

# Health Cards to Assist Decision Making in Consumer Health Search

Oral Presentations - Patient-centered Informatics

S47

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#AMIA2019



# Disclosure

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I have no relevant relationships with commercial interests to disclose.

# Learning Objectives

After participating in this session, the learner should be better able to:

- learn challenges and possible solutions in **assisting** consumer health search users in making **health decisions by searching** from search engines.
- understand the concept of health cards and how **health cards influence decision making** in consumer health search.

# Consumer Health Search (CHS)



- CHS: **people searching for health advice online.**
  - 59% of U.S. adults has searched online for health information [Fox & Duggan, 2013].
  - 7% of Google searches are health related ~ 70,000 health queries/minute [Murphy, 2019].
- Search results strongly **bias people's** health decisions [Pogacar, 2017; White, 2009].
- People **struggle to understand** health search results and **fail to make correct health decisions** [Alpay, 2009; Kobayashi & Ishizaki, 2019].
- 59% of self-diagnosers decided **NOT to confirm their condition with a health professional** [Fox & Duggan, 2013].

# Search Activities

## Search Activities



- Information need:
1. What condition do I have?
  2. What to do?

### (1) Formulating queries

Re-formulating queries

swollen tender pink eye

### (2A) Understanding Search Results Snippets

5 home remedies for pinkeye - Medical News Today  
<https://www.medicalnewstoday.com/articles/324487.php> \*

Jan 19, 2019 - Pinkeye is an eye condition that is usually temporary and the result of a bacterial infection, viral infection, or allergic reaction. ... Pinkeyes, which doctors call conjunctivitis, usually resolves within 2 weeks without treatment. ... However, antibiotics will only help with pinkeye ...

Types of pinkeye • Cool compress • Damp cloth clean • Avoid touching

Pink eye (conjunctivitis) - Symptoms and causes - Mayo Clinic  
<https://www.mayoclinic.org/diseases-conditions/pink-eye/symptoms...fyc-20376355> \*

Jan 3, 2019 - Pink eye (conjunctivitis) is an inflammation or infection of the transparent membrane (conjunctiva) that lines your eyelid and covers the white part of your eyeball. When small blood vessels in the conjunctiva become inflamed, they're more visible. This is what causes the whites of your eyes to appear reddish or pink.

Pink Eye: Usually Mild and Easy to Treat | Features | CDC  
<https://www.cdc.gov/features/conjunctivitis/index.html> \*

Pink eye is common and spreads easily. It sometimes needs medical treatment. Learn the symptoms when to seek treatment, and how to help prevent it.

Pink Eye (Conjunctivitis): Symptoms, Causes, Treatment, Prevention  
<https://www.webmd.com/eye-health/reference> \*

### (2B) Understanding Search Results Web Pages

The collage shows several search results for the query 'swollen tender pink eye'. It includes a search engine results page with a link to 'How to avoid swollen eyelids', a WebMD article titled 'Pinkeye (Conjunctivitis) Slideshow: Causes, Symptoms, & Treatments', a Mayo Clinic page titled 'What is Pinkeye', and a CDC page titled 'Pink Eye (Conjunctivitis): Symptoms, Causes, Treatment, Prevention'. The Mayo Clinic page includes an overview of the condition and a list of symptoms.

### (3) Making health decisions

- Health decisions:
1. Condition that I have is ...
  2. What I should do is:
    - A. Self treat
    - B. Contact health professional
    - C. Use an emergency service

# Health Card for CHS

- Entity cards have been used by commercial search engines to present **coherent, easy to understand and trustworthy** information [Radlinski, 2015].
- The appearance of a health card is triggered by queries that **contain a health condition name or its aliases**.
- We investigate **the benefits of health cards for broader search tasks** - beyond just more information about a health condition.

Appendicitis

About Symptoms Treatments

Causes severe abdominal pain

Large intestine  
Inflamed appendix

A condition in which the appendix becomes inflamed and filled with pus, causing pain.

- Requires a medical diagnosis
- Lab tests or imaging often required
- Treatable by a medical professional
- Short-term: resolves within days to weeks

Appendicitis begins with pain near the belly button and then moves to the right side. This is often accompanied by nausea, vomiting, poor appetite, fever and chills.

Critical: Consult a doctor for medical advice  
Sources: [Mayo Clinic](#)

Health card images and information are courtesy of Google.

# Search Task

For a health scenario, make the following two decisions:

1. What is the **most possible condition for the scenario?**
2. What **to do / level of urgency** ?
  - a) Use emergency service
  - b) Contact a health professional
  - c) Self treat

## Sample scenario:

**Scenario:** Your 12-year-old daughter had a sudden severe abdominal pain with nausea, vomiting, and diarrhea. Her body temperature is 40C.

