

OMNICHANNEL ADOPTION IN HEALTH INFORMATION SYSTEMS FOR PATIENT FOLLOW-UP

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ABSTRACT

The evolution of technology and health information systems has allowed patients in home-based care to receive continuous medical monitoring without needing to be in-person at the care unit. This evolution discusses many challenges the care provider faces and must overcome. Still, on the other side, it brings many benefits to patients, health professionals, care providers, and society in general. Omnichannel strategy in healthcare services is in its early adoption, but it has the potential to overcome many burdens that care providers currently face regarding remote patient follow-up. This article presents the adoption of an omnichannel strategy in health information systems regarding remote patient follow-up in home-based care. The omnichannel approach can potentially increase the organization's social footprint, as this type of interaction aims to fill the gap between organizations and their peers.

KEYWORDS

Omnichannel in Healthcare; Remote Monitoring; Patient Follow-up; Personalized Care Services; Health Information Systems.

1. INTRODUCTION

Lately, healthcare institutions have increasingly focused on an omnichannel interaction model in the various services they provide to their patients. Thus, this adoption has brought positive gains for both the healthcare institutions that implemented it and the patients who enjoy the new healthcare service without having to be in-person at the care unit to receive it (Burri, 2013). The omnichannel strategy adoption has a huge potential in healthcare services, as it would integrate different channels with different services provided to patients and enable the interaction among patients and health professionals more seamlessly (Annis et al., 2020; Moreira et al., 2020). Furthermore, it can automate the collection process and patient clinical data sharing with health professionals remotely, as mentioned previously, without the patient's physical presence at the care unit. With these processes, the data collected can be sent through different channels to health professionals according to their preferences (Cruz et al., 2014; Oleshchuk and Fensli, 2011).

Remote patient follow-up is a practice that has been increasingly adopted in healthcare, especially in patients with implanted pacemakers and implantable cardioverter defibrillators (ICDs) (Varma et al., 2021; Varma and Ricci, 2013) at home-based care. Although this practice has been practiced for some time, it still has many limitations at a technological and human level, especially regarding patient compliance (Abdolkhani et al., 2019). Until now, all patient health monitoring has been carried out through a single channel. Generally, patients use a body sensor that retrieves the data and shares it with health professionals and care providers (Lupu et al., 2009). Omnichannel interaction intends to present a solution where there is not only one channel of interaction but multiple channels between patients and health professionals, as has been the case until now. This approach specifies several interconnected interaction channels in which patients can choose any of these channels to interact with health professionals (Moreira and Santos, 2020). This is a very recent approach, so

more studies are still needed better to understand its impact on patients and healthcare professionals (Moreira et al., 2021).

Due to the daily workload of health professionals, adopting an omnichannel strategy in health information systems to follow up patients in home-based care can have a significant role in this situation. The omnichannel approach could solve many challenges that health professionals face regarding manual patient monitoring. It will release these health professionals from these manual and exhausting tasks regarding patient monitoring. The patient clinical data collected from the body sensors can be loaded and uploaded through an interaction channel to the care provider, where health professionals will analyze the gathered data and make clinical decisions. Thus, the research question identified in this article is: **To what extent can adopting an omnichannel interaction strategy for remote patient follow-up translate into more effective and efficient communication between patients and healthcare professionals?**

With the research question identified, this article aims to assess the possibility of the existence and implementation of omnichannel interaction solutions for remote patient follow-up and to study the impact that it may have on the communication process between the different actors.

2. BACKGROUND

Omnichannel interaction is an evolution of multichannel interaction. Omnichannel interaction has already been applied in several areas, mainly in retail, marketing, and e-commerce. The fast advancement of technologies and information systems has continuously allowed the appearance of new and innovative models and solutions for omnichannel interaction in healthcare services (Moreira et al., 2020; Moreira and Santos, 2020). An attractive model of multichannel interaction was proposed by Ailton M. (2020), which is based on three different tiers. These tiers are the patient tier, coordination tier, and care provider tier. Each tier has a set of actors/roles in the proposed model (Moreira et al., 2020). Many retail organizations have been developing and improving their omnichannel interaction models to offer a seamless user experience to their customers across all interaction channels without interruption. Besides, several concepts and techniques were adopted from the retail organization as they showed maturity regarding the continuous implementation and customer interaction through multiple interaction channels.

