A Corpus for Evidence Based Medicine Summarisation

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ALTA, 10 Dec 2010

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Evidence Based Medicine and Summarisation

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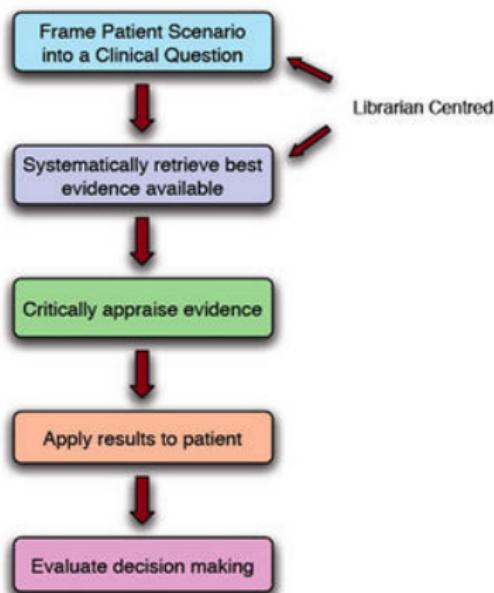
http://laikaspoetnik.wordpress.com/2009/04/04/evidence-based-medicine-the-facebook-of-medicine/

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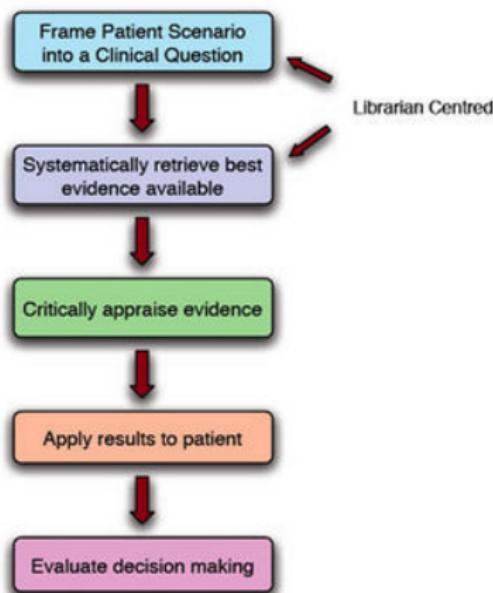
The Five Steps of EBM


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EBM and Natural Language Processing