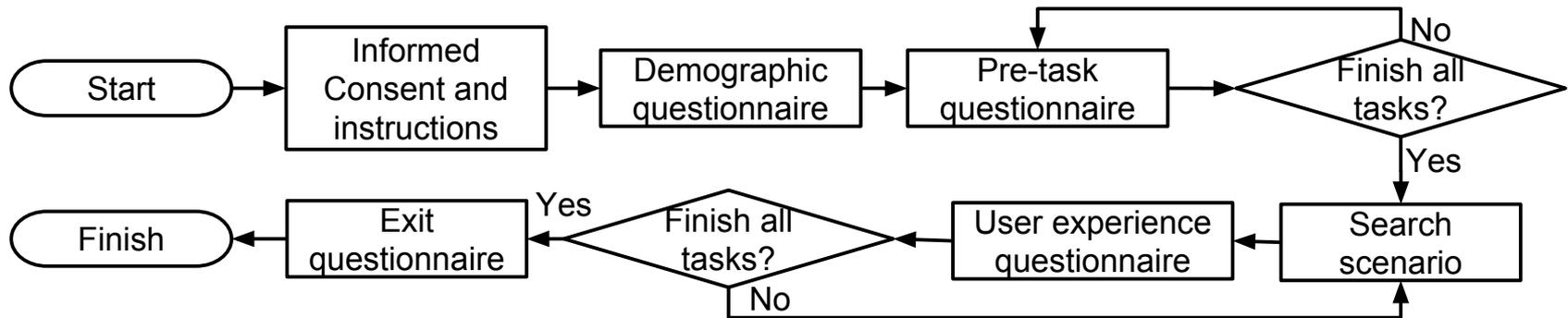
**Correct Diagnosis:** Appendicitis

**Correct Urgency Level:** Emergency

[Semigran et al., 2015]

# Methods: User Study

- 8 health search tasks X 64 Participants = 512 Data Points
- Search interfaces:
  - Correct VS Incorrect Cards
  - Single VS. Multiple Cards



# The Four Search Interfaces

## Single-Card

**Meningitis**  
Also called: migraine headache

About Symptoms Treatments

Severe headache and stiff neck.

Inflamed meninges cause pain.

Brain Spinal cord

Inflammation of brain and spinal cord membranes, typically caused by an infection.

- Treatable by a medical professional
- Spreads by airborne droplets
- Requires a medical diagnosis

Short-term: resolves within days to weeks  
Symptoms include headache, fever and stiff neck.  
Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

With a Correct Card

## Multi-Cards

**Migraine**  
Also called: migraine headache

About Symptoms Treatments

Intense headache and sensitivity to light.

Treatable by a medical professional  
Usually self-diagnosable  
Lab tests or imaging rarely required  
Chronic: can last for years or be lifelong  
Migraine headaches can cause throbbing in one particular area that can vary in intensity. Nausea and sensitivity to light and sound are also common symptoms.  
Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

**Meningitis**  
Also called: inflammation of the brain

About Symptoms Treatments

Severe headache and stiff neck.

Inflamed meninges cause pain.

Brain Spinal cord

Inflammation of brain and spinal cord membranes, typically caused by an infection.

- Treatable by a medical professional
- Spreads by airborne droplets
- Requires a medical diagnosis

Short-term: resolves within days to weeks  
Symptoms include headache, fever and stiff neck.  
Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

**Encephalitis**  
Also called: inflammation of the brain

About Symptoms Treatments

Inflamed brain.

Can cause severe headache and confusion.

Treatable by a medical professional  
Spreads by animals or insects  
Requires a medical diagnosis

Short-term: resolves within days to weeks  
May cause no symptoms or mild flu-like symptoms. Severe cases can be life-threatening. Immediate medical attention is needed for symptoms such as confusion, hallucinations, seizures, weakness and loss of sensation.  
Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

**High blood pressure**  
Also called: HBP, hypertension

About Symptoms Treatments

Measuring blood pressure

A condition in which the force of the blood against the artery walls is too high.

- Treatable by a medical professional
- Requires a medical diagnosis
- Lab tests or imaging not required
- Chronic: can last for years or be lifelong

High blood pressure often has no symptoms. Over time, if untreated, it can cause health conditions, such as heart disease and stroke.  
Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

No Correct Card

**Migraine**  
Also called: migraine headache

About Symptoms Treatments

Intense headache and sensitivity to light.

A headache of varying intensity, often accompanied by nausea and sensitivity to light and sound.

- Treatable by a medical professional
- Usually self-diagnosable
- Lab tests or imaging rarely required
- Chronic: can last for years or be lifelong

Migraine headaches can cause throbbing in one particular area that can vary in intensity. Nausea and sensitivity to light and sound are also common symptoms.  
Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

**Encephalitis**  
Also called: inflammation of the brain

About Symptoms Treatments

Inflamed brain.

Can cause severe headache and confusion.

Inflammation of the brain, often due to infection.

- Treatable by a medical professional
- Spreads by animals or insects
- Requires a medical diagnosis

Short-term: resolves within days to weeks  
May cause no symptoms or mild flu-like symptoms. Severe cases can be life-threatening. Immediate medical attention is needed for symptoms such as confusion, hallucinations, seizures, weakness and loss of sensation.  
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Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

**Pink eye**  
Also called: conjunctivitis

About Symptoms Treatments

Eye with conjunctivitis

Lining of eye (conjunctiva)

- Spreads easily
- Treatable by a medical professional
- Usually self-diagnosable

Short-term: resolves within days to weeks  
Symptoms include redness, itching and tearing of the eyes. It can also lead to discharge or crusting around the eyes.  
Critical: Consult a doctor for medical advice  
Sources: Mayo Clinic

# Why Showing Multi-cards?

- People submitted **underspecified queries** which often make **difficult** (if possible at all) **to determine** the single **correct health card** to present.
- **Presenting possible health conditions** side-by-side **enables** people to perform **differential diagnosis**.

# Search Interface with Multi-Cards

## Scenario 7 of 8:

Your 12-year-old daughter had a sudden severe abdominal pain with nausea, vomiting, and diarrhea. Her body temperature is 40C.

