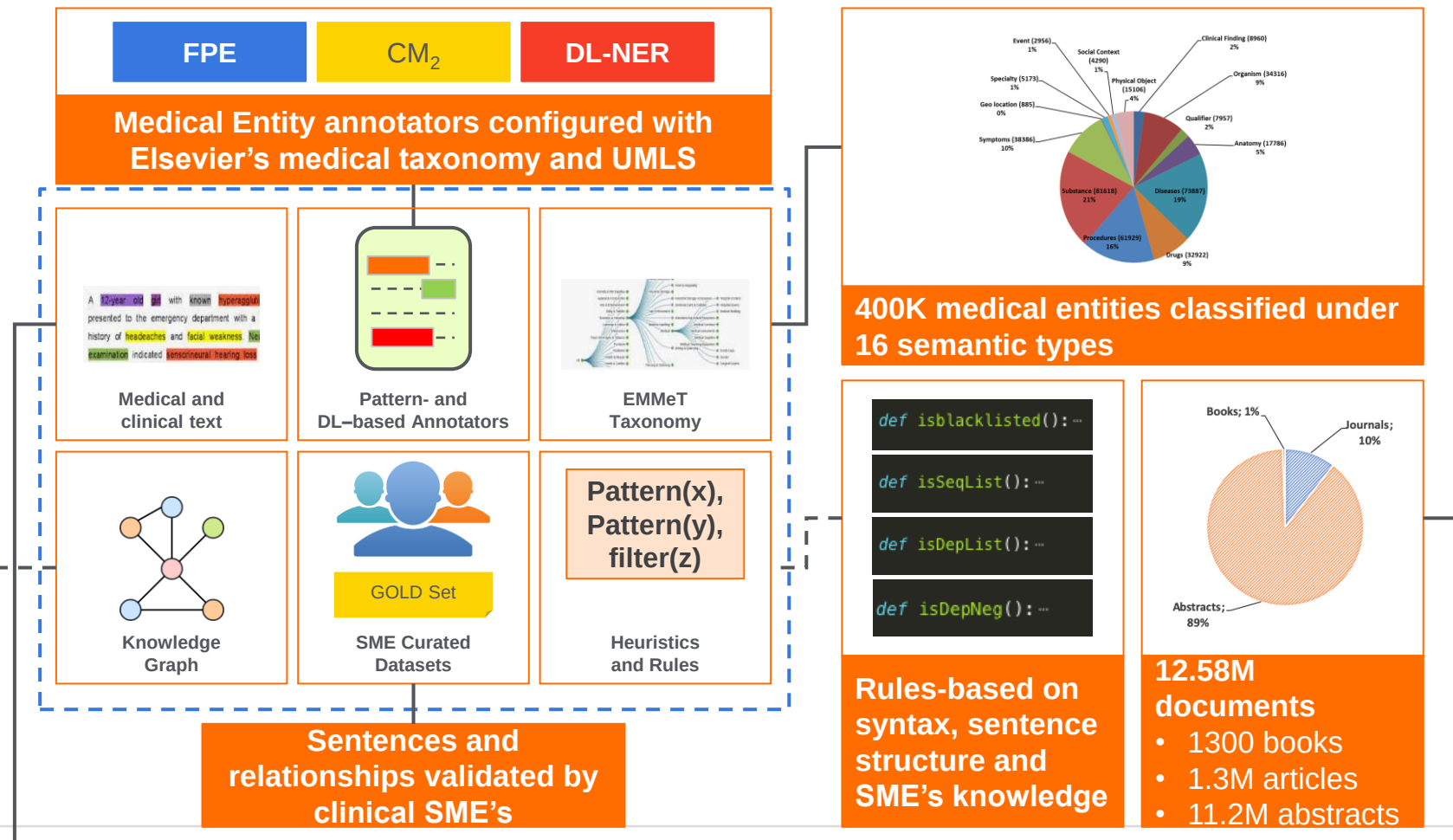
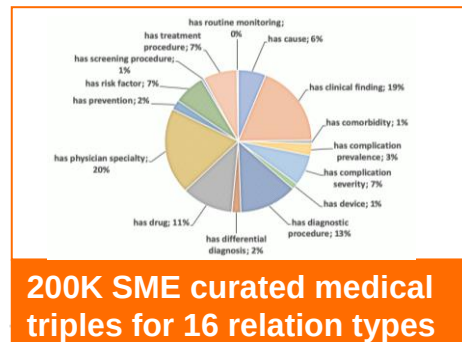
Localized versions for France, Spain, Brazil and Germany

The screenshot displays the ClinicalKey US search interface. On the left, a 'Filter By' sidebar lists various source types and specialties. The main content area shows search results for 'Breast Cancer Screening' and 'Paget Disease of the Breast'. The 'Breast Cancer Screening' result includes a book cover and a 'Breast Cancer' overview section. The 'Paget Disease of the Breast' result includes a definition and a 'Guideline No. 422f: Menopause and Breast Cancer' link. The interface also features a 'Rate Results' button and a 'Was this helpful?' feedback prompt.