The Five Steps of EBM
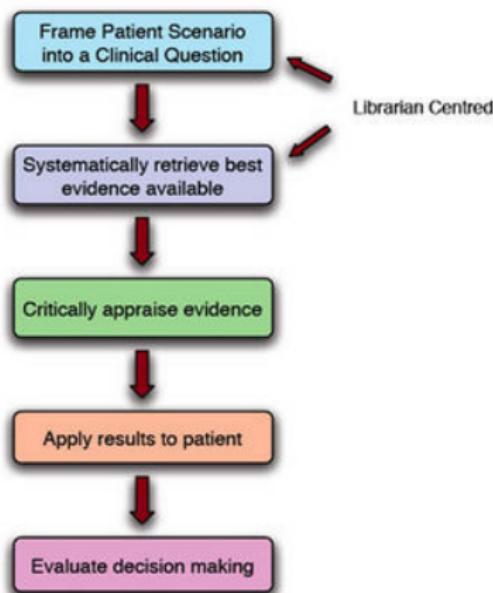
NLP Tasks

- ► Question analysis and classification

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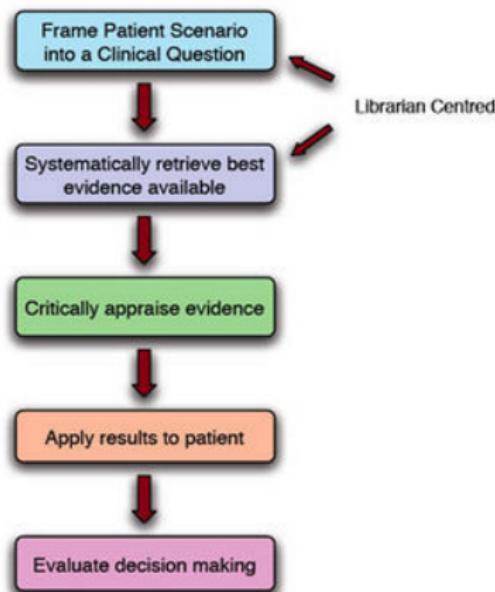
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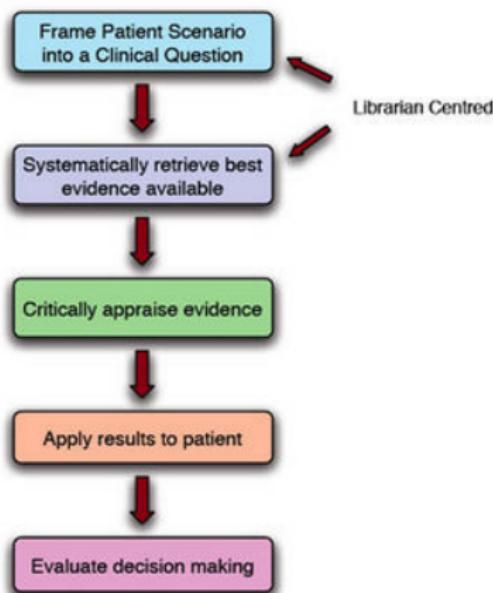
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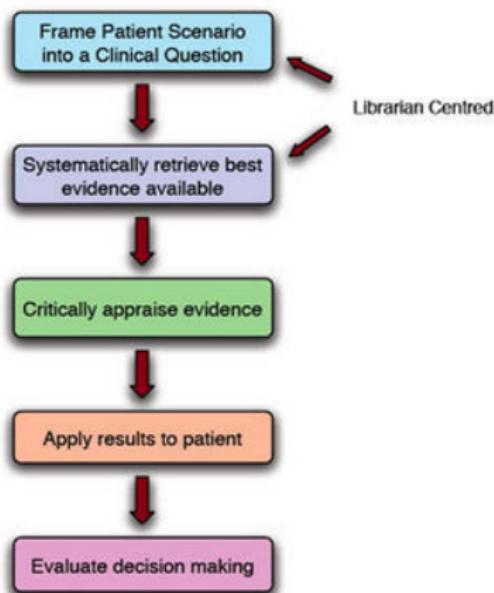
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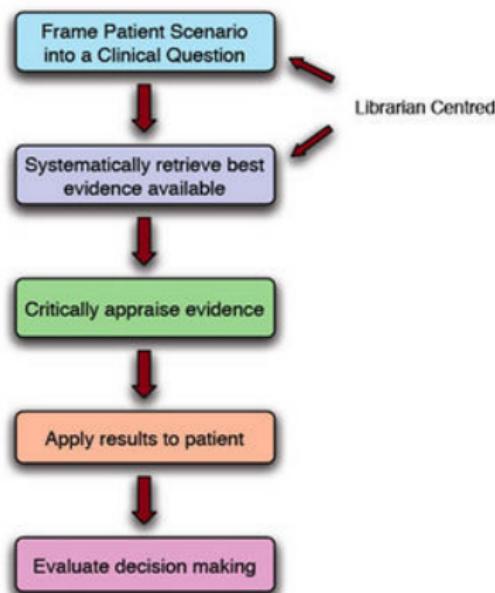
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- ▶ Question analysis and classification
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NLP Tasks

- ▶ Question analysis and classification
- ▶ Information retrieval
- ▶ Information extraction
- ▶ Classification and re-ranking
- ▶ Question answering
- ▶ Summarisation

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Where's the Corpus for Summarisation?

Systems

- ▶ CENTRIFUSER/PERSIVAL: Developed and tested using user feedback (iterative design)
- ▶ SemRep: Evaluation based on human judgement
- ▶ Demner-Fushman & Lin: ROUGE on original paper abstracts
- ▶ Fiszman: Factoid-based evaluation

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Corpora

- ▶ Several corpora of questions/answers available
- ▶ Answers lack explicit pointers to primary literature
- ▶ Medical doctors want to know the primary sources

Contents

Journal of Family Practice's "Clinical Inquiries"

Which treatments work best for hemorrhoids?

Evidence-based answer

Excision is the most effective treatment for thrombosed external hemorrhoids (strength of recommendation [SOR]: **B**, retrospective studies). For prolapsed internal hemorrhoids, the best definitive treatment is traditional hemorrhoidectomy (SOR: **A**, systematic reviews). Of nonoperative techniques, rubber band ligation produces the lowest rate of recurrence (SOR: **A**, systematic reviews).

