

# Aggregating Educational Data for Patient Empowerment

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6<sup>th</sup> Panhellenic Conference on Biomedical Technology  
Athens, Greece, 6-8 May 2015



Personalized patient empowerment and  
shared decision support for  
cardiorenal disease and comorbidities

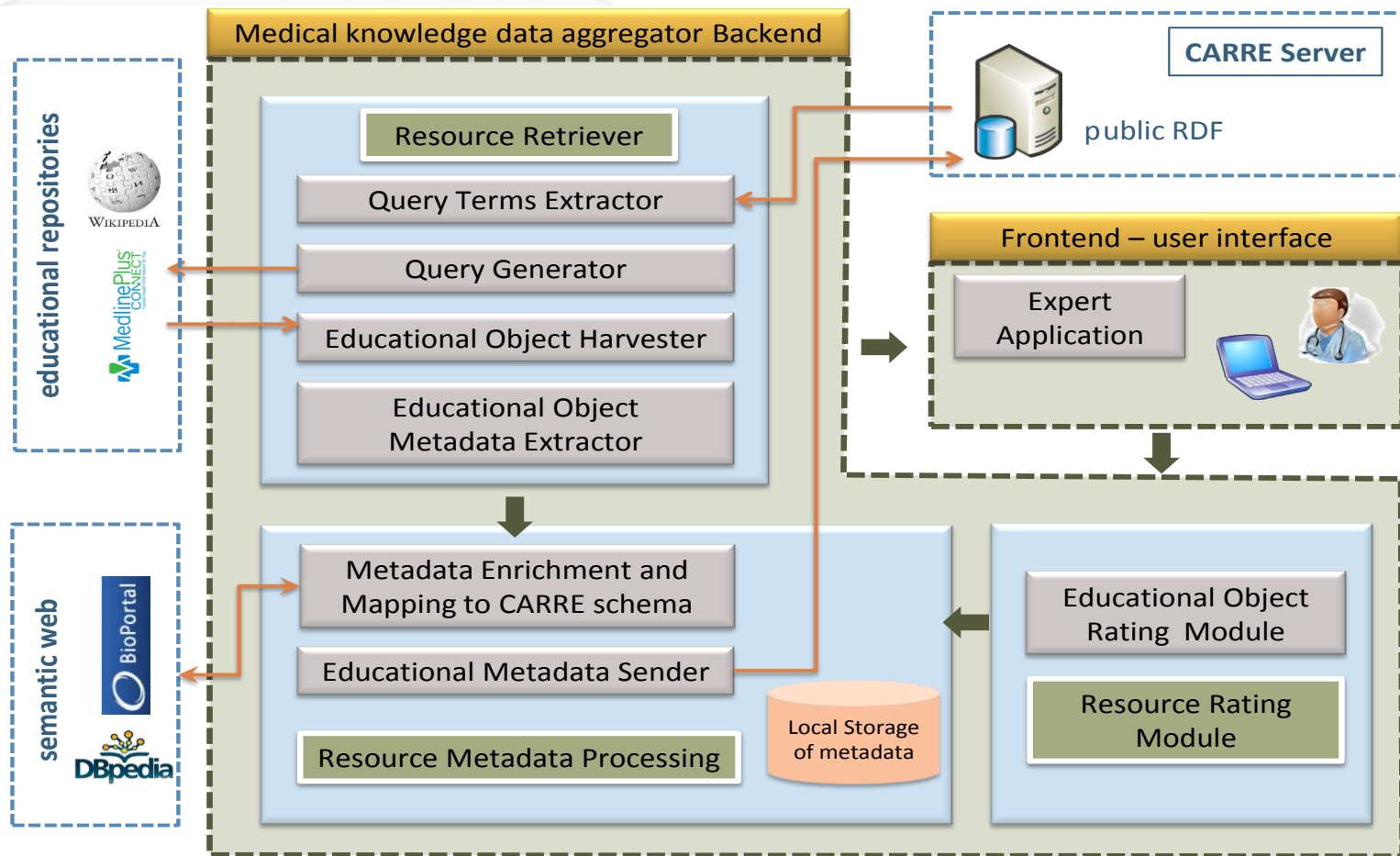
This work was supported by the FP7-ICT  
project CARRE (No. 611140), funded in part  
by the European Commission.



