

## Retrieval-Augmented Generation (RAG)

### Prompt

Question:

Chronic urethral obstruction due to benign prismatic hyperplasia can lead to the following change in kidney parenchyma ?

Options:

- A. Hyperplasia B. Hyperrophy C. Atrophy D. Dyplasia

### Step1: Retrieve K documents



- (1)This study used a prospective cohort design. A total of 198,399 male patients without CKD at baseline were recruited from the UK Biobank from 2006 to 2010..... (Not relevant)
- (2).....Obstructive uropathy causes urine to back up and injure the kidneys, leading to hydronephrosis and eventually shrinkage of kidney tissue..... (Relevant)
- (3)Cox proportional hazards models were used to analyze the relationships between BPH, its medication, and the incidence of CKD and end-stage kidney disease (ESKD)..... (Not relevant)

### Step2: Prompt LLM with K docs and generate

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Documents:

- (1)This study used a prospective cohort design...
- (2)...Obstructive uropathy causes urine to back up and injure the kidneys...
- (3)Cox proportional hazards models were used to analyze the relationships between BPH,...



Answer: A. Hyperplasia (Wrong Answer)



## Ours: Context Knowledge Graph Retrieval-Augmented Generation (CKG-RAG)

### Prompt

Question:

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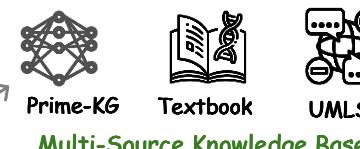
### Step1: Medical Entity Extraction



**Extracted medical entities:**  
[Chronic urethral obstruction; benign prismatic hyperplasia; kidney parenchyma; Hyperplasia; Atrophy; Dyplasia]



### Step2: Retrieval from Multi-Source Knowledge Bases



#### Retrieved Knowledge

- (1)Knowledge from Prime-KG  
(Chronic urethral obstruction, causes, Kidney damage); (Hyperplasia, type\_of, Cell proliferation) .....
- (2)Knowledge from Textbook  
In cases of chronic urethral obstruction, prolonged blockage causes urine to back up, resulting in .....
- (3)Knowledge from UMLS  
Chronic urethral obstruction: Persistent blockage in the urethra that blocks urine flow .....

### Step3: Contextual Knowledge Graph Construction

#### Extracted triples:

- (Kidney parenchyma, part\_of, Kidney);  
(Atrophy, characterized\_by, Tissue shrinkage).....



### Step4: Generation with Graph-structured Soft Prompt