### Tasks:

1. Copy and paste the most possible health condition for this scenario.

2. What would you do now?

- Use an Emergency service. This includes calling 000 or immediately going to an hospital Emergency.
- Contact a health professional. This includes make an appointment with a GP, a home doctor, or call a nurse helpline.
- Self treat. This includes buying an over the counter medicine/drug, use an home-remedy, or performing activities to mitigate the condition.

3. How confident are you with your answers?

Very NOT Confident	NOT Confident	Neutral	Confident	Very Confident
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4. You consider the health cards shown in this scenario as:

All NOT Relevant	Some are Relevant	All Relevant
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All are Difficult to Understand	Some are Easy to Understand	All are Easy to Understand
---------------------------------	-----------------------------	----------------------------

All are NOT Trustworthy	Some are Trustworthy	All are Trustworthy
-------------------------	----------------------	---------------------

Submit

child stomach ache vomiting diarrhea temperature



### Matched Conditions

Sepsis Also called: septicemia	Stomach flu Also called: gastroenteritis	Flu Also called: influenza	Appendicitis
<p>About Symptoms Treatments</p> <p>A life-threatening complication of an infection.</p> <ul style="list-style-type: none"> <li>Requires a medical diagnosis</li> <li>Lab tests or imaging always required</li> <li>Treatable by a medical professional</li> <li>Short-term: resolves within days to weeks</li> </ul> <p>Symptoms include fever, difficulty breathing, low blood pressure, fast heart rate and mental confusion.</p> <p>Critical: Consult a doctor for medical advice</p> <p>Sources: <a href="#">Mayo Clinic</a></p>	<p>About Symptoms Treatments</p> <p>An intestinal infection marked by diarrhoea, cramps, nausea, vomiting and fever.</p> <ul style="list-style-type: none"> <li>Spreads easily</li> <li>Usually self-treatable</li> <li>Usually self-diagnosable</li> <li>Short-term: resolves within days to weeks</li> </ul> <p>Diarrhoea, cramps, nausea, vomiting and low-grade fever are common symptoms.</p> <p>Consult a doctor for medical advice</p> <p>Sources: <a href="#">Mayo Clinic</a></p>	<p>About Symptoms Treatments</p> <p>A common viral infection that can be deadly, especially in high-risk groups.</p> <ul style="list-style-type: none"> <li>Spreads easily</li> <li>Usually self-treatable</li> <li>Usually self-diagnosable</li> <li>Short-term: resolves within days to weeks</li> </ul> <p>Symptoms include fever, chills, muscle aches, cough, congestion, runny nose, headaches and fatigue.</p> <p>Consult a doctor for medical advice</p> <p>Sources: <a href="#">Mayo Clinic</a></p>	<p>About Symptoms Treatments</p> <p>A condition in which the appendix becomes inflamed and filled with pus, causing pain.</p> <ul style="list-style-type: none"> <li>Requires a medical diagnosis</li> <li>Lab tests or imaging often required</li> <li>Treatable by a medical professional</li> <li>Short-term: resolves within days to weeks</li> </ul> <p>Appendicitis begins with pain near the belly button and then moves to the right side. This is often accompanied by nausea, vomiting, poor appetite, fever and chills.</p> <p>Critical: Consult a doctor for medical advice</p> <p>Sources: <a href="#">Mayo Clinic</a></p>

About 1,750,000 results

### Why Is My Child Throwing Up With No Fever? Nausea and ...

<https://www.webmd.com/children/guide/child-throw-up-no-fever>

Usually, your child will also have nausea, watery diarrhea, and stomach pain. It's possible for food poisoning to cause fever, but it's common for it to cause throwing up with no fever, too.

### Diarrhea, Fever, Nausea or vomiting and Stomach cramps ...

<https://symptomchecker.webmd.com/multiple-symptoms?symptoms=diarrhea%7Cfever%7Cnausea-or-vomiting%7C...>

Diarrhea, Fever, Nausea or vomiting and Stomach cramps. WebMD Symptom Checker helps you find the most common medical conditions indicated by the symptoms diarrhea, fever, nausea or vomiting and stomach cramps including Gastroenteritis, Food poisoning, and Irritable bowel syndrome.

### What are the Causes of Stomach Ache and Fever?

<https://www.wisegeek.com/what-are-the-causes-of-stomach-ache-and-fever.htm>

When a person has a stomach ache and fever, one of the most likely causes of his symptoms is a stomach flu. Despite the misleading name, this condition is not related to influenza, but is caused by a virus that leads to such symptoms as pain, fever, diarrhea, nausea, and vomiting .

### Viral Gastroenteritis (Stomach Flu): Symptoms and Treatment

<https://www.healthline.com/health/viral-gastroenteritis>

Symptoms can last from 1 to 10 days, including diarrhea, vomiting, and fever. Here are some self-care tips and home remedies for relief. Viral gastroenteritis, also known as the stomach flu, is an ...

# Search Interface: Scenario and Tasks

**Scenario 7 of 8:**  
Your 12-year-old daughter had a sudden severe abdominal pain with nausea, vomiting, and diarrhea. Her body temperature is 40C.

**Tasks:**

- Copy and paste the most possible health condition for this scenario.
- What would you do now?
  - Use an Emergency service. This includes calling 000 or immediately going to an hospital Emergency.
  - Contact an health professional. This includes make an appointment with a GP, a home doctor, or call a nurse helpline.
  - Self treat. This includes buying an over the counter medicine/drug, use an home-remedy, or performing activities to mitigate the condition.
- How confident are you with your answers?
 