Many authors have presented several solutions to overcome the need for more efficient interaction between patients and health professionals. Still, the solutions that have been proposed are not easy to implement, and most of the time, they did not have the result that was expected, in a way makes these solutions unfeasible (Archip et al., 2016; Prabhakar and Rajaguru, 2017; Varma et al., 2021). On the other hand, the process of implementing the omnichannel interaction strategy in the different health services has been growing at a breakneck pace and with visible results both for the hospitals that implemented this strategy as well as for the patients who started to take advantage of this strategy in their interactions with health professionals. Considering the impact that the multichannel interaction has demonstrated in the healthcare services where they were applied, the same could be used in the interaction between health professionals and patients in home-based care to assess the impact of this strategy in the interaction between them.

3. OMNICHANNEL PATIENT FOLLOW-UP

Several authors present in their article different solutions for remote patient monitoring, which are exclusively based on wearable devices or in-body implantable devices that collect clinical data from patients autonomously and automatically and share this data with health professionals (Cruz et al., 2014; Oleshchuk and Fensli, 2011). This practice brought several benefits as it enabled monitoring patients remotely without physically being in hospital units. On the other hand, several limitations of this practice were also identified regarding technology infrastructure and issues related to the privacy and security of patients' clinical data.

Data collected through patient remote follow-up automatically by body sensors can be sent over multiple channels of interaction on a scheduled basis from the patient's home to health professionals, thus avoiding unnecessary in-person visits to the care provider. This is very convenient for patients and health professionals who monitor these patients. Patient follow-up in home-based care has many challenges that care providers who decide to implement it still need to overcome. Besides, it greatly benefits care providers, health professionals, and patients. Table 1 presents the main challenges and benefits identified regarding remote patient follow-up in home-based care (Abdolkhani et al., 2019; Anwar et al., 2015; Health Services Research, 2011; Hjelm, 2005; Mohammadzadeh and Safdari, 2014; Neslin et al., 2006; Stone et al., 2002; Ventola, 2014).

Table 1 - Challenges and Benefits of Remote Patient Follow-up.

Challenges	Benefits
Channels integration	Reduction of workload of health practitioners
Data standardization and synchronization across different channels	Better quality of data across multiple channels
Data sharing across multiple interaction channel	Autonomous patient clinical data recording
Patients' device battery life	Improve communication among patients and care practitioners
Legacy systems integration in an omnichannel services	Continuous patient health monitoring without in-person appointment
Ethical issues regarding data access	Timely decision making by health practitioners based on data gathered

4. OMNICHANNEL PROCESS

Introducing an omnichannel process in health information systems for home-based care can significantly improve how health practitioners interact with patients by integrating multiple interaction channels with healthcare systems that collect patient clinical data. However, before its implementation, the care provider must first address each of the steps in the omnichannel process. Following the concepts of the retail industry, the same steps can be applied in the healthcare field. Figure 1 shows the omnichannel process presented and its cycle process.

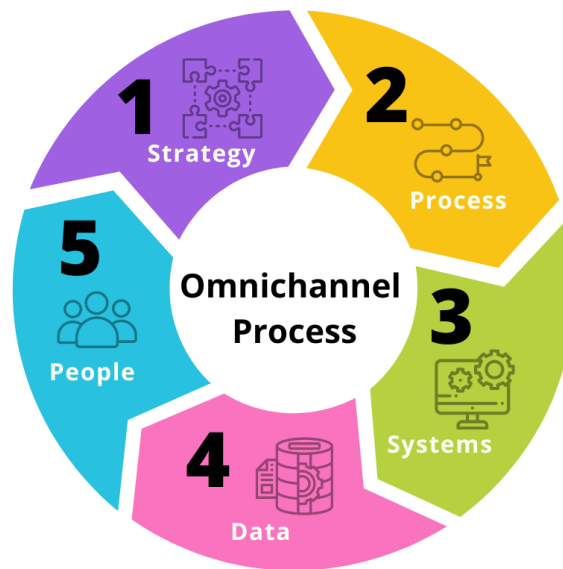


Figure 1 - Omnichannel Process.

