



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Revised Framework For Personalization In Healthcare

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Abstract

Personalization is not an unknown term in business and research worlds. Both are working to make personalization a part of business and applications. Customers feel more inclusive with the feature of personalization built in shopping websites or any other service. In this paper I have talked about personalization and its importance. Also, personalization and machine learning has been discussed along with personalization in healthcare. A framework on personalization in healthcare is discussed and a revised framework suggested. Finally, the work has been concluded with discussion on future work.

Keywords: Machine Learning, Artificial Intelligence, Augmented Care, Personalization

Introduction

Personalization is common in marketing, software designing, content recommendation, email marketing and mobile apps to name a few. Personalization is an important aspect of search experience to make users task easy by providing options while shopping or searching and even reading. Personalization customizes users experience according to search history, behaviours and needs. Suppose you were shopping on Amazon, and you liked a shirt which was beyond your budget. What if there was a similar shirt from a different brand fitting your budget displayed under “You might also like”. This will make your day because without putting any extra effort you found similar item suiting your budget. This is power of personalization. Now you know why we are discussing personalization here. You go for shopping in malls, and you want to buy a tie for yourself. You communicate this to the salesman, and he shows you different designs and colours. Then you tell him your preferred brand and colour which makes task easier. Similarly based on your search history, your shopping cart can be personalized, or your searching can be personalized. While searching for a restaurant if your location is switched on your mobile phone than nearby restaurants are shown at the top. Machine

Learning (ML) algorithms uses personalization to refine and customize your searches and experiences. Different types of ML algorithms are Regression analysis, Clustering, Markov Chains, Deep Learning and Association.

In this paper I have discussed ML in healthcare and how personalization in healthcare can change things. Framework for personalization in healthcare will be suggested.

ML in Healthcare

Machine Learning and Artificial Intelligence (AI) are the most talked about terms. ML algorithms works by analysing large datasets and extrapolating the results to personalize user experiences. Personalization is growing and it is being anticipated that it will become billion dollars industry by 2030. Some examples of personalization based on ML are Spotify, TikTok, Netflix and Goodreads. Similarly, ML can be used in personalized medicines in healthcare. ML is a tool that uses AI to help medical professionals improve patient handling and care. ML can help in:

- **Early Disease detection and remedy suggestion:** Suppose someone has dengue but test has not yet been run. So, depending on the symptoms, history and current ongoing situation treatment of dengue can start while test results arrive.
- **Personalized treatment:** ML can be used to generate, analyse and interpret patient record for personalized treatment.
- **Healthcare updates and trends:** ML can be used to identify and update healthcare situation in an area. Like in case of covid, data was being sorted and interpreted to access what will happen in case of second and third wave of covid.
- **Drug Research and Discovery:** Different components of medicine can be assembled virtually to see results. If combination works on certain disease than it can be produced in small scale for lab testing.
- **Clinical data management:** ML can automate and manage clinical data easing numbers and work of clinical professionals.
- **Risk assessment tools:** In case of cancer patient the treatment can be virtually run and simulated before it is administered to the patient. Here the risk factor is considered. Treatment with high risk will not be given.

Thus, it can be said that ML can help to improve patient experience and care along with reducing cost and increasing operational efficiency.

Personalization in Healthcare

Personalization has become industry trend and need of the hour. Personalization leads to customer retention and satisfaction. Customers feel that they have been understood and their preferences are prioritized. Specifically, technology can personalize four different parts of the patient journey to benefit of patient experience within a lean operations model [3]:

- **Identifying** patients who are eligible for a procedure, service, or outreach
- **Engaging** patients with a personalized call to action
- Augmenting **care** with digital tools, and
- **Monitoring** patient progress over time to ensure continued support.