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All are Difficult to Understand	Some are Easy to Understand	All are Easy to Understand
All are NOT Trustworthy	Some are Trustworthy	All are Trustworthy

**Submit**

Search: stomach ache vomiting diarrhea temperature

Selected Conditions

**Sepsis**  
Also called: septicemia

About Symptoms Treatments



Life-threatening complication of an infection.

- Requires a medical diagnosis
- Lab tests or imaging always required
- Treatable by a medical professional
- Short-term: resolves within days to weeks

Symptoms include fever, difficulty breathing, low blood pressure, fast heart rate and mental confusion.

Critical: Consult a doctor for medical advice  
Sources: [Mayo Clinic](#)

**Stomach flu**  
Also called: gastroenteritis

About Symptoms Treatments



An intestinal infection marked by diarrhea, cramps, nausea, vomiting and fever.

- Spreads easily
- Usually self-treatable
- Usually self-diagnosable
- Short-term: resolves within days to weeks

Diarrhea, cramps, nausea, vomiting and low-grade fever are common symptoms.

Consult a doctor for medical advice  
Sources: [Mayo Clinic](#)

**Flu**  
Also called: influenza

About Symptoms Treatments



A common viral infection that can be deadly, especially in high-risk groups.

- Spreads easily
- Usually self-treatable
- Usually self-diagnosable
- Short-term: resolves within days to weeks

Symptoms include fever, chills, muscle aches, cough, congestion, runny nose, headaches and fatigue.

Consult a doctor for medical advice  
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**Appendicitis**

About Symptoms Treatments



A condition in which the appendix becomes inflamed and filled with pus, causing pain.

- Requires a medical diagnosis
- Lab tests or imaging often required
- Treatable by a medical professional
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Appendicitis begins with pain near the belly button and then moves to the right side. This is often accompanied by nausea, vomiting, poor appetite, fever and chills.

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1,750,000 results

[Why Is My Child Throwing Up With No Fever? Nausea and ...](#)  
ps://www.webmd.com/children/guide/child-throw-up-no-fever  
Usually, your child will also have nausea, watery diarrhea, and stomach pain. It's possible for food poisoning to cause fever, but it's common for it to cause swelling up with no fever, too.

[Diarrhea, Fever, Nausea or vomiting and Stomach cramps ...](#)  
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# Search Interface: Multi-Cards

**Scenario 7 of 8:**  
Your 12-year-old daughter had a sudden severe abdominal pain with nausea, vomiting, and diarrhea. Her body temperature is 40C.

child stomach ache vomiting diarrhea temperature

Tasks:  
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Submit

### Matched Conditions

#### Sepsis

Also called: septicemia

About Symptoms Treatments

Bacteria infect bloodstream

A life-threatening complication of an infection.

- Requires a medical diagnosis
- Lab tests or imaging always required
- Treatable by a medical professional
- Short-term: resolves within days to weeks

Symptoms include fever, difficulty breathing, low blood pressure, fast heart rate and mental confusion.

Critical: Consult a doctor for medical advice

Sources: [Mayo Clinic](#)

#### Stomach flu

Also called: gastroenteritis

About Symptoms Treatments

Stomach Intestines

An intestinal infection marked by diarrhea, cramps, nausea, vomiting and fever.

- Spreads easily
- Usually self-treatable
- Usually self-diagnosable
- Short-term: resolves within days to weeks

Diarrhoea, cramps, nausea, vomiting and low-grade fever are common symptoms.

Consult a doctor for medical advice

Sources: [Mayo Clinic](#)

#### Flu

Also called: influenza

About Symptoms Treatments

Fever and muscle aches

A common viral infection that can be deadly, especially in high-risk groups.

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- Usually self-treatable
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Symptoms include fever, chills, muscle aches, cough, congestion, runny nose, headaches and fatigue.

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#### Appendicitis

About Symptoms Treatments

Causes severe abdominal pain

Large intestine Inflamed appendix

A condition in which the appendix becomes inflamed and filled with pus, causing pain.

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# Search Interface: Snippet List

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child stomach ache vomiting diarrhea temperature

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**Stomach flu**  
Also called: gastroenteritis

About Symptoms Treatments



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About 1,750,000 results

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# Impact of Health Cards on Search Behavior

49% of search session **time** was spent to interact with the **Single-Card** interface.

82% of search session **time** was spent to interact with the **Multi-Cards** interface.

migraine fever neck stiffness

About 3,390,000 results

## Migraines and Neck Pain in Muscles and Nerves | Symptoms

<https://migraine.com/migraine-symptoms/neck-pain/>

Some people living with migraine report neck pain during migraine attacks. Warning: A stiff neck can be a sign of a more serious or potentially life-threatening condition. Seek immediate medical assistance if you experience stiff neck along with fever and headache.

## Fever, Headache, Sore throat and Stiff neck: Common ...

<https://www.webmd.com/multiple-symptoms?symptoms=fever%7Chheadache%7Csores-throat%7Cstiff-n...>

Fever, Headache, Sore throat and Stiff neck. WebMD Symptom Checker helps you find the most common medical conditions indicated by the symptoms fever, headache, sore throat and stiff neck including Viral pharyngitis, Acute sinusitis, and Aseptic meningitis (adult).