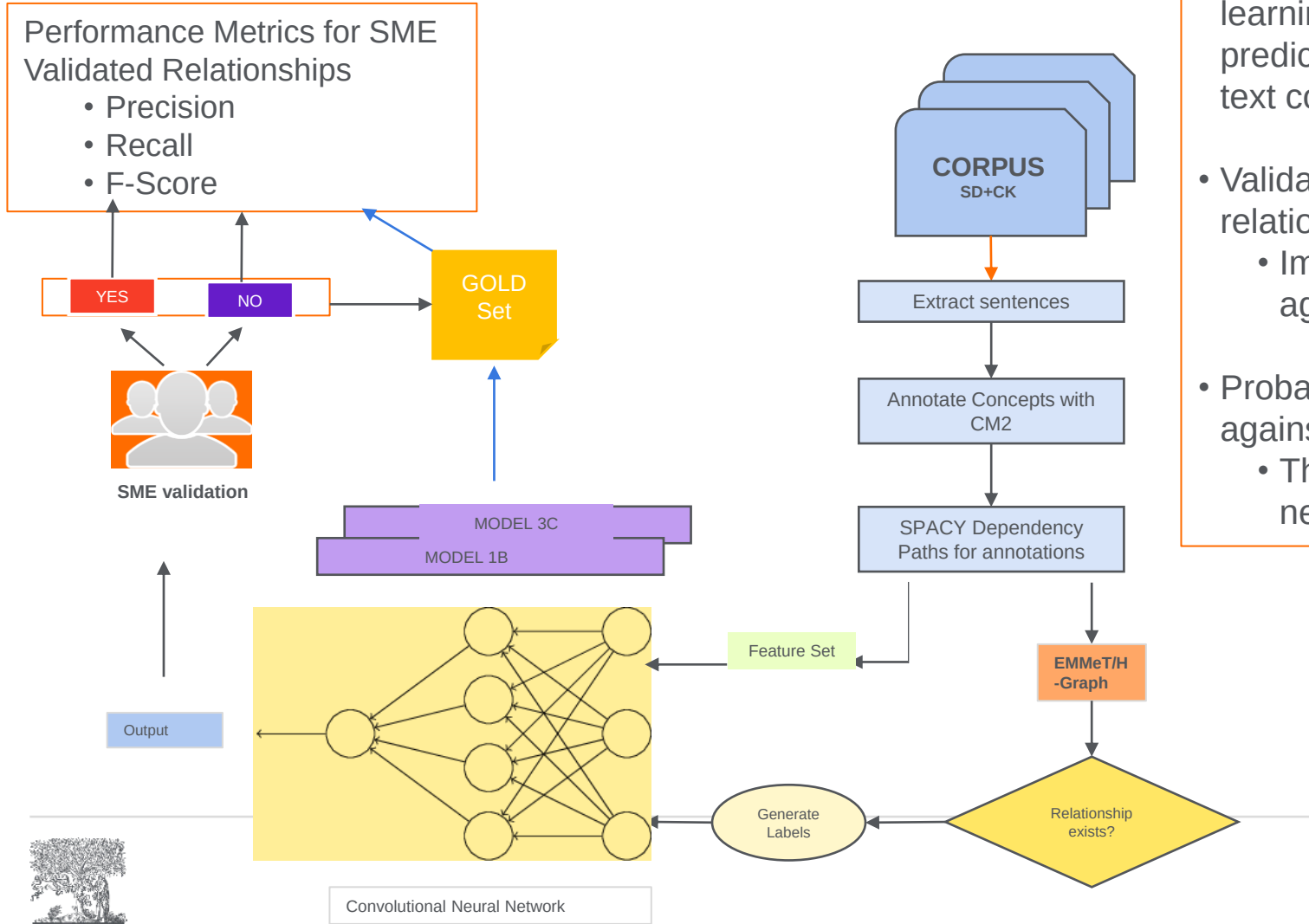
Language	# Medical name labels	# Synonym labels
English	400K	1M
Spanish	200K	400K
German	178K	167K
French	111K	210K
Brazilian Portuguese	150K	111K

Knowledge Extraction From “Noisy” Content

- Mining semantic patterns from our taxonomies
- Improving the quality of diverse data sets and annotations and search, extracting and identifying novel relationships for CDS support.
- Breaking silos, connecting content, peoples, and different assets.



Extracting Symptoms, Treatment, Diagnostic Procedure, and Drug Relationships from Medical Content at Scale



- Modeling workflow utilizes weakly supervised learning via convolutional neural networks (CNN) to predict symptom to disease relationships from free text content
- Validation done on a test set or Gold Set in which relationships are assessed as true or false by SMEs
 - Improvements in the model are evaluated against the Gold Set
- Probability thresholds for the model are tested against Precision, Recall and other metrics.
 - Threshold can be chosen according to business need (high recall or precision)

	Number of Documents
Books	1,320
Journals	1,317,321
Abstracts (Medline)	1,322,484
Total	2,641,125

> 4.2 million clinical relationships extracted from unique evidence

Application of Triple Extraction for Improved Search Performance

- Current algorithm pulls Benzos and Drug Monograph for Amphetamine, and document on ADHD

Creating new triples (associative relationships in sub-predicate-obj) will improve relevancy score of novel drugs indicated both on-label (FDA approved use) and off-label (common use in practice outside of formal FDA approval).

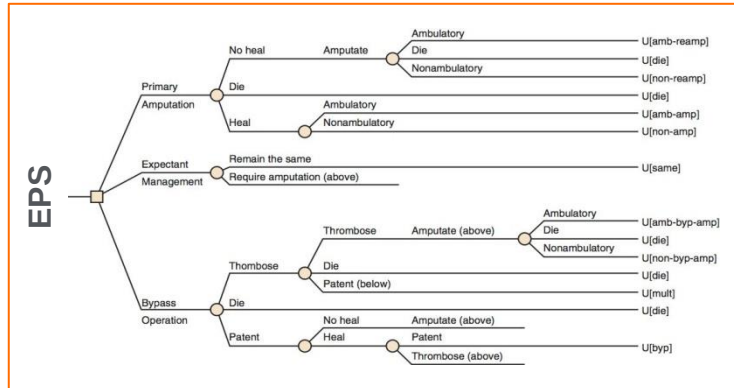
- Improve discoverability at Point-of-Care. Add value by:
 - Improving accuracy of treatment
 - Reducing patient cost of unnecessary tests/treatment
 - Reduced malpractice litigation

The screenshot displays the ClinicalKey search interface. The search bar at the top contains the text 'absence seizure', which is circled in red. Below the search bar, the results are filtered by 'Source Type' on the left sidebar. The main content area shows three results, each marked with a red arrow pointing to the 'Benzodiazepines' link. The results are:

- Benzodiazepines** (Gold Standard. Published July 30, 2020. © 2020.)
- Methylphenydate Stimulants for Attention Deficit/Hyperactivity Disorder...** (Gold Standard. Published January 1, 2019. © 2019.)
- Amphetamine Stimulants for Attention Deficit Hyperactivity Disorder (ADHD)** (Gold Standard. Published May 24, 2018. © 2018.)

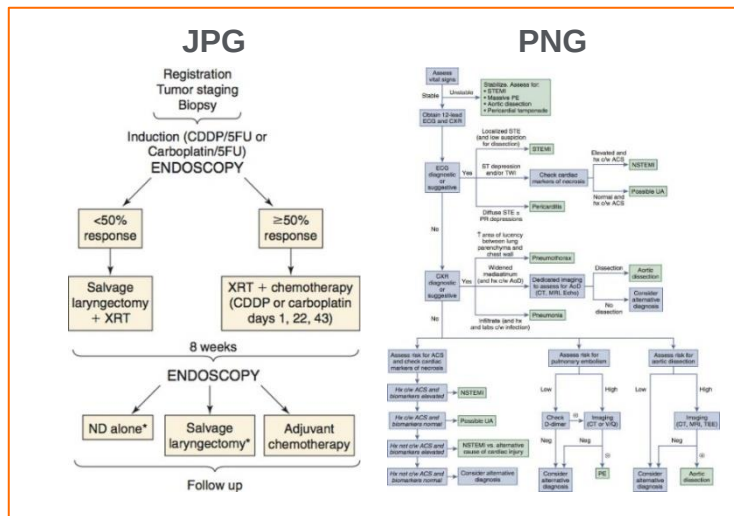
Below the results, there are links for 'absence seizure complications' and 'absence seizure risk factors'. On the right side, a sidebar titled 'Absence Seizure' provides a 'Disease Overview' and a 'Definition' section, which states: 'Absence seizures are a type of generalized seizure characterized by brief episodes of staring with impairment of consciousness (absence). They usually last no more than 20 to 30 sec. The onset and the end of the seizures are sudden. Usually the patients are not aware of them and resume the activity they were performing before the seizure. The electroencephalogram signature of absence seizures consists of a generalized 3-Hz spike and slow wave discharges. More'.

