Pharma

AI41 Group A

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Impact on society

What impact is expected from your technology?

What is exactly the problem? Is it really a problem? Are you sure?

A pharmacy in Belgium has collected a lot of data on the prescriptions but doesnt now how to use this data. To avoid the data just sitting there they would like us to have a look on what we could do with the data.

The pharmacy has suggested two things we could improve using the given data: health improvement and cost reduction.

Are you sure that this technology is solving the RIGHT problem?

We now never for sure the technology will fix the problem but we think we have a big chance of reducing cost by estimating consumption and improving health by reducing the amount of errors.

How is this technology going to solve the problem?

To improve on cost reduction the technology predicts when you need a certain amount of medicine in stock, this mean that the pharmacy could buy medicine in bulk more precisely leading to less waste which reduces cost.

To improve health the technology could suggest a medicine which would be a better fit for the patient which means less side effects and lower chance of error.

What negative effects do you expect from this technology?

The technology could also make mistakes which could lead to higher costs. If the system makes a mistake on health improvement the impact should not bet hat big because the doctor will always check the suggestion before changing the prescription.

In what way is this technology contributing to a world you want to live in?

If the technology would improves health less people will have side effects, we dont think anyone would dislike this idea.

Now that you have thought hard about the impact of this technology on society (by filling out the questions above), what improvements would you like to make to the technology? List them below.

The addition of a disclaimer aimed at the patients stating that one should enquire with their physician or pharmacist may be enough to ensure that any

serious consequences are mitigated. A disclaimer for the pharmacists should perhaps also be included, stating that they should check recommendations from the model for anything that might cause adverse effects.

Hateful and criminal actors

What can bad actors do with your technology?

In which way can the technology be used to break the law or avoid the consequences of breaking the law?

This technology can break several laws. If the pharmacy decides to change the patients their medicine
because it was cheaper without consulting their doctor first, they can get arrested since it is illegal to do
that. Of course, the pharmacies themselves already know about this law so we should not worry about it
too much.

Though if pharmacies can do this, then a hacker might be able to do so as well, they could get the model to recommend medicine that could be damaging to the patient(s). And with negligence and/or complacency, an employee might not think twice about what the AI/machine learning model is recommending while in reality it has been tempered by a criminal actor.

To combat this a disclaimer message could be added.

Can fakers, thieves or scammers abuse the technology?

I cannot imagine this scenario. The pharmacy and their client have a professional relationship. They
should not cross any personal boundaries even without this application. But maybe there is a chance
that the doctor gets offended when he gets requested to change the medication to a cheaper one. In
which case it is not a bad scenario.

Can the technology be used against certain (ethnic) groups or (social) classes?

Well, if we really wanted to, we could make the medicine as expensive as possible and exclude all the
poor people from getting medicine. But that is what we are trying to prevent in the first place. As for
ethnic groups, there is no way that the system knows what kind of person the patient is. This way the
system only cares about what cheaper medicine there is available on the market.

In which way can bad actors use this technology to pit certain groups against each other? These groups can be, but are not constrained to,

ethnic, social, political or religious groups.
This technology cannot be used to pit any group against each other. The pharmacy will keep running like
it used to run without this application, but the only plus added is that the pharmacy will be able to help
the patient get cheaper or better medicine for their buck.

How could bad actors use this technology to subvert or attack the truth?
The pharmacies could try and get only the most expensive medicine for that person and say that it is the
only medicine that will work for them. This way, the patient would not know that there is a medicine
that is a lot cheaper than the one they are trying to buy. But of course, we are only going to show the
cheapest medicine options to the pharmacy. This way no shenanigans can be done with it.

Now that you have thought hard about how bad actors can impact this technology, what improvements would you like to make? List them below.
As mentioned before, a disclaimer message should be present saying that recommendations from the model are merely an advice and not to be taken as definitive. It functions as a tool, its users should remain critical and patients physicians should be consulted before changing their medication. As far as hackers and other similar criminal actors are concerned, standard counter measures such as data encryption and firewalls should suffice.