■ Evidence summary

External hemorrhoids originate below the dentate line and become acutely painful with thrombosis. They can cause pruritus and excoriation because of interference with perianal hygiene. Internal hemorrhoids become symptomatic when they bleed or prolapse (TABLE).

For thrombosed external hemorrhoids, surgery works best

Few studies have evaluated the best treatment for thrombosed external hemorrhoids. A retrospective study of 231 patients treated conservatively or surgically found that the 48.5% of patients treated surgically had a lower recurrence rate than the conservative group (number needed to treat [NNT]=2 for recurrence at mean follow-up of 7.6 months) and earlier resolution of symptoms (average 3.9 days compared with 24 days for conservative treatment).[1]

Another retrospective analysis of 340 patients who underwent outpatient excision of thrombosed external hemorrhoids under local anesthesia re- ported a low recurrence rate of 6.5% at a mean follow-up of 17.3 months.[2]

A prospective, randomized controlled trial (RCT) of 98 patients treated ensurgically found improved pain relief with a combination of topical nifedipine 0.3% and lidocaine 1.5% compared with lidocaine alone. The NNT for complete pain relief at 7 days was 3.[3]

Conventional hemorrhoidectomy beats stapling

Many studies have evaluated the best treatment for prolapsed hemorrhoids. A Cochrane systematic review of 12 RCTs that compared conventional hemorrhoidectomy with stapled hemorrhoidectomy in patients with grades I to III hemorrhoids found a lower rate of recurrence (follow-up ranged from 6 to 39 months) in patients who had conventional hemorrhoidectomy (NNT=14).[4] Conventional hemorrhoidectomy showed a nonsignificant trend in decreased bleeding and decreased incontinence.

A second systematic review of 25 studies, including some that were of lower quality, showed a higher recurrence rate at 1 year with stapled hemorrhoidectomy than with conventional surgery.[5]

Nonoperative techniques? Consider rubber band ligation

A systematic review of 3 poorquality trials comparing rubber band ligation with excisional hemorrhoidectomy in patients with grade III hemorrhoids found that excisional hemorrhoidectomy produced better long-term symptom control but more immediate postoperative complications of anal stenosis and hemorrhage.[6] Rubber band ligation had the lowest recurrence rate at 12 months compared with the other nonoperative techniques of sclerotherapy and infrared coagulation.[7]

Fiber supplements help relieve symptoms

A Cochrane systematic review of 7 RCTs enrolling a total of 378 patients with grade I to III hemorrhoids evaluated the effect of fiber supplements on pain, itching, and bleeding. Persistent hemorrhoid symptoms decreased by 53% in the group receiving fiber.[8]

When surgical hemorrhoidectomy is recommended

The American Society of Colon and Rectal Surgeons recommends adequate fluid and fiber intake for all patients with symptomatic hemorrhoids. For grade I to III hemorrhoids, the society states that banding is usually most effective. When office treatments fail, the society recommends surgical hemorrhoidectomy (SOR: **B**).

The society recommends excision of thrombosed hemorrhoids less than 72 hours old and expectant treatment with analgesia and sitz baths for thrombosed hemorrhoids present for longer than 72 hours (SOR: **B**).[9]

The American Gastroenterological Association recommends excision of symptomatic thrombosed external hemorrhoids that present early. Surgical hemorrhoidectomy should be reserved for when conservative treatment fails and for patients with symptomatic grade III and IV hemorrhoids.[10] ■

TABLE	
Classification of sympt internal hemorrhoid	
GRADE	DESCRIPTION
I	Hemorrhoids protrude wi reduce spontaneously
II	Hemorrhoids protrude wit by hand
III	Hemorrhoids are permane
IV	

Source: Madoff RD, et al. *Gastroenterology.* 2004.[10]

References

1. Greenspon J, Williams SB, Young HA, et al. Thrombosed external hemorrhoids: outcome after conservative or surgical management, *Dis Colon Rectum.* 2004;47:1493-1498.

2. Jorgen J, Bach S, Stubinger SH, et al. Excision of thrombosed external hemorrhoids under local anesthesia: a retrospective evaluation of 340 patients, *Dis Colon Rectum.* 2003;46:1226-1231.

3. Perrotti P, Antropoli C, Molino D, et al. Conservative treatment of acute thrombosed external hemorrhoids with topical nifedipine, *Dis Colon Rectum.* 2001;44:405-409.