Automating Extraction of Medical Decision Trees Via Computer Vision



Flowchart or decision tree corpus is **heterogenous**

—
Different shapes, flow types, formats, colors, resolution, etc.



We developed a general, computer vision-based AI system

for **flowchart deconvolution** to be used at the point of care and in education



Data Science Tools and Domain Expertise Applied for Automated Taxonomy Alignment for Localization & Search Improvement

1. Define extraction targets
(different targets per book)

2. Work with SMEs to
define extraction rules
(different rules per language)

3. Implement extraction
rules on source XMLs
(per book and language)

8. Ingestion of terms into TASS,
translation memory building,
improved interoperability across
products.

7. Ingestion into H-Graph, semantic
tagging, live Search



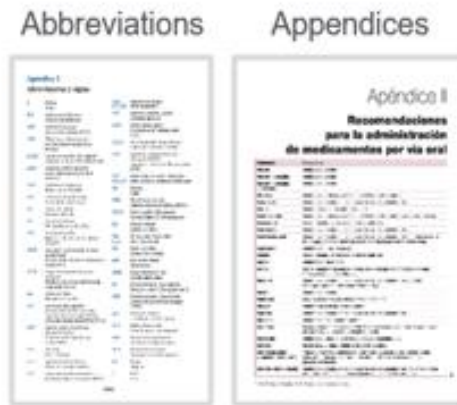
6. Machine translate into target
language and file prep for SMEs
to work on

5. Run code gap analysis by
language

Source	ES	PT	PT-BR	PT-PT
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema

4. Deduplicate and
translate extracted terms

Source	ES	PT	PT-BR	PT-PT
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema
27670: with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema	with emphysema and emphysema



Books
(PDFs and XMLs)

Indexes

Glossaries

Empowering Clinicians and Students TO Discover Content

- Create ClinicalKey Topic Pages that are **indexable** and **searchable** on **Google** for our customers
- Improve the physician and student search experience
- Free to access through ScienceDirect
- Offer hundreds of thousands of comprehensive and topical web pages
- Provide definitions and related terms for each concept
- Provide snippets of high-quality, relevant, peer-reviewed content

The screenshot displays the ClinicalKey Topic Page for 'Rheumatoid arthritis'. At the top, a dark header bar contains the title 'Rheumatoid arthritis' in white, followed by a brief definition: 'RA is a chronic, systemic, autoimmune disorder in which T-cell-mediated inflammation results in deforming symmetrical polyarthropathy and multiple extra-articular manifestations [Table 24.8]. Tanskanen & Selzer (2017), Chapter 29; UpToDate Surgery, Essentials of Rheumatology'. To the right, a 'Related Terms' box lists: 'Arthritis, Autoimmune disease', 'Connective tissue disorders', 'Clinical finding: Inflammation', 'Joint, Distal', 'Connective tissue disorders', 'Spondyloarthritis', 'Share Terms', and 'List of Topic Pages'. Below the header, there are links for 'Add to Mendeley', 'Download as PDF', and 'Set alert'. The main content area is divided into two columns. The left column, titled 'Rheumatoid arthritis (2021)', includes a 'Clinical Overview' and 'Diagnostic Procedures' section, listing 'Primary diagnostic tools' such as 'History and physical examination', 'Laboratory testing: is useful if rheumatoid arthritis is suspected based on history and physical examination', 'Serology: rheumatoid factor and/or anti-cyclic citrullinated peptide antibodies', 'Acute phase reactants: C-reactive protein or erythrocyte sedimentation rate', and 'The 2010 American College of Rheumatology/European League Against Rheumatism classification criteria recommend using joint count (number of joints affected), duration of symptoms, and laboratory results to identify patients with undifferentiated synovitis who have the highest likelihood of developing persistent rheumatoid arthritis'. The right column, titled 'Rheumatoid arthritis in adults: management', includes a 'Guideline' section with an 'Overview' that states: 'This guideline covers diagnosing and managing rheumatoid arthritis. It aims to improve quality of life by ensuring that people with rheumatoid arthritis have the right treatment to slow the progression of their condition and control their symptoms. People should also have rapid access to specialist care if their condition suddenly worsens. NICE has produced a COVID-19 rapid guideline on rheumatological autoimmune, inflammatory and metabolic bone disorders. It recommends changes to usual practice to maximise the safety of patients and protect staff from infection during the COVID-19 pandemic. NICE has also produced technology appraisal guidance on drug treatment for rheumatoid arthritis.' Below the overview, there are links to 'Rheumatoid arthritis Clinical Disease Activity Index (CDAI) .com' and 'Rheumatoid Arthritis Criteria (1987 revision, American Rheumatism Association) .com'. An orange arrow points from the text 'Provide definitions and related terms for each concept' in the list to the 'Rheumatoid arthritis' title in the screenshot.

Improving the User Search Experience

Snippet evaluation

- Snippet images were reviewed by semantic group: Symptoms/findings, disease, drug, procedure
- Ranking system generated for image snippets

Validating and Labelling definitions sentences

- Sentences prioritized by token
- Semantic patterns identified in sentence structure
- Definitions if multiple for a term were classified as preferred (Yes) or not preferred (No)
- 5,000+ definitions analyzed

Images for Diffuse dermatitis



Fig 1 Clinical presentation on admission. Coalescent erythematous scaly papules in perioral area and periorbital edema are noted.

Lovett, Audrey, MD: Diffuse dermatitis: An unexpected initial presentation of cystic fibrosis. From: Journal of the



Fig 2 Diffuse erythematous scaly papules on trunk.