## Stiff Neck and Headache - healthhearty.com

<https://healthhearty.com/stiff-neck-headache>

Moderate to severe headache and stiff neck - Encephalitis, migraine, sinus headache Extreme headache and stiff neck - Trigeminal neuralgia, meningitis. ... The virus causing meningitis spreads easily and quickly in unhygienic areas. Muscle spasms, fever, headache, sore throat, behavioral changes, stiff neck are symptoms of viral meningitis disease.

## Why Neck Pain Is Frequently Related to Migraines - Upper ...

<https://upperlevelawareness.com/neck-pain-frequently-related-migraines/>

Neck pain is a common migraine symptom, and with good reason. But before we get to that, let's take a look at some research in Italy that clearly connects... These relationships can also damage nerves and soft tissue, thereby causing pain and stiffness. Even for patients who do not have migraines, the tissue damage often causes pain first.

## Case Study: Headache, neck stiffness, and fever - The ...

<https://www.clinicaladvisor.com/clinical-challenge/case-of-headache-stiff-neck-and-fever/article/996...>

A 55-year-old man with a history of hypertension and migraines is sent by his primary care provider to the ED for a spinal tap to rule out meningitis... Headache, neck stiffness, and fever.

## Migraine, Headaches, Nausea, and Vomiting - WebMD

<https://www.webmd.com/migraines-headaches/headache-migraines-and-nausea>

A severe headache that causes nausea and extreme sensitivity to light may sound like a migraine. But if you also have a stiff neck, with or without a fever, it could be meningitis, which requires ...

## Infections That Cause Headaches and a Fever

<https://www.vervethealth.com/infections-that-cause-headache-and-fever-1719431>

A brain abscess is a rare, but potentially life-threatening condition, in which infected fluid collects in the brain. Symptoms of a brain abscess can resemble that of meningitis or encephalitis and include: fever, headache, neck stiffness, neurological dysfunction, and confusion.

## Case Study: Headache, neck stiffness, and fever - The ...

<https://www.clinicaladvisor.com/clinical-challenge/case-of-headache-stiff-neck-and-fever/article/996...>

A 55-year-old man with a history of hypertension and migraines is sent by his primary care provider to the ED for a spinal tap to rule out meningitis... Case Study: Headache, neck stiffness.

## I got headaches but no fever my neck quite stiff so am I ...

<https://answers.yahoo.com/question/index?qid=20071030144154A0w6fj>

I got headaches but no fever my neck quite stiff so am I fine? got headache and stiff neck and very giddy/XX. ... Migraine-One sided, more common in females. Sensitivity to light, pain behind one eye, throbbing, brought on by bright lights, chocolate, cheese, red wine or menstrual cycle. ... Stiff Neck And Fever. Source(s) ...

## Stiff neck? Blinding headache? HELP!!!! | Yahoo Answers

<https://answers.yahoo.com/question/index?qid=20070930182129AA3y16>

Last night I felt the worst because I was vomiting, had violent chills and a fever. Should I... show more For the past four days I have had a horrible headache. My head points and I get worse with lights. ... COULD STILL BE A MIGRAINE BUT WITH A STIFF NECK AND THE OTHER SYMPTOMS YOU NEED TO GO TO THE E.R. RIGHT NOW AND BE CHECKED ...



**Meningitis**  
Also called: meningococcal meningitis

**About** Symptoms Treatments

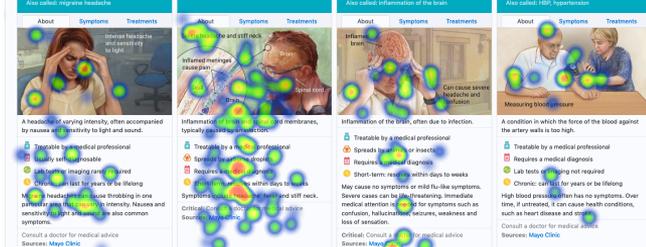
A headache of varying intensity, often accompanied by nausea and sensitivity to light and sound.

- Treatable by a medical professional
- Usually self-resolving
- Generally requiring over-the-counter
- Children at risk for years before being

**Stiff Neck and Headache - healthhearty.com**  
Moderate to severe headache and stiff neck - Encephalitis, migraine, sinus headache Extreme headache and stiff neck - Trigeminal neuralgia, meningitis. ... The virus causing meningitis spreads easily and quickly in unhygienic areas. Muscle spasms, fever, headache, sore throat, behavioral changes, stiff neck are symptoms of viral meningitis disease.

migraine fever neck stiffness

About 3,390,000 results



**Migraine**  
Also called: migraine headache

**Meningitis**  
Also called: meningococcal meningitis

**Encephalitis**  
Also called: inflammation of the brain

**High blood pressure**  
Also called: hypertension

**Migraine and Neck Pain in Muscles and Nerves | Symptoms**  
<https://migraine.com/migraine-symptoms/neck-pain/>

**Fever, Headache, Sore throat and Stiff neck: Common ...**  
<https://www.webmd.com/multiple-symptoms?symptoms=fever%7Chheadache%7Csores-throat%7Cstiff-n...>

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**Infections That Cause Headaches and a Fever**  
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**Stiff neck? Blinding headache? HELP!!!! | Yahoo Answers**  
<https://answers.yahoo.com/question/index?qid=20070930182129AA3y16>

# Measurements

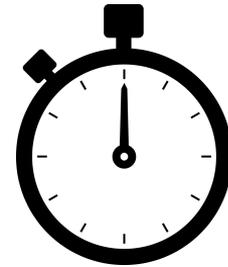
1. **Selected** as a source of information