Privacy

Are you considering the privacy & personal data of the users of your technology?

This category is only partial filled.

Does the technology register personal data? If yes, what personal data?

A patient might not want their data to be used for this technology. Even though this data is not binding to the patient themselves, the medicine might be. For this reason, the patient might decline the usage of their medicine in this technology. They might want to have consistency when it comes to their doctors giving out their medicine.

Do you think the technology invades the privacy of the stakeholders? If yes, in what way?

This question has not been answered yet.

Is the technology is compliant with prevailing privacy and data protection law? Can you indicate why?

This question has not been answered yet.

Does the technology mitigate privacy and data protection risks/ concerns (privacy by design)? Please indicate how.

This question has not been answered yet.

In which way can you imagine a future impact of the collection of personal data?

This question has not been answered yet.

Now that you have thought hard about privacy and data protection, what improvements would you like to make? List them below.

A patient should be informed on their data and what it is used for, while also giving them the option to opt out of their data being used for the machine learning model if they so desire.

Human values

How does the technology affect your human values?

How is the identity of the (intended) users affected by the technology?

Health issues are a daily aspect of the lives of a significant percentage of the population. Therefore, it is highly important that the technology will ensure that the values of its potential users are respected.
Medicine if often the solution for medical issues, and the target of this technology's predictions. It aims to provide cheaper alternatives for medicine and to predict treatment based on other customers' experience, emphasizing accessibility, and alleviating the daily struggle of people with medical issues. Therefore, it has a positive impact on its users' identity, ensuring a non-stigmatizing approach.

How does the technology influence the users' autonomy?

Because the technology is meant to make a prediction and recommend a prescription drug, the autonomy of the users, patients and pharmacists, is limited. Even more, the patients rely on the pharmacists to use the technology.
However, because such decisions are heavily reliant on medical knowledge and judgement on a case-by-case basis, the pharmacist can decide if the predictions are suitable for the patient's case.
Therefore, some users such as the pharmacists have almost full autonomy, while the patients do not.

What is the effect of the technology on the health and/or well-being of users?

The technology's goal is to improve the health and well-being of its users. However, the combination and interaction between prescription drugs will need to be accounted for to ensure the health of the users. Because it can lead to severe side effects, illness or even death, it is critical that the users' well-being is not put in danger.

Now that you have thought hard about the impact of your technology on human values, what improvements would you like to make to the technology? List them below.

One of the improvements on this technology that would be beneficial for the patient users would be increased transparency into the prediction process and factors. The technology needs to be non-stigmatizing and easily approachable. Because health is generally a private and sensitive topic, transparency would guarantee a wider and safer reach to a higher number of people.
Another improvement for this technology would be to employ domain

knowledge in future iterations. Not only does it safeguard the health of patient users, but pharmacist users will not have to evaluate drug combinations with every case, making their tasks easier while also not removing their autonomy.

Stakeholders

Have you considered all stakeholders?

Who are the main users/targetgroups/stakeholders for this technology? Think about the intended context by answering these questions.

Name of the stakeholder
Pharmacists

How is this stakeholder affected?
The costs of running the pharmacy will go down because they now have insight and have to ability to
predict future costs. This will allow them to streamline the process of acquiring the medicines.
Reducing the costs of running the pharmacy. This also allows them to see trends in the medicine use.
And prepare for these by buying these medicines before they are sold out for example.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Patients

How is this stakeholder affected?
Because the pharmacy will have insight into how many medicines to buy, the patient will be sure that
the medicine that they need will always be in stock. So, they no longer have to worry about if they
can still buy it. And when the technology suggests a better medicine, maybe with a lower price, the
patients will save money. And have a better time using the medicine.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Name of the stakeholder
Rob Prob

How is this stakeholder affected?
Rob Prob works at Informa, and thier clients are the pharmacies. This means that Rob knows about their priorities of the pharmacies. And will talk to us about what they need, and how we could improve on the technology.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Did you consider all stakeholders, even the ones that might not be a user or target group, but still might be of interest?