Lovett, Audrey, MD: Diffuse dermatitis: An unexpected initial presentation of cystic fibrosis. From: Journal of the American Academy of Dermatology,

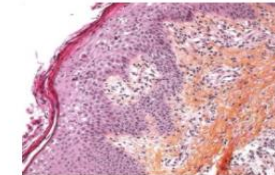


Fig 3 Specimen from first biopsy showing acanthosis, confluent parakeratosis, mild spongiosis, and mild lymphohistiocytic perivascular infiltrate with a few eosinophils. (Hematoxylin-eosin stain; original magnification: $\times 20$.)

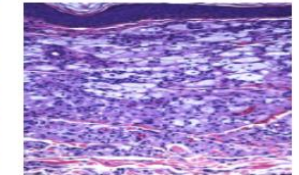


Fig 5 Later biopsy specimens showing predominately foamy histiocytes with rare Touton giant cells. (Original magnification: $\times 10$.)

Satter, Elizabeth K., MD, MPH: Diffuse xanthogranulomatous dermatitis and systemic

sentence	label	probab	tokenl	concept	lmui	Preferred
Constipation is defined symptomatically as the infrequent passage of hard stools, straining while passing a stool, or pain associated with the passage of a hard stool.	TRUE	0.89073	0	Constipation	2791117	Y
Contact lens wear is another form of corneal microtrauma that seems to be associated with keratoconus.	TRUE	0.58857	0	Contact lens	2791118	N
Febrile seizures (FSs) are the most common type of pediatric seizure and occur in patients between 6 months and 5 years of age associated with fever but without intracranial infection or defined cause.	TRUE	0.77412	0	Febrile seizures	2791122	Y
Febrile seizures are the most commonly reported neurologic adverse event after measles vaccination.268,726,729&733 Fever from any source lowers the threshold for seizures, and a febrile seizure is not a sign of central nervous system (CNS) infection or disease.	TRUE	0.57132	0	Febrile seizures	2791122	N
A cosmetic is any substance applied to the body for cleansing, beautifying, promoting attractiveness or altering the appearance.	TRUE	0.92267	1	cosmetic	2791125	Y
Unlabelled boxCosmetics&CA cosmetic is a substance applied to the body for cleansing, to promote attractiveness or to alter the appearance.	TRUE	0.90877	2	cosmetic	2791125	N
Tetracosactide is a synthetic peptide analogue which consists of the active N-terminal amino acids 1&24 of the ACTH molecule.	TRUE	0.60257	0	Tetracosactide	2791126	Y
Craniosynostosis refers to the premature closure of one or more cranial sutures, which may occur during the prenatal period, early infancy, or childhood.	TRUE	0.81027	0	Craniosynostosis	2791127	N
Craniosynostosis is premature fusion of one or more cranial vault sutures with resultant skull deformity.	TRUE	0.7404	0	Craniosynostosis	2791127	N
Craniosynostosis is a congenital disorder that occurs due to premature intrauterine fusion of one or more of the six cranial sutures leading to an abnormal shape of skull.	TRUE	0.94814	0	Craniosynostosis	2791127	Y

Capturing the Impact of Customer Usage

- Are highly discoverable synoptic content through search engines
- Include content enriched with hyperlinks to other topics of interest: **Images, calculators, articles, book content**
- <https://www.elsevier.com/solutions/sciencedirect/topics>



23 million visits
on average per month



363,000+
topic pages in 20 disciplines



Hyperlinked from over
5.8 million journal articles

Ease of Doing Business (EODB) Primary Care India

Elia Lima-Walton, MD
Elsevier
November 28, 2022

❑ Project

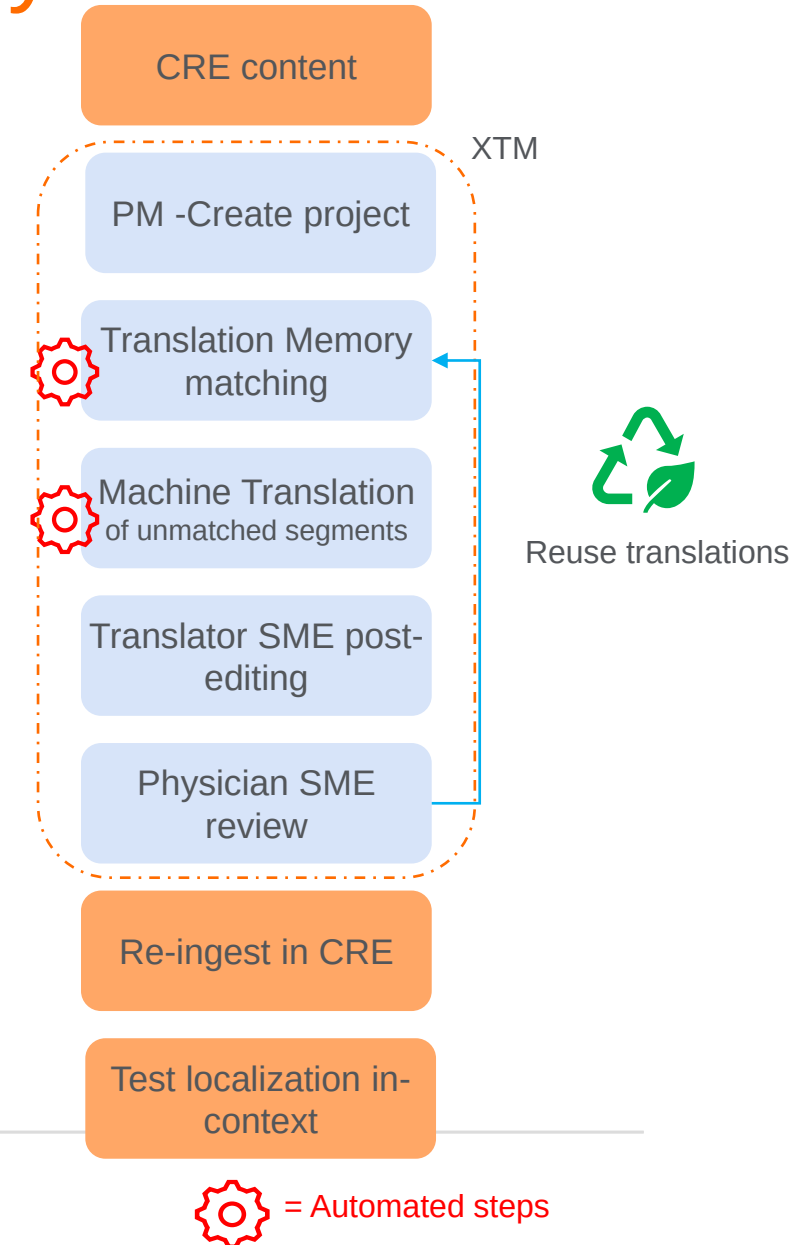
Ease of Doing Business (EODB), an advanced portal for social and administrative services dedicated to reforms programme, joined hands with ELSEVIER to further empower the Anganwadi (ASHA) workers in India.