To successfully implement the omnichannel strategy, care providers should study and learn from the omnichannel process that the retail industry has implemented. An explanation of each step is provided below (Mike, 2021; Valos, 2009; Vincle, 2019):

- **Strategy** - these are the goals and objectives that care providers aim to achieve with omnichannel implementation. The challenges should also be considered when defining the omnichannel approach.
- **Process** - are all the procedures and workflows for adopting the omnichannel strategy. They must be designed to be adequately proactive instead of reactive.
- **Systems** are all the information and technology necessary to enable an omnichannel strategy. They can make or break the adoption of care providers, whether successful or unsuccessful.
- **Data** - all the clinical data exchanged among different channels and healthcare systems.
- **People** are all the actors that somehow belong to the interaction process. These actors may include patients and their relatives, nurses, physicians, technicians, administrative staff, etc.

Regarding the patient remote follow-up in home-based care, the care provider should define the right strategy with the proper process and systems to get clinical data from patients and share it with health professionals. Successful implementation of the omnichannel strategy in healthcare service still has a long way to go. However, the present omnichannel process aims to help care providers adopt the omnichannel strategy in their activities and make these processes less painful. The following section will briefly discuss omnichannel adoption in health information systems for remote patient follow-up.

5. DISCUSSION

Patients in home-based care need continuous medical follow-up from caregivers. Omnichannel strategy can play an essential role in the interaction between patients in home-based care and health professionals by automatizing the process of collecting clinical data and sending it to care providers, which will be processed and presented to a health professional. Thus, this will reduce the workload on health professionals who do not need to contact the patient to collect patient clinical data manually or move the patient to a caregiver for health professionals to collect the data. The omnichannel adoption in healthcare will give massive relief for health professionals from repetitive tasks and free up the patient from the need to be physically at a care provider so that health professionals can collect their clinical data.

Besides, patients can use any of the channels available to interact continuously with health professionals. Data exchanged across omnichannel interaction is processed before it is presented to health professionals. Thus, with the omnichannel strategy, caregivers will be presented with helpful information to help them in their decision-making process. Figure 2 illustrates the adoption of an omnichannel strategy in healthcare services for remote patient follow-up.

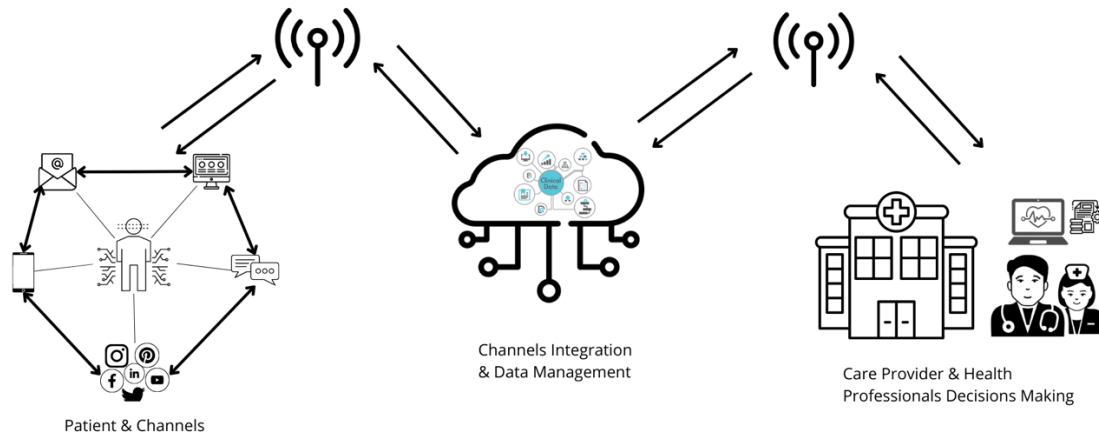


Figure 2 - Omnichannel Interaction in Remote Patient Follow-up.

