A role for mechanistic reasoning in medical decision making

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Outline of the talk

Introduction

-philosophy of medicine discussion of mechanisms

-bioethics literature on shared decision making

Two examples

Thesis: In some cases patients need to know how a treatment works (not just that it does)

Introduction

EBM proponents

– evidence of the effectiveness of a therapy from a well conducted RCT is sufficient to show the efficacy of a therapy

- Mechanistic reasoning is often unreliable

Others

-RCT results are often not generalizable

-we need mechanistic reasoning for clinical application

Mechanistic explanations

Mechanistic explanations can tell us how (rather than simply whether) certain treatments work.

causal explanations are explanatory because they provide a glimpse of the structure of a corresponding mechanistic explanation

MDC (2000), Williamson (2013)

Russo-Williamson thesis

in order to establish a causal claim, one needs to establish both that there is some cause that makes a difference to the effect, and that there is a mechanism from cause to effect, where

"a mechanism for a phenomenon consists of entities and activities organized in such a way that they are responsible for the phenomenon"
(Illari and Williamson (2012).

genuine explanations require knowledge of *actual* mechanisms (Machamer et al. 2000, Craver 2007).

Open question:

Can knowledge of *possible* mechanisms, which is what we often have in medicine, can aid in the clinical decision-making process?

Shared decision-making

patients should be able to make decisions regarding treatments that are in their own best interest – even when that interest does not coincide with the interests or desires of the prescribing clinician – or of anyone else.

How does this work in practice?

Shared decision-making

- Give all relevant information

(greater emphasis on patient autonomy)

- Narrow down information before presenting it to the patient

(greater patient satisfaction? Botti and Iyengar 2004)

Risk vs. benefit

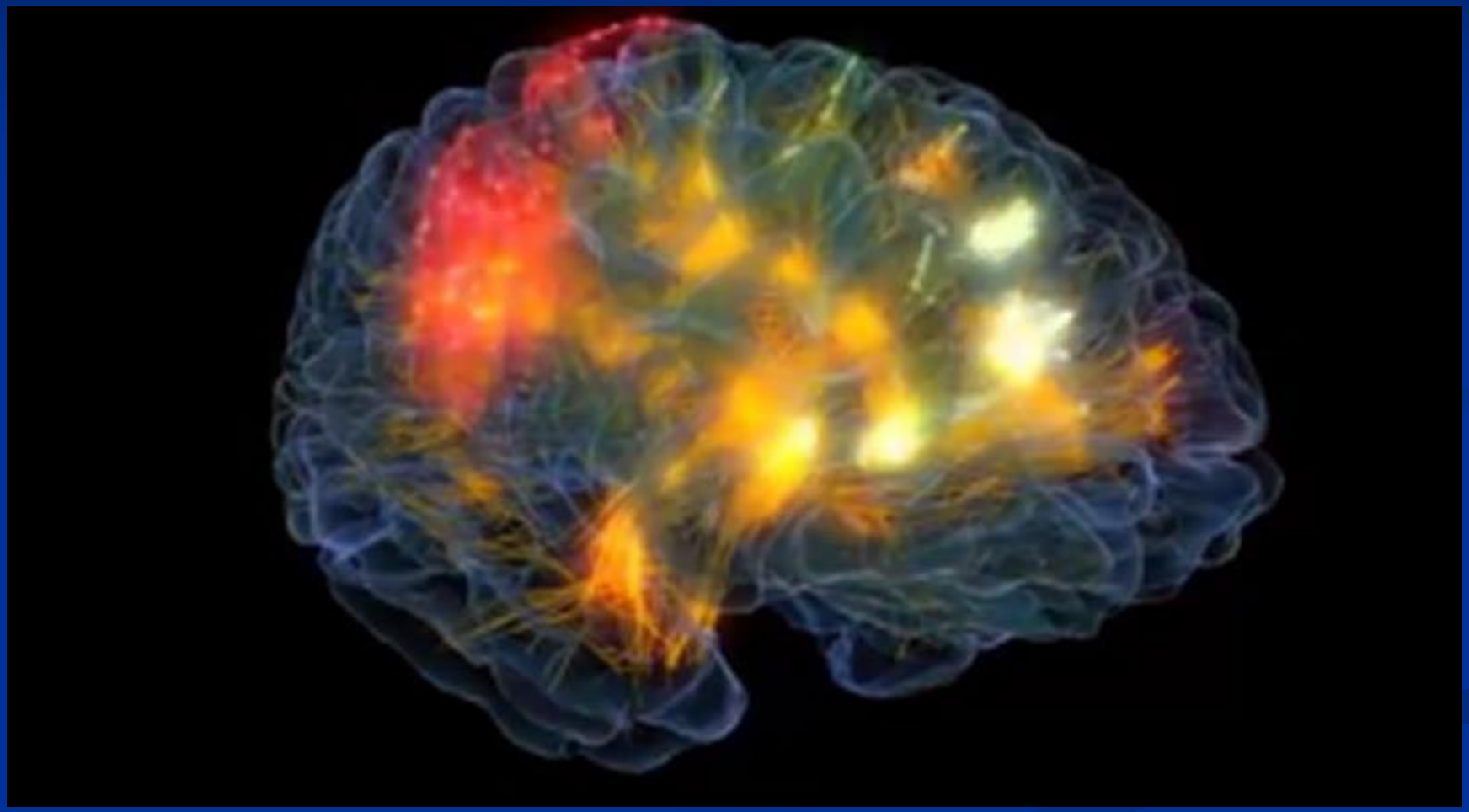
Shared decision-making at least requires understanding of a treatment's risk vs. benefit profile.