Name of the stakeholder
Medicine suppliers

How is this stakeholder affected?
Because they pharmacy can predict how much medicine they will need in the future. They could
inform the suppliers ahead of time. This means that the process of the supplier will be easier because
they can see how much they need to supply in the coming. So, they dont have to buy in too many
medicines to ship out. And their costs will also be reduced.

Did you consult the stakeholder?
Yes

Are you going to take this stakeholder into account?
Yes

Now that you have thought hard about all stakeholders, what improvements would you like to make? List them below.

For the patients it is of utmost importance that their health and safety remains top priority. This can only be done with the assistance of the pharmacists, since they should also be aware of possible dangerous or adverse combinations of medication that the model could predict. Patients should be given the option to opt out, barring their data from being used, and in the case they do want to take part then they should be informed on how their data is being used.

Data

Is data in your technology properly used?

Are you familiar with the fundamental shortcomings and pitfalls of data and do you take this sufficiently into account in the technology?

Yes, but not for certain. The data collected come from pharmacies/a pharmacy located somewhere in Belgium. Any specific details regarding the data are kept unknown to us by Informa and their client. We do not know which company owns these pharmacies and we dont know whether this data comes from only a single or from multiple pharmacies.

How does the technology organize continuous improvement when it comes to the use of data?

The initial development will involve supervised learning, however in later stages the technology should be able to make predictions and learn on the data it is fed by itself.

How will the technology keep the insights that it identifies with data sustainable over time?

The technology should retain the knowledge it has about the patients and the medicine prices as far as can be allowed. It can help give insights into a patients history or the history of a medicines price increases.

In what way do you consider the fact that data is collected from the users?

There is no underlying business model behind the collection of user data.

Now that you have thought hard about the impact of data on this technology, what improvements would you like to make? List them below.

Currently the only improvement we can make is by expanding the data it has access to. Other than that it should be stated clearly to all parties involved (i.e. pharmacists, patients, etc) that the decisions made by the technology are not definitive and should be considered more as opinions or advice

Inclusivity

Is your technology fair for everyone?

Will everyone have access to the technology?

No, this technology will not be available to the general public. The final product is really only meant to be used by the pharmacists working for the client company. The patients will never interact with the technology directly, but may be able to make certain requests or ask questions to their pharmacists regarding it.

Does this technology have a built-in bias?

At the time of writing this is uncertain, however we speculate that biases might occur based on the patients age (bias towards older or younger patients) or the medicines price (bias towards cheaper products).

Does this technology make automatic decisions and how do you account for them?

Its decisions will be automatic, but the technology does not get to make an definitive choice in the matters of what medicines the patient will get. When a decision is made by the technology, it will be standard procedure to get the input of a professional pharmacist and the patients general practitioner. The decisions the technology makes are going to be viewed as an advice in these discussions

Is everyone benefitting from the technology or only a a small group? Do you see this as a problem? Why/why not?

Seeing as this directly benefits pharmacies, patients and possibly als insurance companies, we would argue that this technology only benefits relatively small groups. This isnt essentially a problem, as its really only needed if its necessary and those not benefitting from it arent missing out on anything crucial to their lives. The technology doesnt replace a pharmacist or doctor.

Does the team that creates the technology represent the diversity of our society?

Yes. We have consist of many different cultures and nationalities. However we dont see how that would impact this technology

Now that you have thought hard about the inclusivity of the technology, what improvements would you like to make? List them below.

At the time of writing, no improvements regarding this technologys inclusivity come up.

Transparency

Are you transparent about how your technology works?

Is it explained to the users/stakeholders how the technology works and how the business model works?

This technology predicts the medicine which is needed for the coming months. With the previous
data of how much medicine has been bought we can make predictions on how much medicine is
need for the coming month(s). This will give us insight on costs for the coming future.

If the technology makes an (algorithmic) decision, is it explained to the users/stakeholders how the decision was reached?

To give the pharmacy better insight on why a certain prediction was made. They should be able to
comprehend how the algorithm functions. This is important because the technology should assist the
pharmacist with the cost reduction. And when the technology suggests another medicine it should
be clear why it was chosen.