The goal of the EODB India project is to upskill **250K local frontline Health workers** across India using digital training resources. The content types (Primary Care Pathways, videos by Osmosis, a stand-alone app) will be localized into 6 languages: Hindi, Telugu, Kannada, Marathi, Gujarati, Assamese.

❑ Benefits

- ❖ Standardizing and simplifying the process by centralizing translation
- ❖ Localization engineering, training & consultation support for internal teams & linguists
- ❖ Easily scalable processes, effort-time reduction via machine translation
- ❖ Creating permanently leverageable resources (translation memory, repeatable workflows) to support future localization efforts in India

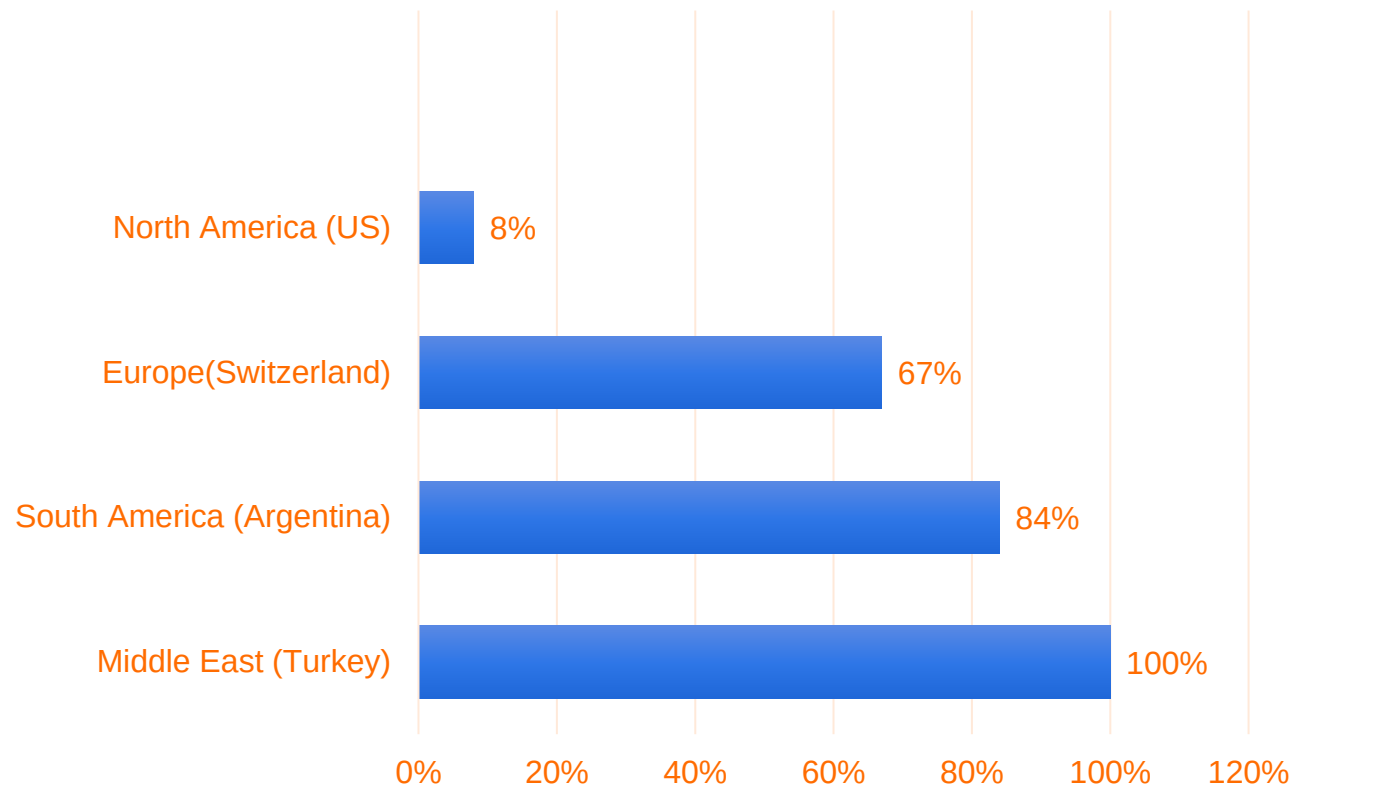
<https://www.thestatesman.com/india/eodb-elsevier-joint-venture-improve-lot-ashas-1503090092.html>



Most North American Guidelines are published in journals; Most international guidelines are published on websites

Proportion of Non-Indexed Guidelines by Region

- Guidelines that are published in medical journals are usually indexed in literature databases such as MEDLINE
- A small but important proportion of North-American guidelines are published on websites rather than indexed MEDLINE journals
- A large proportion of international guidelines are not indexed on MEDLINE



- Build a surveillance bot that keeps track of clinical guidelines that are used at the point-of-care

- The surveillance bot “visits” 1000’s of active links for clinical guidelines daily and reports back on all changes
- Cost avoidance

- Quickly identify changes in guidelines
- Automating pipeline for guideline review.
- High precision



ELSEVIER

- Patient count by city

© 2022 Mapbox © OpenStreetMap

Patient count per Careplan

Name	Careplan	Count
AASP ALLERGY AND	Weight management	1
ABSOLUTE HEALTH	Diabetes self manag	1
ACHIEVE TMS CENT	Diabetes self manag	1
ADCARE HOSPITAL OF	Hyperlipidemia clini	1
WORCESTER INC	Infectious disease C	1
	Inpatient care plan C	1
	Respiratory therapy	1

Medicine Base cost

Careplan	Medications	Cost
Allergic disorder mo	Vitamin B 12 5 MG/	3
Asthma self	120 ACTUAT Flutica	560
management	NDA020503 200 AC	7,322
Burn care	Acetaminophen 160	16
	Acetaminophen 325	84
	Acetaminophen 325	2,421

Top 10 Organisation

Name	Number of Records per Organization
NEWTON-WELLESLEY	35
HALLMARK HEALTH	30
CAMBRIDGE HEALT	25
NORTH SHORE MEDI	25
MORTON HOSPITAL	25
MOUNT AUBURN HO	20
MILFORD REGIONAL	20
LOWELL GENERAL H	15
LAWRENCE GENERA	15
FALMOUTH HOSPITAL	10