Thesis:

Some cases require more than this – they also require understanding of how a treatment works.

Thus there is a role for mechanistic reasoning in clinical decision making.

Example 1: schizophrenia treatment



Symptoms: delusions, confusion, hallucinations, disordered speech

Treatment: questiapine, risperidone, or aripiprazole

Statistic: 50% of patients with schizophrenia do not adhere to their treatment regime (Zipursky (2014)

Solving the problem of treatment adherence

what factors contribute to a patient's decision to take or not to take a particular medication?

-side-effects vs. benefit

-understanding how the treatment works

Patient satisfaction increases when patients feel they are understood (Bene-Kociemna et al. (1982)

and when they understand their own illness (Hayashi et al. (2001)

However, many patients report that they have not been told the purpose of the medication Gray et al. (2005)

Shared decision making may be facilitated by educating patients on the mechanisms underlying schizophrenia and its pharmaceutical treatments

Kikkert et al. (2006) - factors that influence whether or not a patient takes antipsychotic medication.

- "having an understanding of the illness"
- "having insight into the illness"

insight

generally defined as a patient's ability to understand the nature and significance of her illness—to recognize pathological symptoms as pathological and adhere to the advised treatments

impaired insight in up to 80% of patients (Joesph, Narayanaswarmy, and Venkatasubramanian, 2015)

Insight does not appear to be closely related to medication efficacy –insight influences compliance independently of whether or not the patient receives symptom relief from the medication.

Mechanistic knowledge is an important additional and independent factor for patients to consider when deciding on a particular treatment regime.

Should patients be given information about a medication's supposed mechanism of action?

-maximize autonomy?

Mechanistic information could be unduly persuasive.

People can be more easily persuaded to accept a given psychological claim when the explanation is accompanied by neuroscientific evidence, even though these explanations contain reasoning errors

McCabe and Castel, (2008), Weisberg, Keil, Goodstein, Rawson, and Gray, (2008)

Giving patients, particularly patients with mental illnesses, mechanistic information about a treatment option might result in the patients putting undue epistemic weight on such information in the course of their decision-making process, simply due to the mechanistic nature of the information.

recommendation

Case by case basis:

For some, better understanding of the possible mechanisms involved in schizophrenia and its pharmacological treatments might help them to feel empowered when making treatment decisions.