4. Jayaraman S, Colquhoun PH, Malthaner RA. Stapled versus conventional surgery for hemorrhoids, *Cochrane Database Syst Rev.* 2006;(4):CD005393.

5. Tjandra JJ, Chan MK. Systematic review on the procedure for prolapse and hemorrhoids (stapled hemorrhoidopexy), *Dis Colon Rectum.* 2007;50:878-892.

6. Shanmugam V, Thaha MA, Rabindranath KS, et al. Systematic review of randomized trials comparing rubber band ligation with excisional haemorrhoidectomy, *Br J Surg.* 2005;92:1481-1487.

7. Johanson JF, Rimm A. Optimal nonsurgical treatment of hemorrhoids: a comparative analysis of infrared coagulation, rubber band ligation, and injection sclerotherapy, *Am J Gastroenterol.* 1992;87:1600-1606.

8. Alonso-Coello P, Guyatt G, Heels-Ansdell D, et al. Laxatives for the treatment of hemorrhoids, *Cochrane Database Syst Rev.* 2005;(4):CD004649.

9. Cataldo P, Ellis CN, Gregorcyk S, et al. Practice parameters for the management of hemorrhoids (revised), *Dis Colon Rectum.* 2005;48:189-194.

10. Madoff RD, Fleshman JW, American Gastroenterological Association Clinical Practice Committee. American Gastroenterological Association technical review on the diagnosis and treatment of hemorrhoids, *Gastroenterology.* 2004;126:1463-1473.

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ported a low recurrence rate of 6.5% at a mean follow-up of 17.3 months.[2]

A prospective, randomized controlled trial (RCT) of 98 patients treated nonsurgically found improved pain relief with a combination of topical nifedipine 0.3% and lidocaine 1.5% compared with lidocaine alone. The NNT for complete pain relief at 7 days

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For thrombosed external hemorrhoids, surgery works best

Few studies have evaluated the best treatment for thrombosed external hemorrhoids. A retrospective study of 231 patients treated conservatively or surgically found that the 48.5% of patients treated surgically had a lower recurrence rate than the conservative group (number needed to treat [NNT]=2 for recurrence at mean follow-up of 7.6 months) and earlier resolution of symptoms (average 3.9 days compared with 24 days for conservative treatment).[1]

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References

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An extract of our corpus

\<question\>**Which treatments work best for hemorrhoids?**\</question\>
\<Answer\> \<snip ID="1"\>*Excision is the most effective treatment for thrombosed external hemorrhoids* \<SOR type="B"\>retrospective studies\</SOR\>

> \<long\>A retrospective study of 231 patients treated conservatively or surgically found that the 48.5% of patients treated surgically had a lower recurrence rate than the conservative group (number needed to treat [NNT]=2 for recurrence at mean follow-up of 7.6 months) and earlier resolution of symptoms (average 3.9 days compared with 24 days for conservative treatment). \<ref ID="15486746" / \>\</long\>

> \<long\>A retrospective analysis of 340 patients who underwent outpatient excision of thrombosed external hemorrhoids under local anesthesia reported a low recurrence rate of 6.5% at a mean follow-up of 17.3 months. \<ref ID="12972967" / \>\</long\>

\<snip ID="2"\>*For prolapsed internal hemorrhoids, the best definitive treatment is traditional hemorrhoidectomy.* \<SOR type="A"\>systematic reviews\</SOR\>

> \<long\> A Cochrane systematic review of 12 RCTs that compared conventional hemorrhoidectomy with stapled hemorrhoidectomy in patients with grades I to III hemorrhoids found a lower rate of recurrence (follow-up ranged from 6 to 39 months) in patients who had conventional hemorrhoidectomy (NNT=14). Conventional hemorrhoidectomy showed a nonsignificant trend in decreased bleeding and decreased incontinence. \<ref ID="17054255" / \>\</long\>

> \<long\> A systematic review of 25 studies showed a higher recurrence rate at 1 year with stapled hemorrhoidectomy than with conventional surgery. \<ref ID="17380367" / \>\</long\>\</snip\>

\<snip ID="3"\> ... \</snip\>\</answer\>

Components of the Corpus

Components

Question	direct extract from the source
Answer	split from the source and manually checked
Evidence	extracted from the source
Additional text	manually extracted from the source and massaged
References	PMID looked up in PubMed (automatic and manual procedure)