The omnichannel strategy enables patient monitoring across multiple interaction channels (see Figure 2) and gives care professionals more data and options to analyze the collected data and consequently improve the timing of their clinical decisions.

A SWOT analysis regarding the adoption of omnichannel interaction in healthcare services for remote patient follow-up is presented below (Caldwell, 2021; Cunha et al., 2020; Mohammadzadeh and Safdari, 2014; Rangaswamy and Bruggen, 2005; Ventola, 2014; Wan et al., 2018).

Table 2 - SWOT Analysis of Omnichannel strategy for remote patient follow-up.

Strengths	Weaknesses
Patient clinical data available across multiple channels of interaction	Lack and poor of preparation of health professionals to use new technologies to interact with patients in home-based care
Reduce health professional's workload and tasks	Poor implementation of omnichannel strategy
Increase the quality-of-care services provided to patients in home-based care	Data inconsistency across channel can be a huge problem and can make health professionals decision-making even harder
Opportunities	Threats
Improve interaction among patient and health practitioners	Law and regulation regard patient clinical data
Care practitioners can make timely decision-making based on data available in different channels of interaction	Data security and privacy
Improve the quality of work of health professionals	Third-party entities

Following the analysis provided in Table 2 combined with Figure 2, it seems plausible to affirm that the omnichannel strategy can be a viable solution in remote patient follow-up. Adopting an omnichannel strategy in health information systems for remote patient follow-up can remove many daily burdens that health

professionals face and reduce their workload and tasks regarding patient clinical data collection and interaction. This strategy also brings a new opportunity to health professionals concerning how they can monitor and follow up with patients in home-based care across multiple interaction channels.

Thus, this adoption of omnichannel for remote patient monitoring will allow the patients to be involved and more enrolled in the treatment process. They will feel more confident as they have a direct channel to interact with a health professional to clarify their worries without needing to be a care provider to interact with a health professional. Currently, the omnichannel strategy in health information systems is still in the early adoption in care services, but it has already demonstrated its potential to care provider who adopts it. The impact and potential of this strategy in home-based care monitoring can be even more significant with the adoption. However, further research and maturity of omnichannel solutions will be required to take better advantage of it concerning the interaction and communication between patients and health practitioners.

5.1 Results

This paper presents a more theoretical concept of omnichannel interaction in healthcare services. Still, some previous studies have been carried out on the implications of multichannel interaction in healthcare services. Omnichannel interaction services are an evolution of multichannel interaction services that aim to combine all available channels of interaction in a single touchpoint to present to its users. Several studies are referred to support the work presented in this paper, such as A Conceptual Model for Multichannel Interaction in Healthcare Services and Health Professionals' Decision-Making Based on Multichannel Interaction Services, which are already published and available online. Also, some preliminary studies regarding omnichannel interactions in healthcare services are highly encouraging since they open a new window for patient involvement with health professionals in healthcare services provided to them. Additionally, this kind of interaction has a significant impact on the activity of health professionals as well as resource allocation and management in health institutions, which is a very flattering indication of the impact of an omnichannel approach in health information systems.

6. CONCLUSION

The concepts of omnichannel interaction for health information systems in home-based care for remote patient follow-up presented in this article are a theoretical study of how the omnichannel strategy can be used and impact remote patient follow-up. Besides, the concepts introduced here are still in their very early stage of development and adoption, requiring more studies to assess the different topics proposed and discussed in this article to evaluate the impact of omnichannel interaction health information systems in home-based care with the more practical use case. As stated before, adopting the omnichannel strategy in home-based care still has a long way ahead that must be addressed by researchers and care providers who decide to adopt it. On the other hand, this adoption will bring to discussion more issues that care providers still need to overcome, such as data protection and privacy of patients in home-based care, among many other ethical issues related to omnichannel interaction in general and in the healthcare field. The proposed research question for this article aims to study the viability of omnichannel strategy adoption in health information systems for home-based care and how this approach can contribute to a better and more effective interaction between the different actors involved and society. So far, it has been possible to address and accomplish the proposed research questions. However, more studies should be conducted with practical use cases to address the presented practice and take more lessons from omnichannel in home-based care.

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