However, attempting to improve mechanistic knowledge and, in general, pushing a mechanistic understanding of schizophrenia might also have a negative impact on a given patient.

Case 2: hormonal birth control

For some women it is not enough to know that the method of birth control in question has a low rate of failure and an acceptable side-effect profile, instead, they also want to know how the method prevents pregnancy before they make the decision to use it.

All forms of hormonal birth control, including pills, patches, rings, implants, injections and IUDs, contain progestin (a synthetic form of progesterone), and some forms contain both progestin and estrogen.

Mechanisms of action

1. prevention of ovulation

1. thickening of cervical fluid

1. thinning of endometrial lining (prevents implantation)

The third mechanism of action is considered by some women (and men) to be morally unacceptable because it takes place after the joining of the ovum and the sperm.

While it is not *abortifacient* (because it takes place prior to pregnancy, which is defined as conception plus implantation) it is also not *contraceptive* – because it takes place after conception.

This third mechanism is morally unacceptable for some because they hold the view that preventing the implantation of a human embryo amounts to the unjust killing of a human person.

While we acknowledge that this view is philosophically problematic, still, women have the right to hold it, and to make treatment decisions based upon it.

Complicating factor

In any given case it is not known whether or not the birth control method was successful in preventing pregnancy (if it was) because of this third mechanism, or rather if it prevented conception via one of the other two mechanisms.

Philosophical issues

1. What counts as adequate information for the patient to reach an informed decision in this case?

-risk vs. benefit is not enough

-patient wants to know how the intervention works (but this is epistemically problematic)

Maybe we should not give patients information about possible mechanisms?

Even the mere possibility that the method could prevent the implantation of an embryo makes it morally unacceptable:

"for women to whom the induced death of a zygote/embryo is important, the failure to discuss the possibility of this loss, even if the possibility is judged to be remote, would be a failure of informed consent."

(Kahlenborn, Stanford and Larimore (2002)

Sometimes only two mechanisms are disclosed

"The main mechanisms [of hormonal birth control methods] are ovulation inhibition and changes in the cervical mucus that inhibit sperm penetration [there are also] effects on the endometrium that, theoretically, could affect implantation. However, no scientific evidence indicates that prevention of implantation actually results from the use of these methods. Once pregnancy begins, none of these methods has an abortifacient action."

In spite of the supposed distinction referenced here, there are no studies that have been conducted to differentiate between "main" and "theoretical" mechanisms of hormonal birth control.

While no method that works prior to implantation can (by definition) be considered to be an abortifacient, phrasing the information in this particular way seems to be misleading.

From a philosophy of medicine perspective all of the three mechanisms are, in some sense, "theoretical" !

Suppression of ovulation, thickening of cervical mucus, and thinning of the endometrium are observed and from this mechanism of pregnancy prevention is inferred.

Philosophical issues

2. How much weight, in general, should be given to *possible* mechanisms in the clinical decision-making process?

It depends on what is at stake for the patient: If what is at stake is of grave moral importance, then even possible mechanisms should be taken into account.

counterexample

Decision of whether or not to take medication to lower blood pressure:

-risk vs. benefit profile should be enough – it doesn't seem that mechanism of action (barring some possible comorbid condition) should matter

-moral stakes in this case are low or nil

Conclusion

We have suggested a role for mechanistic reasoning in the patient's clinical decision-making process that has been neglected in both the philosophy of medicine and biomedical ethics literatures: its importance in the patient's decision making process regarding whether or not to take certain treatments.

Conclusion

Mechanistic reasoning, even when imperfect, in some instances does have an important role in the medical decision-making process.

In such cases, knowledge of possible mechanisms should not be ignored or withheld from patients, but instead should be part of the information relayed to the patient during the clinical encounter.

Thank you!