Planned Size

- ▶ 496 questions
- ▶ 3,000 references (a very rough estimate)

Status

Done

- ▶ All data converted from source to intermediate format
- ▶ All questions automatically extracted and split
- ▶ All evidence types automatically extracted
- ▶ All reference IDs automatically looked up
- ▶ Annotation tool functional

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To Do

- ▶ Manually check questions and evidence types
- ▶ Manually extract and massage text
- ▶ Manually check reference IDs

Annotation Tool

Contents

Summarisation Framework

- Single document summarisation
- Use ROUGE on the target text
- Pilot corpus fragment
  - 12 questions
  - 73 references

Straight Baselines

Systems

Last Return the last n sentences

Outcomes Return the output of NLM's outcome extractor

Straight Baselines

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Last Return the last n sentences

Outcomes Return the output of NLM's outcome extractor

Results

System	n	Avg F	Confidence Interval	
Last	3	0.183	[0.159–0.206]	—∘—
Outcomes	3	0.181	[0.158–0.205]	—∘—

Query-based Baselines

Simple   Return the last n sentences that share any non-stop words with the question

UMLS C   Return the last n sentences that share any UMLS concepts with the question

UMLS G   Return the last n sentences that have the greatest graph similarity with the question (random walks on UMLS relations using Eneko Agirre's system)

Query-based Baseline Results

System	n	Avg F	Confidence Interval	
Last	3	0.183	[0.159–0.206]	─○─
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Simple	3	0.180	[0.157–0.203]	─○─
UMLS C	3	0.185	[0.161–0.209]	─○─
UMLS G	3	0.172	[0.149–0.194]	─○─

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Using the Abstract Structure

Preselect sentences and then:

Abstract   Summary

Section 1	S1.1 S1.2
Section 2	S2.1
Section 3	S3.1 S3.2
Section 4	S4.1 S4.2
Section 5	S5.1 S5.2
Section 6	S6.1

Using the Abstract Structure

Preselect sentences and then:

1. Map each section to one of: background, setting, design, results, conclusion, evidence, appendix

Abstract   Summary
  Background   S1.1 S1.2
  Design   S2.1
  Results   S3.1 S3.2
  Conclusion   S4.1 S4.2
  Conclusion   S5.1 S5.2
  Appendix   S6.1

Using the Abstract Structure

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1. Map each section to one of: background, setting, design, results, conclusion, evidence, appendix

2. Select the first n sentences of the last "conclusion" section

Abstract

Background	S1.1 S1.2
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Results	S3.1 S3.2
Conclusion	S4.1 S4.2
Conclusion	S5.1 S5.2
Appendix	S6.1

Summary

S5.1 S5.2

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Using the Abstract Structure

Preselect sentences and then:

1. Map each section to one of: background, setting, design, results, conclusion, evidence, appendix

2. Select the first *n* sentences of the last "conclusion" section

3. If we have less than *n* sentences, fill from the first sentences of the previous "conclusion" section, and so on until all "conclusion" sections are used up

Abstract

Background	S1.1 S1.2
Design	S2.1
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4. If we have less than n sentences, fill from the "results" sections

5. If we still have less than n sentences, fill from the "design" sections

Abstract

Background	S1.1 S1.2
Design	S2.1
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4. If we have less than n sentences, fill from the "results" sections
5. If we still have less than n sentences, fill from the "design" sections
6. If the abstract has no structure, return the last n sentences

Abstract

Background	S1.1 S1.2
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UMLS G	3	0.172	[0.149–0.194]	—∘—

System	n	Avg F	Confidence Interval	
No Overlap	3	0.184	[0.161–0.206]	—∘—
Word	3	0.178	[0.154–0.199]	—∘—
UMLS	3	0.185	[0.160–0.209]	—∘—

Selected Results (samples=720)

The ROUGE results by duplicating all summaries by 10 for the two most differing scores are:

System	n	Avg F	Confidence Interval	
UMLS Concepts	3	0.185	[0.178–0.193]	—•—
UMLS Graph	3	0.172	[0.165–0.179]	—•—

Summary and Further Work

Summary

- Developing a corpus for EBM summarisation
- Initial baseline experiments

Summary and Further Work

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- ▶ Developing a corpus for EBM summarisation
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Further Work

- ▶ Complete the corpus
- ▶ Repeat the baseline experiments
- ▶ Use corpus for multi-document summarisation

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QUESTIONS?