

# Addressing Digital Health Equity Through Diverse User Personas

ASLI MCCULLERS, BS,<sup>1</sup> NAHEED AHMED, PHD, MA<sup>2</sup>

<sup>1</sup> University of Delaware; MedStar Health Research Institute

<sup>2</sup> Grossman School of Medicine, New York University

Correspondence: [amccul@udel.edu](mailto:amccul@udel.edu) (Asli McCullers)

*With patient portals emerging as a powerful digital health innovation, the work described in this manuscript strives to ensure that these innovations occur with health equity at the forefront. This work approaches this uniquely through the data-informed development of user personas. This will be particularly useful for developers and healthcare institutions when considering the diverse needs of potential patient portal users of historically marginalized backgrounds.*

**Keywords:** Patient portals, User personas, Health equity, Digital Health, Health care innovation

## Introduction

There are numerous benefits to patient portal platforms including facilitation of provider-patient communication and improved patient health outcomes.<sup>1</sup> Research shows that patients who enroll in and use patient portal accounts have improved health outcomes and are more engaged in their health.<sup>2, 3</sup> However, patient portal usage data indicates significant disparities by patient subpopulations, specifically among elderly, racial and ethnic minorities, lower technology and health literate, and safety-net populations.<sup>4,5,6</sup> There is an urgent need for healthcare systems and

developers to close these gaps in usage, so that patient portal platforms are accessible and approachable for these patient subpopulations. To facilitate the design and operation of inclusive patient portal platforms, we present user personas incorporating different patient subpopulations, and how to meet the technology and health needs of each persona. These user personas were developed based on research and a review of the literature to maximize patient portal usage across patient subpopulations.

## Background

While designing these user personas, we have considered various barriers that influence patient portal usage. Low digital literacy has been evidenced as a strong barrier to patient portal usage, as navigating online systems can be arduous for those who are not adept in accessing digital resources.<sup>7,8,9</sup> Low health literacy serves as an additional barrier, as those with low health literacy are less likely to find health information

technology useful due to limited understanding of the implications and best uses of these resources.<sup>9</sup> Limited access to computers, smart phones, or the Internet may also prevent full uptake to patient portals, as these tools are largely web-based. People with disabilities, low-income communities, older populations, and racial and ethnic minorities are the most at risk to being impacted by these barriers, as the

marginalization of these groups have led to differing levels of education, health and digital literacy, internet access, and other determinants of health that shape their access to

## Methods

The user personas we designed are collectively informed by two patient portal studies performed by a medium academic healthcare system in the Mid-Atlantic region, which both contained data on patient portal users and non-users. We additionally developed these personas based on findings from an environmental scan of peer-reviewed and grey literature.

The first study we leveraged to inform our user personas aimed to examine demographic differences between patient portal users and non-users, as well as examine health literacy, patient self-efficacy, technology usage and media and technology attitudes between patient portal users and non-users.<sup>12</sup> This data was collected from an online survey completed by a sample of 489 Amazon Mechanical Turk (MTurk) workers from December 2021 to January 2022. Data were analyzed using latent class analysis (LCA) and multivariate logistic regression models. Among the most relevant findings for the current analysis on user personas were indications that patient portal usage was high among patients with health insurance, a primary care provider, and patients with comorbid disorders.<sup>12</sup>

The second study we used to inform our user persona designs aimed to examine patient portal usage from pre- to post-onset of the COVID-19 pandemic, as well as to assess differences in portal usage by chronic disorders from pre- to post-onset of the pandemic.<sup>13</sup> Patient portal data were extracted and analyzed from a sample of 153,628 unique patients with patient portal account receiving care in a medium, Mid-Atlantic-based academic healthcare system. Patient portal usage from pre-onset (March 2019-February 2020) to post-onset of the COVID-19 pandemic (March

contemporary care resources such as patient portals.<sup>10,11</sup>

2020-February 2021). A demographic analysis and a series of mixed effects models confirmed that patient portal usage was higher among these patient populations (insured, have primary care provider, have comorbidities of any type) and among patients with a disability, high levels of patient self-efficacy, and positive attitudes toward use of technology.<sup>13</sup> Other results relevant to our user personas evidenced in both studies include higher income and education levels among patient portal users, more users living in urban locations, and high health literacy among non-users.<sup>12, 13</sup>

An environmental scan of the peer-reviewed and grey literature aligned with the findings from these two studies. This scan also provided additional details on differences among patient portal users and non-users beyond the scope of the two studies. This scan included studies found using PubMed and Google Scholar, as well as other scholarly content found in standard Google search engine. This scan included a global array of studies, including research based out of the United States, Australia, Canada and the Netherlands. Our search terms, which were adapted depending on database or search engine type, included phrases such as: “user personas”; “patient portal users”; “patient portal non-users”; “patient portal characteristics”; “patient portal disparities”; “digital health equity” and others. The additional information we found included data suggesting that women more often identify as users when compared to men, and that average users are typically younger than non-users.<sup>14,15</sup> Racial differences have also been noted, as White and Asian-Americans are more likely to utilize patient portals than Hispanic/Latinx or African Americans.<sup>10, 11, 16</sup>

**Use Personas**

A total of three patient portal user personas were developed (Table 1). These personas are defined by health utilization patterns,

technology barriers, and email and computer usage.