2. Lead to more **correct** decisions



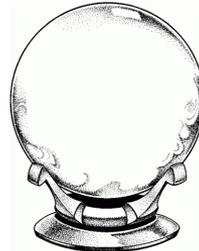
3. Reduce **time** to complete a task



4. Reduce the **effort** to complete a task



5. Increase rate of **Good abandonment\***



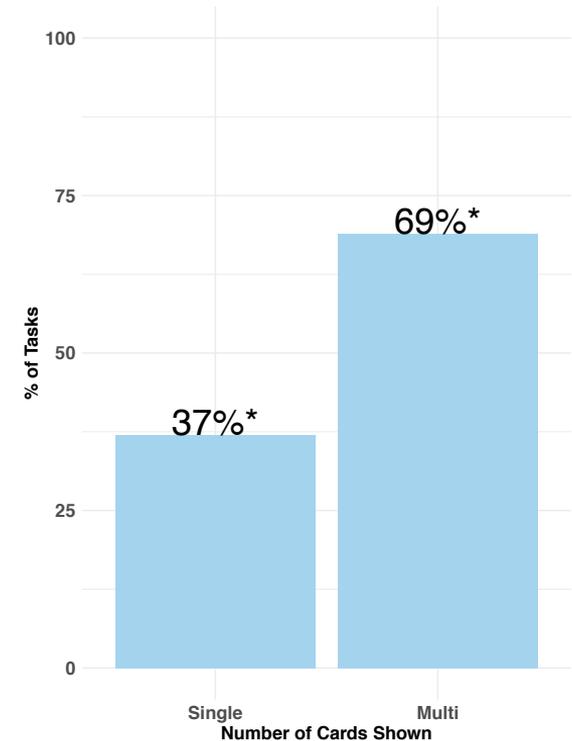
6. Improve **confidence** on decisions



\* Good abandonment is when people manage to complete a task without clicking on the search results.

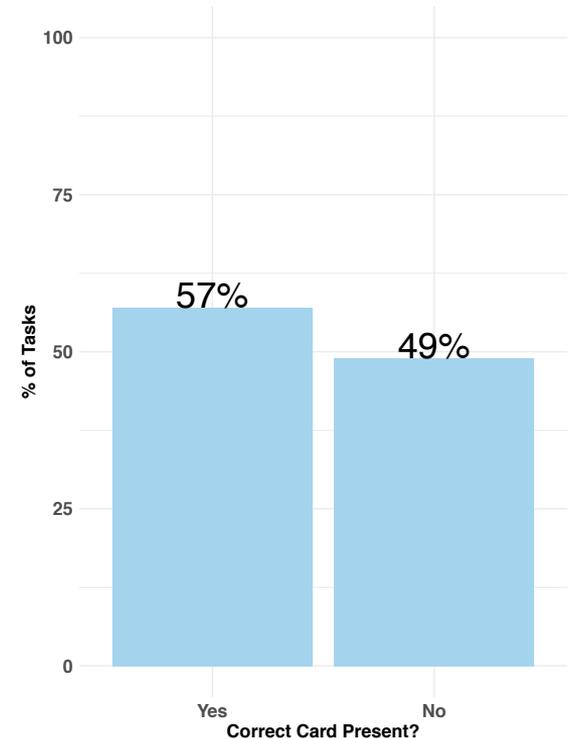
# Are Health Cards Selected as a Source of Information? (1)

People **selected information** from **multi-cards** significantly more frequent than from single-card.



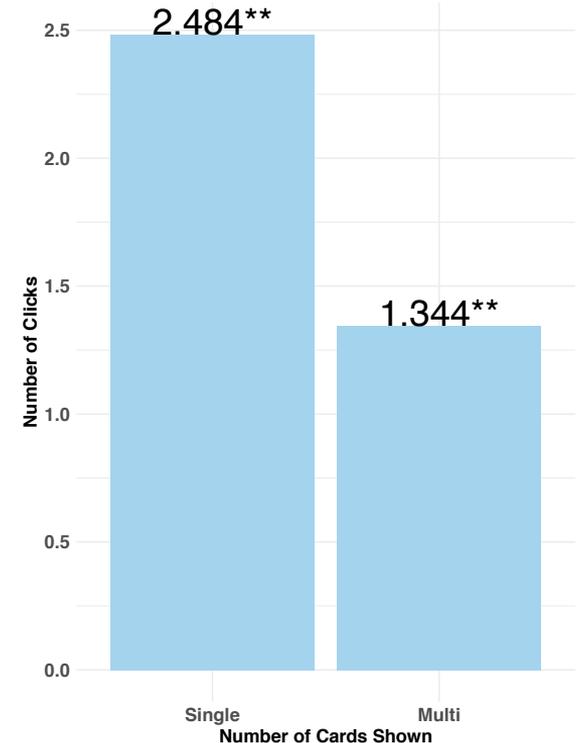
# Are Health Cards Selected as a Source of Information? (2)

People **select** from health cards **regardless the correctness** of health cards.