# Multi-source aggregation and annotation

- **Goal:** Educational object aggregation from multiple sources, rated and annotated by experts & patients
- **Possible Resources:**
  - ↪ MedlinePlus
  - ↪ Emedicine
  - ↪ Wikipedia
  - ↪ Healthfinder
  - ↪ WebMD
  - ↪ ...
- **Decided to use:**
  - ↪ MedlinePLUS and Wikipedia
    - include both from authoritative and crowd-source repositories
    - API available, free, CARRE related
  - ↪ Dbpedia, Bioportal for enrichment
    - Dbpedia & Bioportal provide SPARQL endpoint

# Component based Architecture



# Key Points

- **Personalized patient recommendations on authoritative and non authoritative educational material**
  - ↪ Based on current diagnosis
  - ↪ Based on prediction models regarding current health status
- **Aggregated Educational material that are approved by Medical Experts and rated accordingly**
  - ↪ Protect patients from getting false information
  - ↪ Speed up patient knowledge with more relevant content
- **Allow non-authoritative information in a controlled manner**
  - ↪ Extend patient point of view of a condition
  - ↪ Patients get enough information to protect themselves from medical malpractice

# Examples cases

- Recommendations regarding “**acute kidney disease**”
  - ↪ Top 5 related articles
  - ↪ Educational material from authoritative sources
  - ↪ Approved and rated resources from Medical Experts
- Compare sources regarding “**Diabetes**”
  - ↪ Most accurate information
  - ↪ Most complete articles
  - ↪ Most helpful articles found by patient

# Summary results for CARRE risk elements

CARRE risk elements	Education material
Atrial fibrillation	12
Obesity	14
Central obesity	19
Dyslipidaemia	19
Age	19
Death	20
Left ventricular hypertrophy	21
Hypoglycaemia	21
Diabetes	22
Acute myocardial infarction	27
Ischemic stroke	28
Depression	30
Cardiovascular disease	32
Heart failure	33
Ischemic heart disease	34
Hypertension	34
Chronic kidney disease	34

Source	Educational Material
wikipedia	71%
Medlineplus	29%

# Implementation

*(Open Source)*

- **Frontend Aggregator** as a web application
  - ↪ Desktop PC
  - ↪ Mobile / Tablet
- **Backend Annotator** as a SPARQL query service
  - ↪ NodeJS server

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The screenshot shows a web application interface. At the top, there is a navigation bar with a logo, 'Home', 'CARRE Devices', and a search bar containing 'chronic kidney disease'. Below the navigation bar, there is a search results section titled '43 results'. The results are displayed in a list format with the following items:

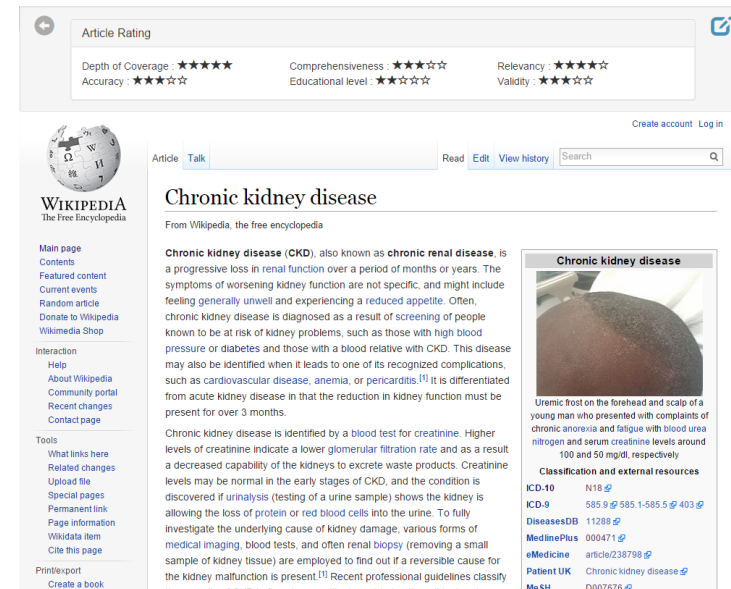
- Chronic Kidney Disease**  
You have two kidneys, each about the size of your fist. Their main job is to filter wastes and excess water out of your blood to make urine. They also keep ...
- Kidney Failure**  
Healthy kidneys clean your blood by removing excess fluid, minerals, and wastes. They also make hormones that keep your bones strong and your blood healthy. ...
- Dialysis**  
When your kidneys are healthy, they clean your blood. They also make hormones that keep your bones strong and your blood healthy. When your kidneys fail, ...
- Kidney Diseases** [3.5]  
... blood pressure, or a close family member with kidney disease. Chronic kidney disease damages the nephrons slowly over several years. ...
- Parathyroid Disorders**  
Most people have four pea-sized glands, called parathyroid glands, on the thyroid gland in the neck. Though their names are similar, the thyroid and parathyroid ...
- Anemia**  
If you have anemia, your blood does not carry enough oxygen to the rest of your body. The most common cause of anemia is not having enough iron. Your body ...
- Diabetic Kidney Problems**  
If you have diabetes, your blood glucose, or blood sugar, levels are too high. Over time, this can damage your kidneys. Your kidneys clean ...



