The Prospects of Healthcare in Smart Homes

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Introduction

As the world has shown exponential innovation within the computation sector in the last twenty years, researchers are attempting to predict which areas in our daily lives will be impacted the most by the steady integration of modern technology. With the rise of commonly heard devices such as Alexa voice assistants, or Ring doorbells, homeowners are now implementing an increasingly complex ecosystem of the internet of things found within their homes for. Such homes are frequently referred as smart homes. In this paper we will discuss what a smart home is, how it can impact the medical field, as well as the potential security and ethical threats that surround it.

Background

According to Frances K. Aldrich, smart homes can be defined as any "residence equipped with computing and information technology, which anticipates and responds to the needs of the occupants" which can be used to "promote their comfort, convenience, security and entertainment" (Aldrich, 2003). The inception of the term Smart Home was introduced by the American Association of Home Builders in 1984(*A Brief History of Smart Home Automation* 2019). It has gained rapid traction among consumers since then, and "Over 20 billion smart home products are projected to be in use by 2020" (*SMART HOME SECURITY DEVICES MAY BE VULNERABLE TO SMART HACKERS* 2018). Currently, modern smart homes house increasingly complex devices which are interlinked through their local wireless networks. These

devices allow “the user to control functions such as security access to the home, temperature, lighting, and a home theater remotely.” (Hayes, 2021).

Potential Benefits

Many proponents of smart homes advocate its predisposition to immensely improving the medical field through “decentralized healthcare” (Bennett et al., 2017), which can provide a more personalized experience in a timely manner. Through the use of smart accessories and sensors throughout the household, residents are able to access “home care, virtual medical consultancy and the management of residents’ health” (Marikyan et al., 2021). Personal accessories can accurately assess their medical condition and put them in contact with their medical provider or emergency services if the need arises, as seen with current smart home devices such as the Amazon Echo and Alexa, or the Google Home. Furthermore, the “ability to use appliances without fiddling with small buttons and knobs is of great advantage” (Bennett et al., 2017) to patients who are “physically impaired” (Bennett et al., 2017). Overall, decentralized healthcare would reduce the burden on current healthcare facilities, promoting “independent living…and care accessibility for the ageing population” (Marikyan et al., 2021).

Aside from an increase in quality of medical care, patients may also experience simultaneous financial benefits through the implementation of smart devices in their home. As was stated by Bennett et all, smart homes can be a “cost-effective in aiding the elderly and disabled to remain in the home for longer in a non-obtrusive way. This can allow greater independence and quality of life while reducing the chance of social-isolation.” (Bennett et al., 2017). This can be applied

by utilizing smart devices that monitor and reduce unnecessary energy use throughout the house, which can be especially useful to the elderly or patients with mental disabilities. (Marikyan et al., 2019, Balta-Ozkan et al., 2013a)

Legal, ethical issues, and security concerns

As the intention of smart homes is to "gather data from a variety of sources including the environment, the home and the patient themselves." (Bennett et al., 2017) in real time, many patients and homeowners are cautiously hesitant regarding the ethical and security concerns if this data was exploited. As most modern smart homes operate from a centralized data store such as a Google NEST, "apps and devices are able to communicate by reading from or writing to variables in the centralized data store." (*SMART HOME SECURITY DEVICES MAY BE VULNERABLE TO SMART HACKERS* 2018). This presents the possibility that intruders can physically or digitally compromise a "low-integrity product", like a light switch or thermostat, and subsequently gain control of the centralized data store and security devices (*SMART HOME SECURITY DEVICES MAY BE VULNERABLE TO SMART HACKERS* 2018). This not only puts the user's privacy and medical data of the resident at risk, but potentially exposes them to physical danger.

Conclusion

To conclude, I believe that as more smart homes are integrated into the general population, we will see an exponential growth in quality-of-life features helping us with our daily schedule. However, I believe that both the medical sector and patients will see the greatest boons of this

revolutionary technology, as the quality-of-care increases and the medically disabled are still able to live with increased independence.

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