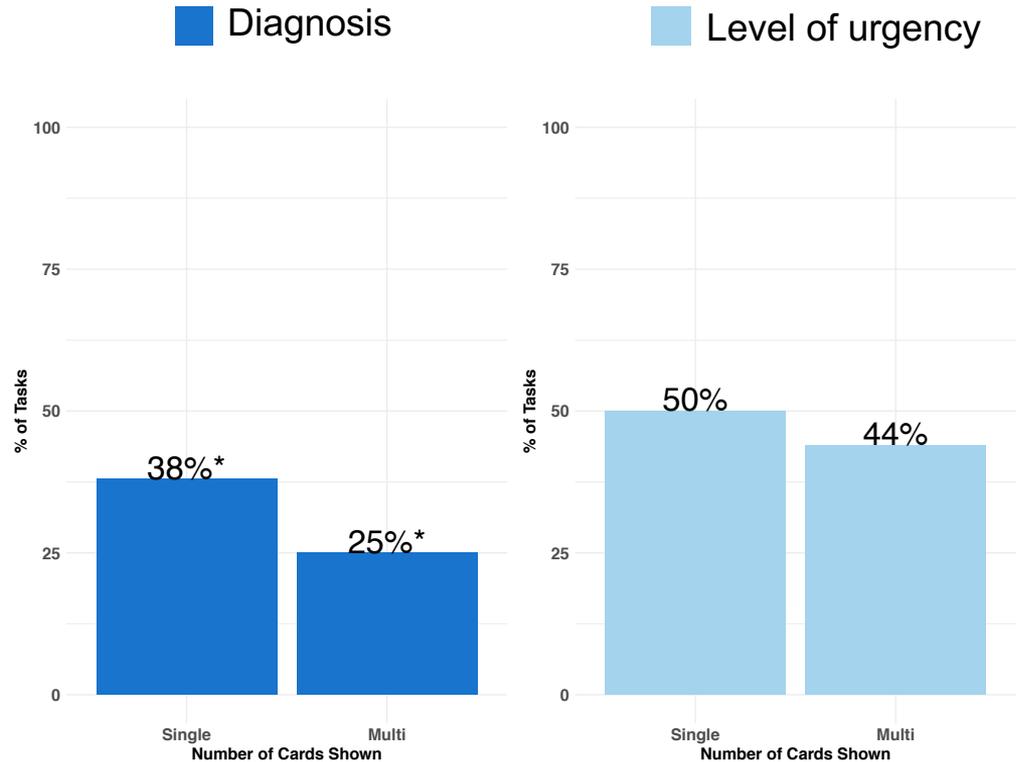
# Does Presenting Health Cards Reduce Effort to Complete a Task?

- **Effort is** translated as the **number of clicks** required to complete a task.
- The **multi-cards** interface enables people to make health decisions with **significantly less effort** than the the single card interface.



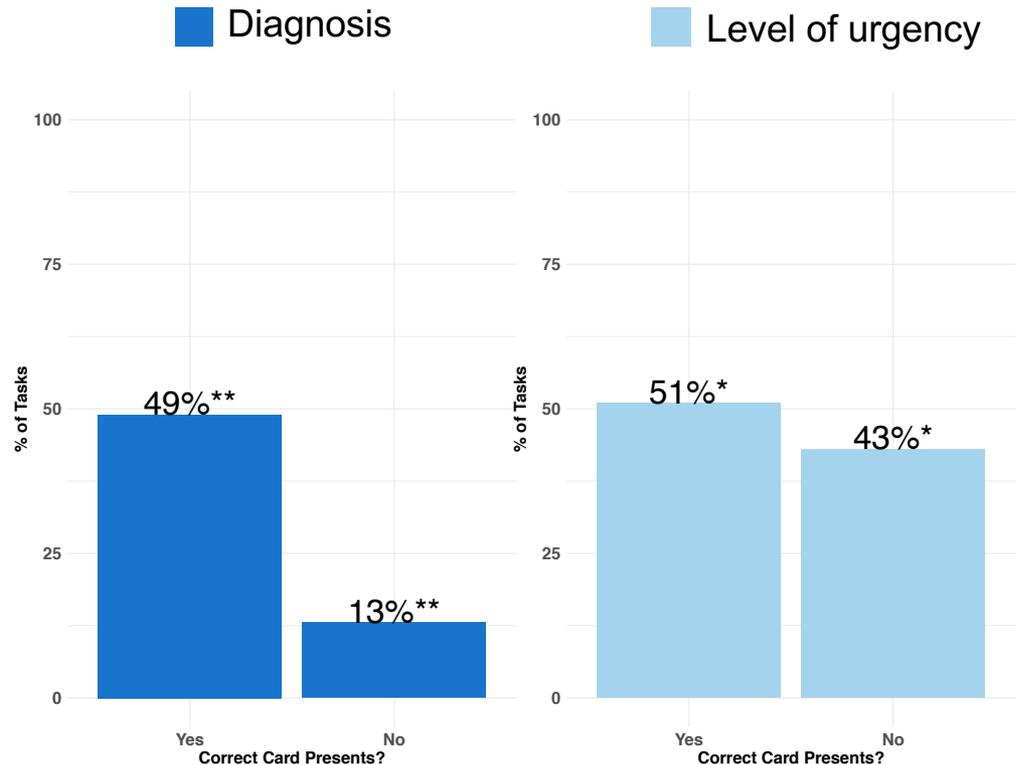
# Does Presenting Health Cards Improve the Number of Correct Decisions? (1)