Table 1.  
*Use Personas*

|                          | User Persona 1   | User Persona 2  | User Persona 3   |
|--------------------------|--|---|--|
| Healthcare Utilization   | <ul style="list-style-type: none"> <li>• No primary care provider</li> <li>• No health insurance</li> <li>• Low use of healthcare services</li> </ul>  | <ul style="list-style-type: none"> <li>• Has primary care provider</li> <li>• Has health insurance</li> <li>• Inconsistent use of healthcare services</li> </ul>  | <ul style="list-style-type: none"> <li>• Has primary care provider</li> <li>• Has health insurance</li> <li>• Regular use of healthcare services for preventative and/or screening appointments, and/or management of acute and chronic conditions</li> </ul>                            |
| Technology Barriers      | <ul style="list-style-type: none"> <li>• None or limited access to technological devices</li> <li>• None or limited access to Internet</li> <li>• Limited comfort with use of technology                             <ul style="list-style-type: none"> <li>◦ Prefers receiving physical copies of medical records or paperwork</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Moderate access to technological devices and Internet                             <ul style="list-style-type: none"> <li>◦ Out-of-date or poor quality technological devices</li> </ul> </li> <li>• Limited comfort with use of technology                             <ul style="list-style-type: none"> <li>◦ Mixed preferences about modality of receiving medical records and paperwork</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• No to minimal barriers</li> </ul>   |
| Email and Computer Usage | <ul style="list-style-type: none"> <li>• No active email account</li> </ul>  | <ul style="list-style-type: none"> <li>• Has active email account</li> <li>• Email account used inconsistently</li> </ul>   | <ul style="list-style-type: none"> <li>• Has an active email account</li> <li>• Email account used regularly                             <ul style="list-style-type: none"> <li>◦ Can access email via multiple devices (cellular device, computer, tablet, etc.)</li> </ul> </li> </ul> |

|                          |  |
|--------------------------|--|
| Healthcare System Inputs | <ul style="list-style-type: none"> <li>• Technology assessment of patient <ul style="list-style-type: none"> <li>○ Identify access barriers</li> <li>○ Provide resources (internal and external) to address barriers</li> </ul> </li> <li>• Technology support <ul style="list-style-type: none"> <li>○ Assistance with setting up email and patient portal accounts</li> <li>○ Support for issues with patient portal accounts</li> <li>○ Provide secure access to device for patients in provider waiting room/lobby/office</li> </ul> </li> </ul>   |
| Developer Inputs         | <ul style="list-style-type: none"> <li>• Integrate accessibility features into patient portal accounts for patients with vision, hearing and other disabilities</li> <li>• Pilot test patient portal platform with patients from different backgrounds (low to high technology and health literacy; patients with vision, hearing, and other disabilities; low to high income; low to high education levels; diverse racial and ethnic backgrounds; diverse age groups; diverse gender/sexuality representation).</li> <li>• Survey potential users from different backgrounds regarding which features may be of most useful</li> </ul> |

### *Type #1*

The first user persona is someone who faces significant barriers to accessing technology and healthcare services. Barriers to healthcare include lack of health insurance which severely limits use of healthcare services due to high out of pocket fees and patients typically do not have a primary care provider. Technology barriers include none to minimal access to devices needed for patient portal usage (e.g. computer, tablet, smart phone) and none to limited access

to Internet. These technology barriers are shaped by structural factors, such as limited finances to purchase devices and pay for Internet services and contribute to low technology literacy and comfort with technology. The absence of an actively used email account is another barrier, which complicates enrollment and usage of patient portal platforms.

### *Type #2*

The second user persona faces some barriers in accessing technology and healthcare services but has more points of access when compared to the first user. Though this user has both health insurance and a primary care provider, their healthcare utilization behaviors are inconsistent due to barriers such as lack of transportation, inability to take time off from work, and medical mistrust. These users have

moderate access to technology including both Internet and personal internet-accessible devices for access to patient portals. However, their device is slow and outdated, which makes checking emails and using patient portals frustrating. Thus, these users tend to prefer printed copies of medical records and other health status updates.