Total claim cost per visit

Name	Cost
CAMBRIDGE HEALTH ALLIANCE	1,848
FALMOUTH HOSPITAL	995
HALLMARK HEALTH SYSTEM	1,724
LOWELL GENERAL HOSPITAL	1,723
LAWRENCE GENERAL HOSPITAL	288
MILFORD REGIONAL MEDICAL CE.	1,615
MOUNT AUBURN HOSPITAL	1,859
NEWTON-WELLESLEY HOSPITAL	2,371
MORTON HOSPITAL	2,599
NORTH SHORE MEDICAL CENTER -	1,601

Medication cost per organisation

Name	Medications	Cost
CAMBRIDGE	Acetaminophen 21.7	20.3
HEALTH ALLIANCE	Acetaminophen 325	49.9
	Amlodipine 5 MG Or	32.2
	Clopidogrel 75 MG O	21.9
	Nitroglycerin 0.4 M	58.0
	Simvastatin 20 MG	20.7
FALMOUTH HOSPITAL	120 ACTUAT Flutica	7.1
	Acetaminophen 21.7	14.2
	Acetaminophen 325	22.8
	NDA020503 200 AC	132.8
HALLMARK HEALTH SYSTEM	72 HR Fentanyl 0.02	129.9
	Acetaminophen 21.7	23.3



Unlock the Data in your Patients' Health Records

FINAL DIAGNOSIS:

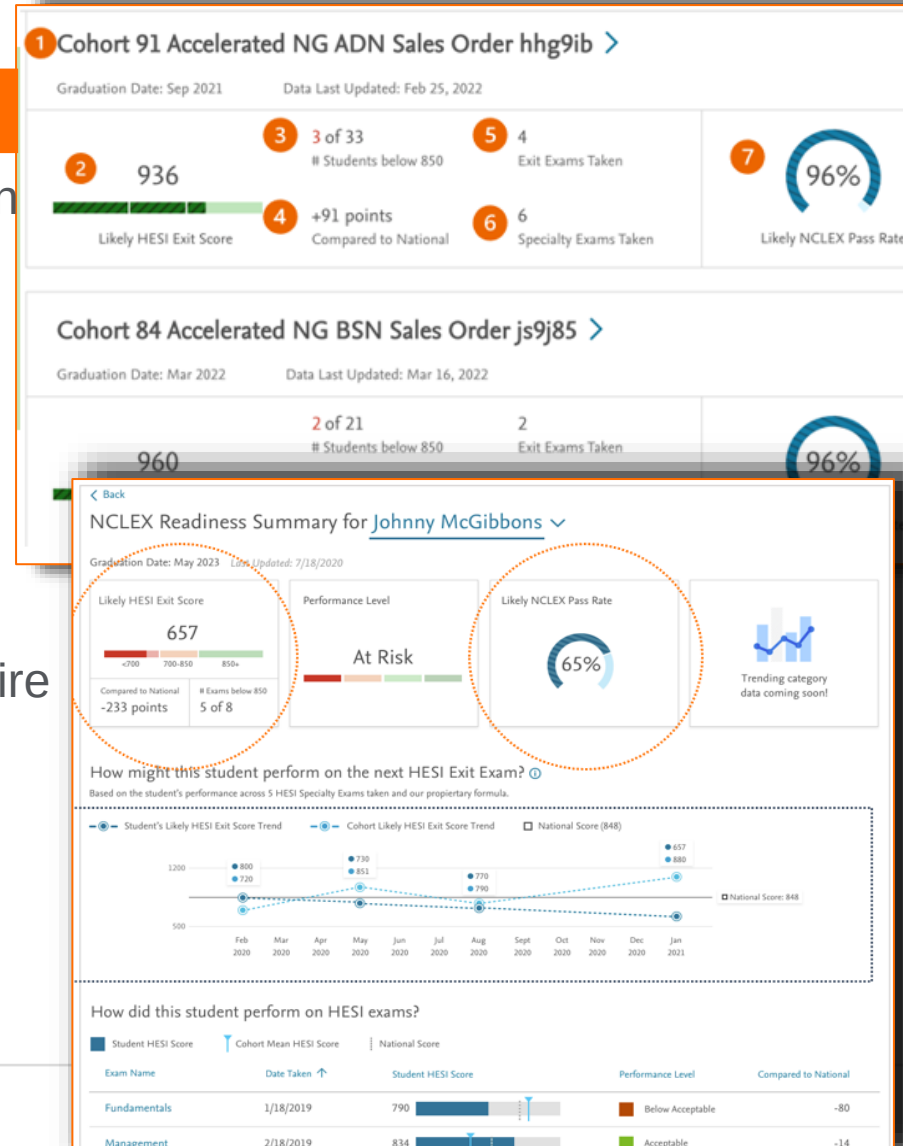
- PART 1: BREAST, LEFT, SEGMENTAL MASTECTOMY AT 10:00-
- A. INVASIVE DUCTAL CARCINOMA, NOTTINGHAM GRADE 2 (TUBULAR FORMATION 3, NUCLEAR GRADE 2, MITOTIC ACTIVITY 1; TOTAL SCORE 6/9).
 - B. THE INVASIVE TUMOR MEASURES 1.5 CM IN LARGEST DIMENSION (GROSS MEASUREMENT).
 - C. DUCTAL CARCINOMA IN SITU (DCIS), MICROPAPILLARY AND CRIBRIFORM PATTERNS, NUCLEAR GRADE 2.
 - D. DCIS ACCOUNTS FOR 6% OF TOTAL TUMOR VOLUME, ADMIXED WITH OR CLOSE TO INVASIVE COMPONENT.
 - E. INVASIVE TUMOR IS 2.5 MM FROM ANTERIOR MARGIN AND 4 MM FROM POSTERIOR MARGIN; DCIS IS LESS THAN 0.2 MM FROM THE ANTERIOR MARGIN.
 - F. NO LYMPHOVASCULAR INVASION IDENTIFIED.
 - G. ATYPICAL DUCTAL HYPERPLASIA.
 - H. NON-NEOPLASTIC BREAST TISSUE SHOWING PAPILLOMA, FIBROCYSTIC CHANGE AND DUCTAL EPITHELIAL HYPERPLASIA.
 - I. BIOPSY SITE CHANGES.
 - J. TUMOR IS POSITIVE FOR ER AND PR, HER-2/NEU SCORE 2+