Is it possible to file a complaint or ask questions/get answers about this technology?

Because this technology will be used by many pharmacies. We think that being able to ask questions
or filing a complaint about the technology should be an option. This will not only make the
technology more transparent but will also make it more reliable. When there is a problem with the
technology a pharmacy should be able to file a complaint. This will only improve the product in the
future

Is the technology (company) clear about possible negative consequences or shortcomings of the technology?

When a certain medicine is suggested, a competitor might lose customers. Other than that, we dont
see any more negative consequences. this will need to be improved in the future.

Now that you have thought hard about the transparency of this

technology, what improvements would you like to make? List them below.

We should make sure that the technology is as transparent as possible on how it reached a conclusion. Also, feedback should be taken into account, this will only improve the product.

Sustainability

Is your technology environmentally sustainable?

In what way is the direct and indirect energy use of this technology taken into account?

Machine learning has the potential for an increased energy consumption, compared to other technologies. As such, this risk is acknowledged, however due to the relatively small scale of the technology, it will not have a major impact on sustainability.
One way to improve the energy consumption is to refactor the technology continuously, to ensure energy efficiency.

Do you think alternative materials could have been considered in the technology?

Not really, at this moment there are no possible alternative materials that could have been used for this technology.

Do you think the lifespan of the technology is realistic?

The advantage of software technologies is that the maintenance and repair of such technologies is relatively sustainable and can extend the lifespan almost indefinitely, provided the main resource of time, is available.

What is the hidden impact of the technology in the whole chain?

The technology is developed for the pharmaceutical industry, with the goal of making the chain more efficient, from prescription to consumers using the products.
Because of the nature of the predictions the technology will make, specifically drug prescriptions and medicine prices, it can encourage a feedback loop of cheaper medicine prices and more efficient treatment choices for patients.
This is the hidden impact of the technology, and while it is not necessarily a negative impact, the risk of errors in predictions can impact the whole chain.

Now that you have thought hard about the sustainability of this technology, what improvements would you like to make? List them below.

Material sustainability is not applicable in this case, since this isnt addressed in any of the data. Cloud storage solution may be used as a way to reduce energy consumption, without investing large sums into on-premise sustainable energy generation (i.e. wind mills, solar arrays)

Future

Did you consider future impact?

What could possibly happen with this technology in the future?

We can see this technology continuously improving as time goes by, to potentially the point it can replace humans. We think that in the case this scenario is encountered, it may be beneficial for healthcare costs and treatment efficacy. On the other hand, a worst case scenario may involve this technology being responsible for several deaths

Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one utopian scenario.

The new app HealthBudy has reached 200 million users last week. For the ones who have been living under a rock the last 2 years, the app (released in 2034) monitors your body and food intake, with this data the app suggests medicines to avoid serious illnesses. When a medicine gets suggested you can order this medicine with the click of a button!

According to estimates the app has already saved around 55.000 people.

Sketch a or some future scenario (s) (20-50 years up front) regarding the technology with the help of storytelling. Start with at least one dystopian scenario.

Last week a new report came out about PharmBud (a system the pharmacies and doctors use to prescribe medicine to patients). The CDC have investigated the system and found that the system has caused millions of deaths around the world, the system consistently makes mistakes proscribing the wrong medicine to people.

Would you like to live in one of this scenario's? Why? Why not?

I would like to live in the first scenario if the privacy of the data is protected well.

What happens if the technology (which you have thought of as ethically well-considered) is bought or taken over by another party?

I think not much would happen since the data is anonymous.

Impact Improvement: Now that you have thought hard about the future impact of the technology, what improvements would you like to make? List them below.

In a best case scenario, AutoPharma will remain as a utility tool to assist pharmacists and patients in finding better and/or cheaper alternatives to their medication, while control remains with the experts. At a certain point, improvement or alteration need to halt to prevent human positions from being replaced, because this could do more harm than good even if the health and cost benefits are significant.