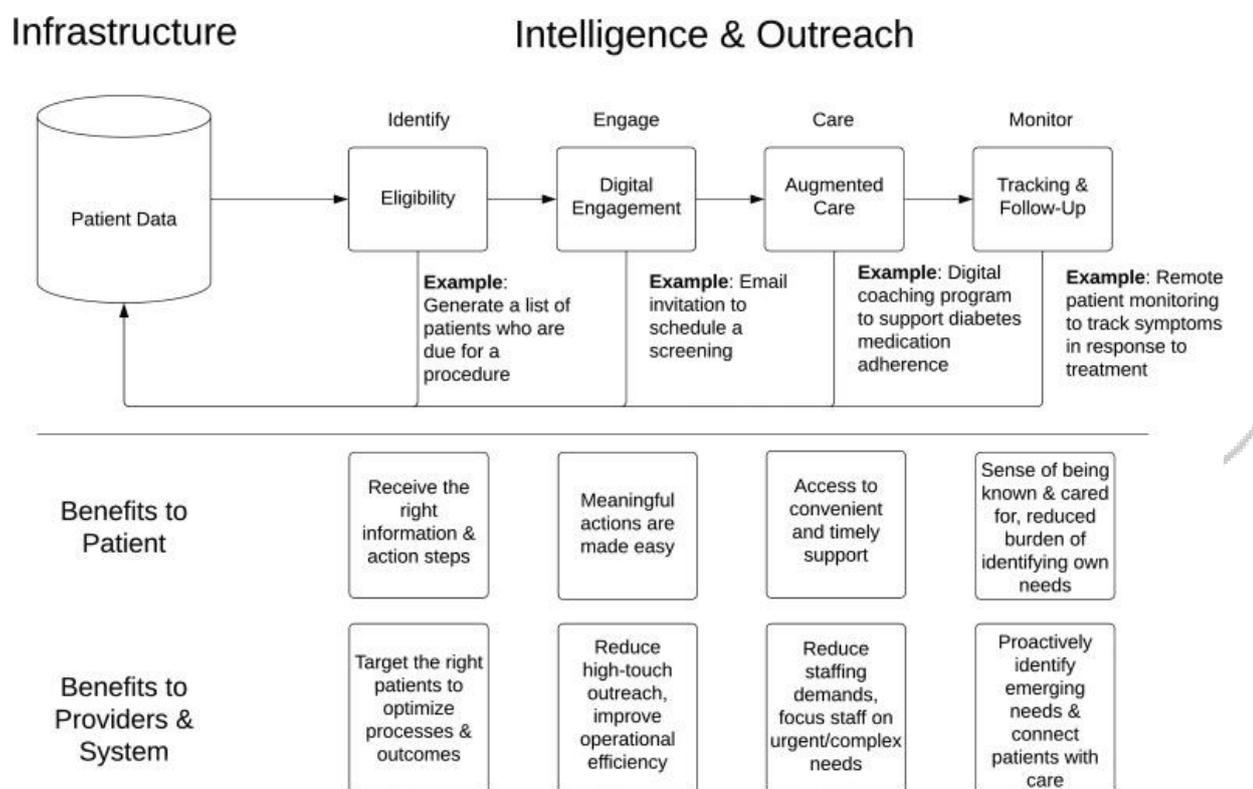


Figure 1: Relation between Infrastructure and Intelligence and Outreach [3].

Bucher (2023) [3] in her work depicted the importance of technology in Augmented Care of patients where infrastructure, intelligence and outreach are important in giving a personalized experience to a patient. The benefits at each step of the process both for the patient and the provider has been clearly stated. Bucher (2023) [3] further states that the information we need to understand people in context and personalize exists but must be gathered and organized. To make this task of data gathering and organization easier I suggest use of machine learning here. Our framework adds one more component to figure 1.

Framework for Personalization in Healthcare

I have modified the framework suggested in figure 1. One more component i.e. Prediction is needed for a complete personalized touch. So, the framework has five components:

1. Identify: Here patient eligibility should be governed by demographics, ongoing disease outbreak and due for doctor visit variables.
2. Prediction: Prediction will need clinical data to predict health outcomes of the patient and information about any outbreak in their locality.
3. Engage: Digital engagement via email, phone calls, SMS or personal visit can be scheduled depending on the nature and requirement of the patient.
4. Care: Based on the prediction care or augmented care should be provided. Healthcare Infection Society defines augmented care as most care where medical/nursing procedures render the patients susceptible to invasive disease from environmental and opportunistic pathogens such as *Pseudomonas aeruginosa* and other alert organisms [4].
5. Monitor: In this phase tracking and follow-up along with feedback is done. Feedback is important because after doing everything the patient might be dissatisfied with the service because he might not be improving or not taking the procedures seriously.

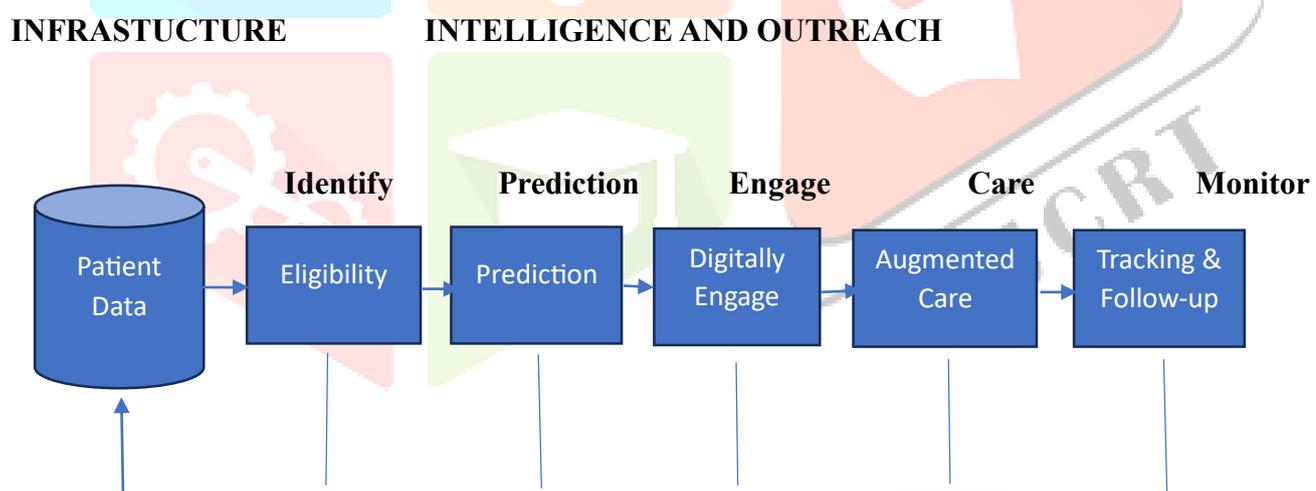


Figure 2: Revised Framework for Personalization in Healthcare

Figure 2 is a modification of figure 1 where I have added 'Prediction' as an element in Intelligence and Outreach. Prediction is important because it will access patients' medical history and consider any pandemic outbreak in that area. Disease chance will be evaluated depending on the prediction report and accordingly the patient will be guided. Also 'Care' has been taken as an element instead of just 'Augmented Care' i.e. holistically caring for the patient and not just augmented care. Hence, patient data is being handled at five levels instead of four as in the previous framework.

Conclusion

Personalization is advancing in different domains and so is the demand from customers. Healthcare is a segment where personalization has started picking up. In this paper I have suggested a revised framework for personalization in healthcare which can reduce manpower while proving customised service to each patient.

Personalization is going anywhere and so focus should also be on privacy of data and transparency of services. Live chat is picking up due to capability to address urgency and immediacy. Healthcare can also leverage these features in it's system for better patient care and handling.

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