Site	Surgical Approach	Tumor Type(s)	Tumor Size	LN involvement	ER Status	PR Status	HER-2/NEU Score
Left Breast	Mastectomy	Invasive Ductal Carcinoma, DCIS	1.5 cm	0	+(positive)	+(positive)	2+

Predictive Analytics to Help Nursing Education Institutes Support their Nursing Students

Cohort

- Predicted likely exit score for cohort based on specialty/ actual exit exam performance
- No. of 'at risk' students
- Performance of cohort compared to National average
- No. of exits taken
- No. of specialties taken
- Likely NCLEX pass rate averaged out on entire cohort
- Determine NCLEX-RN readiness by tracking student performance throughout the curriculum, starting with the first HESI Specialty Exam.
- Identify at-risk students early

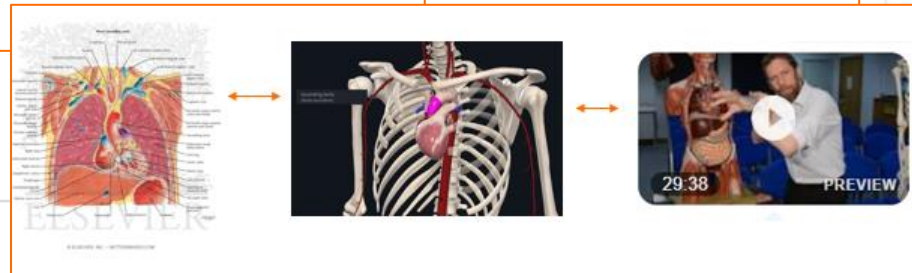
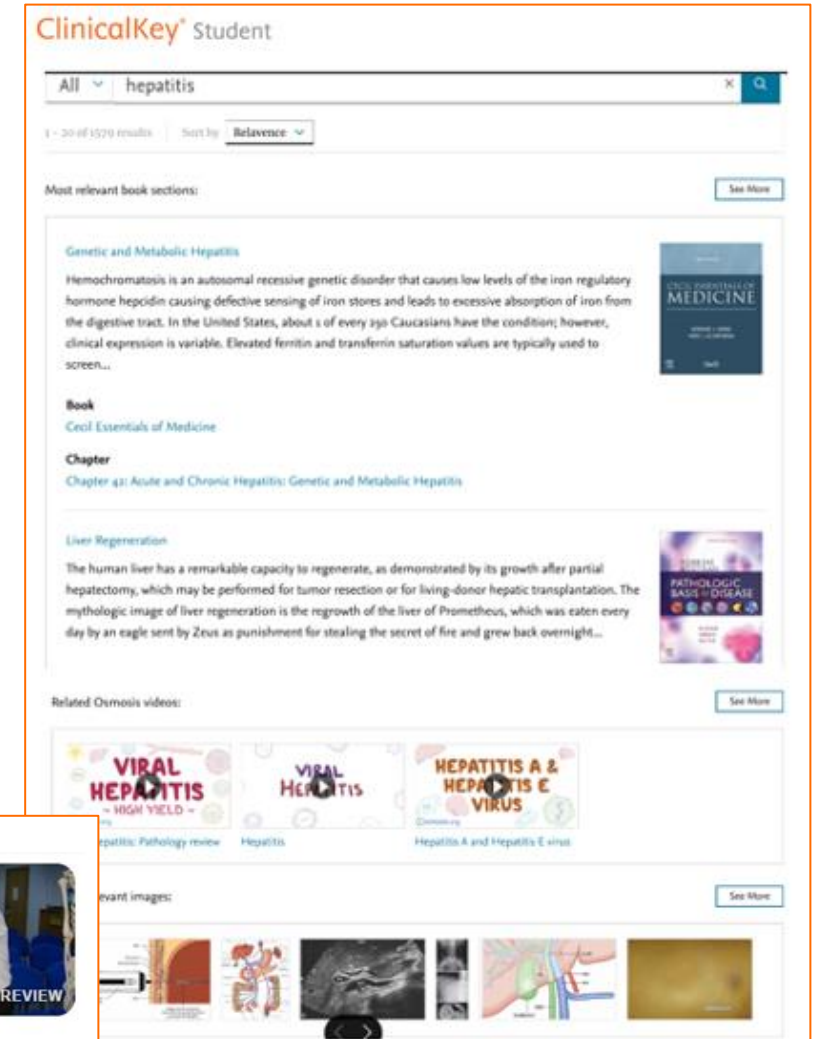
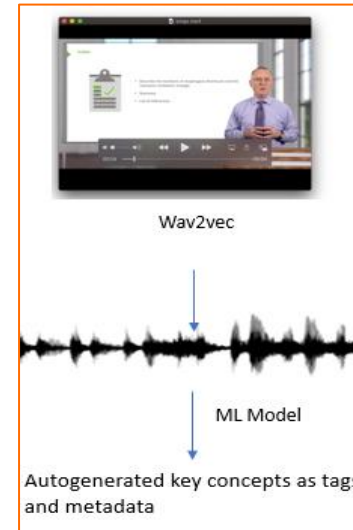


This research is converted to **actionable insights** for Nursing Educators for NCLEX

Automated Transcript Generation and Metadata Tagging for Linking Elsevier Health Products for Medical Students

Elia Lima-Walton, MD
Elsevier
November 28, 2022

- Improved content indexation and interlinking between transcripts and clinical vignettes
- Facilitating navigation and interoperability across education products
- Used to create model which prioritizing key terms/meta data to be surfaced
- Additionally:
 - Automated annotation and parsing
 - 2D/3D image cross walks created
 - Automated prioritization of key to support various Products