### *Type #3*

The third user persona faces minimal barriers to patient portal use. These users have a trusted primary care provider, as well as reliable health insurance. These users regularly use healthcare services for preventive and/or screening appointments to manage acute and chronic conditions. These users are well

We also provide insights on critical healthcare systems and developer inputs for consideration of a maximally equitable patient portal design. On the healthcare system level, we posit that a technology assessment of patients, including identification of access barriers as well as provision of internal and external resources, should be performed. We also recommend technical support, including assistance with setting up both email and patient portal accounts, support for any issues with patient portal accounts and provision of secure devices for use in the waiting room, lobby, or office. Developer inputs should include integration of accessibility features within patient portal accounts for patients with vision, hearing and other disabilities. Specifically, these features could potentially include simple, effective text enlargement features and high-quality text-to-

adjusted to technology use, with strong internet access and an up-to-date array of Internet-accessible devices (e.g. smartphone, computer, tablet). These users regularly monitor their emails and are open to downloading and using patient portal applications.

speech and voice typing capabilities. We recommend that developers pilot test the patient portal platform among a diverse sample of users, with intentional effort to include the following demographics; those with both low to high technology and health literacy; patients with vision, hearing, and other disabilities; patients with various income levels; patients with various education levels; diverse racial and ethnic backgrounds; diverse age groups and diverse gender/sexuality groups. Potential users from these groups should be surveyed regarding which particular patient portal features (i.e., admission summaries, records access, messaging provider, etc.) would be most useful to them. Centering feedback from a diverse group will allow for an equity-focused approach in the patient portal design.

## **Discussion**

Our work explores the development of equity-oriented user personas for patient portal use. This work intends to serve as a launchpad for development and innovation as digital health moves to the forefront of medical care. The development of user personas provides thoughtful insights of the situational details that may explain trends in patient portal usage. While user personas are unable to directly define the authentic lived experiences of potential users, they are pivotal in ensuring accessibility, diversity and inclusion are well embedded into the design of patient portals.

This study is uniquely informed by patient portal usage studies conducted out of a Mid-Atlantic based medical system, and a scan of the peer reviewed and grey literature. Insights from these sources provided comprehensive data on diverse patient subpopulations and healthcare needs related to technology. Our user personas speak to a multitude of both barriers and facilitators to engaging in patient portals, including access to Internet-accessible devices, insurance status and primary care. We contextualized this further by noting that psychosocial factors such as medical mistrust, inability to take time off of work and digital

hesitancy or frustration in the characterization of these personas. In continued work, we encourage developers, alongside researchers and providers, to be intentional about amplifying the feedback of historically marginalized populations, including people with disabilities, racial and ethnic minorities, and LGBTQIA+ identifying individuals in the early design stages of patient portals. In doing so, patient portals and digital health at-large may evolve to be optimally inclusive and equity oriented.

The limitations of this analysis should be considered in future directions for this work. Our personas could certainly be improved with increased dimensionality to authentically speak to the complexities of health inequity. In future analysis, these user personas should be strengthened through use of driving factors, facilitated dialogue and modeling to extend their reach beyond surface-level variables we have centered, such as race, insurance status and

income level. More dynamic, highly tailored preferences should also be included to make future persona designs maximally engaging, inclusive and rooted in advocacy and equity, including patient's personal care goals, occupational considerations, personality attributes and lived experiences with discrimination that shape a patient's journey in pursuing care. We also note that this work should be further grounded in other elements of innovative strategies for health technology research, including User Experience (UX) and Customer Experience (CX) research strategies. Lastly, these studies were partially informed by an environmental scan, which may not have produced as robust of a basis as a systematic literature review, for example. Future studies should aim to be more systematic in the grounding of literature to ensure that personas have a maximally strong foundation.

## Conclusion

With digital health being increasingly adopted in healthcare, it is critical for inequalities to be considered in the design of tools like patient portals. Our data addresses this need through the development of uniquely informed user personas that highlight the diverse social, technological, and health related

needs that many real patients may resound with. In this, we encourage developers, researchers and providers alike to center health equity in ongoing activities that contribute to the expansion of digital health and medicine.

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## Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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### Statement of Contributions

These authors contributed equally to the writing of this manuscript. Asli McCullers played the primary role in developing this work into a publishable manuscript, and wrote the abstract, background, segments of the "User Persona" section, discussion and conclusion. Naheed Ahmed conceptualized the vision for this paper, and wrote the introduction, methods and segments of the "User Personas" section.

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