**Single-card** interface leads to a significantly **higher number of correct diagnosis** than multi-cards interface.

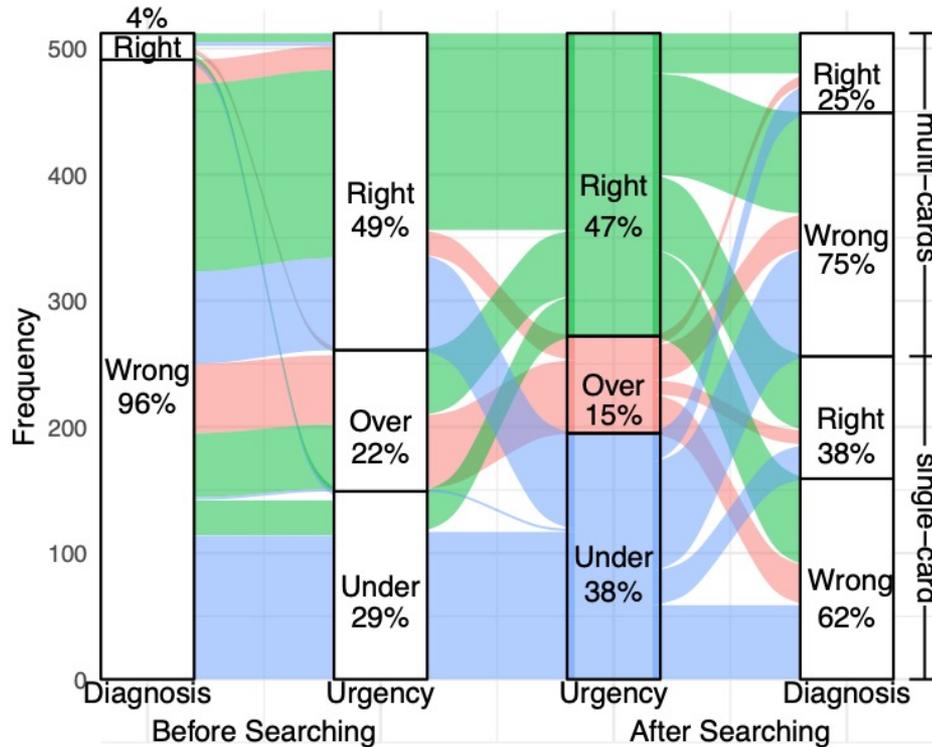


# Is Presenting Health Cards Improves the Number of Correct Decisions? (2)

- The **correctness of decisions** is **dependent** to the correctness of the **presented health card**.
- This is inline with findings from a previous study by Pogacar et al. in 2017.



# Correctness of Decisions Before and After Search



- **Search activities** lead to significant **increase of correct diagnosis**.
- **Search activities** did **NOT** lead to **better level of urgency correctness**.
- **43% of correct diagnosis had an incorrect level of urgency** (73% of them were underestimated).

# Was It Us?



## Before

## Now

### Self-treat

### Seek Medical Attention

### Emergency

### Emergency

#### Stye

Also called: Sty

About Symptoms Treatments

Eyeid inflammation

A red, painful lump near the edge of the eyelid that may look like a boil or pimple.

- Usually self-treatable
- Usually self-diagnosable
- Lab tests or imaging rarely required
- Short-term: resolves within days to weeks

Styes are often filled with pus. Sometimes a stye can form on the inner part of the eyelid.

Consult a doctor for medical advice

Sources: [Mayo Clinic](#)

#### Sinusitis

Also called: sinus infection

About Symptoms Treatments

Sinuses

Bacteria in mucus causes inflammation

A condition in which the cavities around the nasal passages become inflamed.

- Treatable by a medical professional
- Usually self-diagnosable
- Lab tests or imaging rarely required
- Short-term: resolves within days to weeks

Symptoms include headache, facial pain, runny nose and nasal congestion.

Consult a doctor for medical advice

Sources: [Mayo Clinic](#)

#### Appendicitis

About Symptoms Treatments

Causes severe abdominal pain

Large intestine

Inflamed appendix

A condition in which the appendix becomes inflamed and filled with pus, causing pain.

- Requires a medical diagnosis
- Lab tests or imaging often required
- Treatable by a medical professional
- Short-term: resolves within days to weeks

Appendicitis begins with pain near the belly button and then moves to the right side. This is often accompanied by nausea, vomiting, poor appetite, fever and chills.

**Critical:** Consult a doctor for medical advice

Sources: [Mayo Clinic](#)

#### Appendicitis

ABOUT SYMPTOMS TREATMENTS

Causes severe abdominal pain

Large intestine

Inflamed appendix

A condition in which the appendix becomes inflamed and filled with pus, causing pain.

- Requires a medical diagnosis
- Lab tests or imaging often required
- Treatable by a medical professional
- Short-term: resolves within days to weeks
- Critical: needs emergency care

The appendix is a pouch on the colon that has no known purpose. Appendicitis begins with pain near the belly button and then moves to the right side. This is often accompanied by nausea, vomiting, poor appetite, fever and chills.

Appendicitis is usually treated with surgery and antibiotics. If untreated, the appendix can rupture and cause an abscess or systemic infection (sepsis).

Consult a doctor for medical advice

Sources: Mayo Clinic and others. [Learn more](#)

# Implications

- People **struggle** to **infer** the **level of urgency** based on search results. In fact, people tend to **underestimate urgency** across search interfaces.
- This is problematic as making the **correct diagnosis** is **not as important as** identifying the **correct level of urgency**.

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Diagnosis	Urgency Level	Risk
Correct	Under-estimated	Harm well-being
Correct	Over-estimated	Waste medical resources
Incorrect	Correct	None to minimum

- **Future work** needs to better assist people in **deciding the urgency level** of their perceived condition.

# Thank you!

Email me at: [jimmy@uq.net.au](mailto:jimmy@uq.net.au)