Cultural Sensitivity Prototype for Nursing Health Education

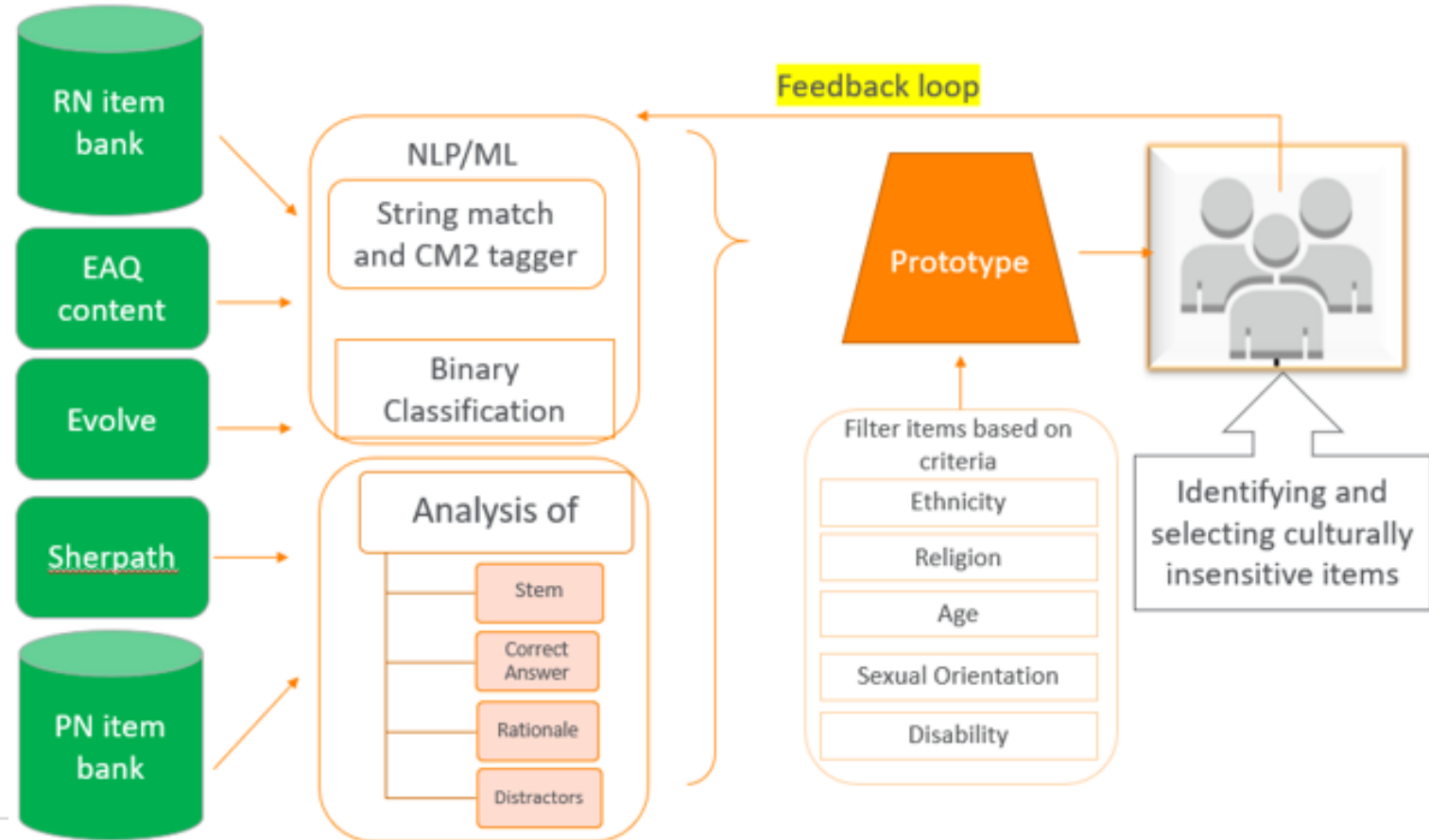
Objective

1. Investigate which items are culturally insensitive in nursing practice test items.
2. Provide analytics of topic area and banks containing culturally insensitive items.
3. Build a prototype using ML, NLP, & Analytics which identifies items from nursing banks and remediation material that is culturally insensitive.

Key Impact

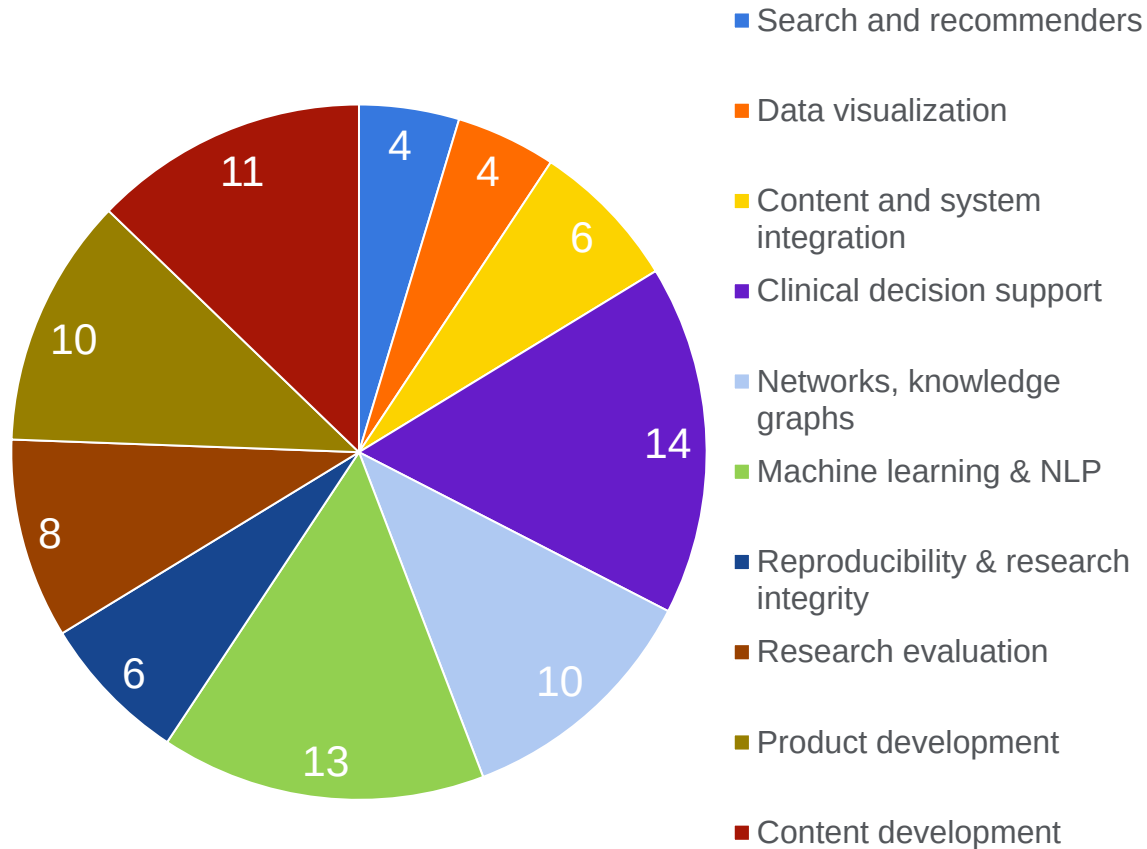
Text extraction, ingestion, and binary classification to feed into algorithm and built prototype for NHE support.

NHE Cultural Sensitivity Prototype



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Current research collaborations n=81





Thank you

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