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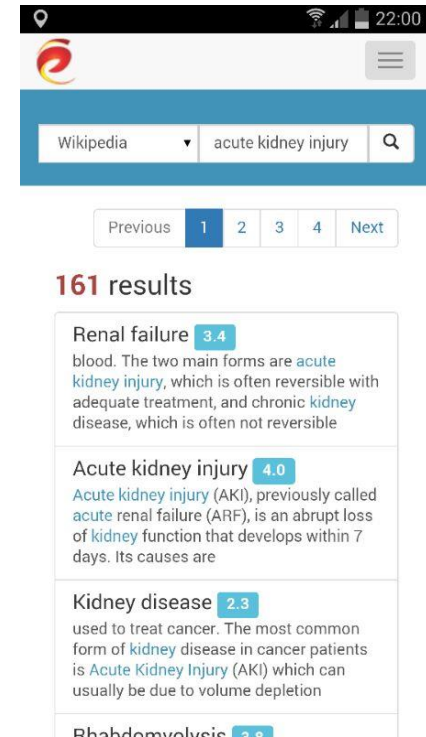


The screenshot shows the Wikipedia article for 'Chronic kidney disease'. At the top, there is an 'Article Rating' section with five criteria: Depth of Coverage (★★★★★), Accuracy (★★★★☆), Comprehensiveness (★★★★☆), Educational level (★★★★☆), Relevancy (★★★★★), and Validity (★★★★★). Below this is the Wikipedia logo and a sidebar with navigation links. The main content area starts with the title 'Chronic kidney disease' and a sub-header 'From Wikipedia, the free encyclopedia'. The text describes the disease as a progressive loss of renal function, mentioning symptoms like feeling generally unwell and reduced appetite. It also discusses diagnosis through screening and blood tests for creatinine. On the right side, there is a box titled 'Chronic kidney disease' containing a photograph of a person's face showing uremic frost on the forehead and scalp, and a list of external resources including ICD-10, DiseasesDB, MedlinePlus, eMedicine, Patient UK, and MeSH.

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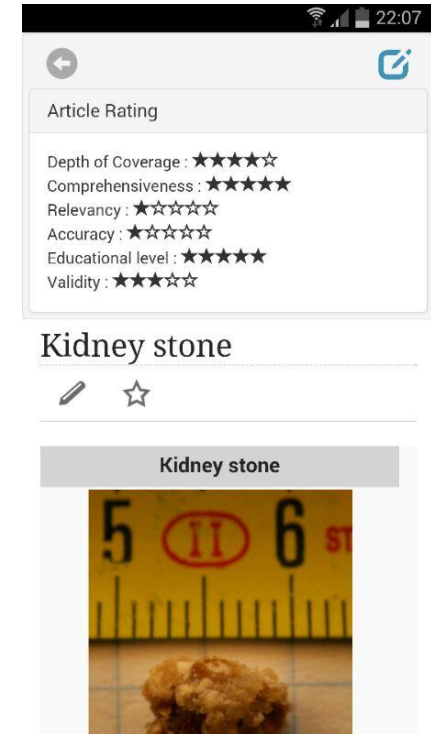
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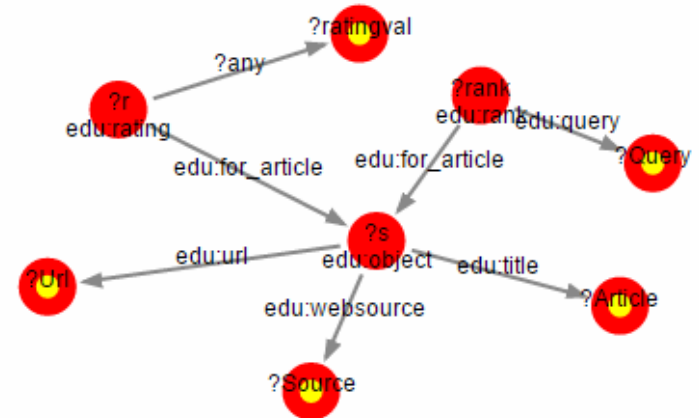
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- Online RDF data demonstration: <http://goo.gl/qVeVoE>
- Online Video demonstration: <http://youtu.be/vuu-1n0KVNc>



# Thank you!

- try the Aggregator at:

<https://edu.carre-project.eu>

- download the source from:

<https://github.com/telemed-duth/carre-edu>

# Acknowledgement



This work was supported by the FP7-ICT project CARRE (No. **611140**), funded in part by the **European Commission**.



**CARRE Project:** Personalized patient empowerment and shared decision support for cardiorenal disease and comorbidities.

CARRE Project website: <http://www.carre-project.eu>

cite as:

N. Portokallidis, G. Drosatos, E. Kaldoudi, Aggregating Educational Data for Patient Empowerment, ELEVIT 2015: 6<sup>th</sup> Panhellenic Conference on Biomedical Technology, p. 79, Athens, Greece, 6-8 May 2015