

Utilizing the Advances in Digital Health Solutions to Manage Care in Cancer Patients

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ABSTRACT

In recent years, the clinical context for cancer has changed, and it is now characterized by extended survival rates and more diverse and complex cancer trajectories and symptomatology. The changes in the landscape of cancer care also include a shift towards the home setting or the outpatient setting with an increased amount of care being delivered at home or transferred to the patients themselves and their family caregivers. These changes have also impacted the type and amount of information required by the patients and their caregivers as well as the type of

care needs that are to be addressed by health-care professionals. Finally, the transitions within the health-care setting might also create a caring gap that the patient is left to deal with independently or with minimal support. These changes have led to the emergence of innovative digital/technological solutions for supporting patients during their cancer care continuum.

Key words: Digital health, eHealth, information, mHealth, smartphones, symptom burden, technology

What is the New Shape of Cancer Care?

Cancer is considered a chronic condition, which requires long-term commitment by both patients and health-care professionals. Along the cancer care continuum, the patient and the family (often as informal caregivers) are facing many challenges ranging from adapting to the transitions between care settings (e.g., from oncology to palliative care) to the self-management at the home setting. Within the cancer

context, issues such as the transition toward the use of oral agents over intravenous administration can pose great threats to the safety and quality of life of the patients affected by cancer. In any setting, the effective management of such situations relies on the good communication between patients and health-care professionals, and especially at the home setting, this communication needs to take place in real time. This allows for timely and appropriate

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clinical decision-making and intervention.^[1] Issues such as the lack of adherence, the reporting and management of treatment-induced side effects, and real-time assessment of patient-reported outcomes all need to be considered within the patient-centered and patient empowerment frameworks. With reference to the experience of symptoms by cancer patients, it is evident that in their majority, these patients report several symptoms simultaneously.^[2] The presence of concurrent symptoms is called symptom clusters or symptom constellation and within the cancer context is a frequent recorded phenomenon, especially in those patients receiving chemotherapy and/or radiotherapy or those with advanced disease.^[3,4] Due to the concurrent nature of these symptoms, their management becomes more complex whereas its poor management can lead to worsening of the patient's emotional and physical status, poor adherence to treatment, and diminished quality of life.^[5,6] This complex interaction between symptoms within a cluster has been recently demonstrated by a large randomized controlled trial where the mediation analysis showed that there are more than linear correlations between the symptoms of a cluster.^[7] However, regardless of the correlations between the symptoms, what remained consistent was the negative impact of the symptom burden on the patient's perceived quality of life.^[7]

Why Digital Health Solutions Can Help?

Digital health solutions involve the use of telecommunication and virtual technology to deliver health care outside the traditional health-care facilities.^[8] In the same light, Eggersmann^[9] defined eHealth as health services and information delivered or enhanced through the Internet and related technologies.

There are several reasons that can advocate in favor of implementing technological solutions to specific areas of care. The problem of ensuring universal access to care or aftercare (follow-up) can be challenging for certain patient groups, especially those who live in remote and rural areas distant from cancer centers. The disproportional increase of cancer prevalence year on year compared to the relatively limited resources contributes to the problem of providing appropriate care to an increasing number of patients.^[10] The use of technology has the ability to supplement the limited time for patient report and communication within the confines of the ambulatory care and face-to-face visit.^[11] It also holds the potential of real-time communication with the patient and/or family caregiver that allows an immediate assessment and decision-making on appropriate interventions.^[1] An important aspect of cancer care is patient-centeredness and how this can be supported through

the application of technological advances. According to the Institute of Medicine, patient-centered care refers to care that is respectful of and responsive to individual patient preferences, needs, and values,^[12] while within the nursing paradigm, individualized nursing care has been defined as patient perceptions of nurses' activities and being cared for as an individual.^[13] Snyder *et al.*^[14] proposed that there are several ways that technology can support and promote patient-centered care. For example, information technology provides a reciprocal means for a patient to feedback critical information to their carers, including the patient's functioning and well-being (e.g., patient-reported outcomes). Similarly, clinicians can use informatics to integrate the information they learn from patients with their medical knowledge and data resources to improve patient care.^[14] As cancer care is complex, it requires an interdisciplinary team to be involved throughout the cancer continuum. Within this context, health information technologies can offer interdisciplinary teams the opportunity to track and monitor care across the cancer trajectory by allowing for the tracking, follow-up, and coordination of patient tests, referrals, and outside care.^[15]

How Digital Health Solutions Can Help?

There are several innovative ways in which digital health solutions can contribute to the delivery of and improvement of cancer care management. Not all digital health solutions are appropriate or applicable to every group of cancer patients in a one-size-fits-all approach. Furthermore, the characteristics of the disease, the type of symptoms experienced by the patient, their explicit treatment and disease-related needs, and the level of support he or she has are only a few of the elements that need to be considered in the process of choosing the most appropriate digital health solution.

In recent years, wearable health technology such as fitness bands (i.e., utilizing actigraphy) have become increasingly popular. Their popularity has given the opportunity to utilize some of their applications as tools to promote healthier behaviors. Furthermore, fitness bands can also be used as part of an overall management strategy for specific aspects of the care. For example, their ability to provide real-time measurements of patients' heart rate, blood pressure, and body temperature and also to track sleep patterns and activity levels has been utilized in the monitoring of the patient (as performance status), especially between follow-up periods.^[16]

The use of virtual environments through immersive or augmented virtual reality (VR) has several applications in the management of cancer within the hospital and the

home setting. For example, Høybye *et al.*^[17] utilized virtual environments to engage adolescent and young adult cancer patients and increase their adherence to treatment. VR has also been used as a tool to enhance symptom management, for symptoms such as pain and anxiety as a distraction method. For example, Sander Wint *et al.*^[18] investigated VR use during lumbar puncture with a sample of 30 adolescents (aged 10–19 years). Their results showed lower pain scores in the VR group; however, differences were not statistically significant.

Information and communications technology-based solutions utilize mobile devices, platforms, and applications (mHealth) and have a wide range of applications including assisting with self-management, delivering real-time data on a patient's health condition to both the patient and caregivers, and storing personal health information in an easily accessible format. McCann *et al.*,^[19] for example, utilized a mobile phone-based questionnaire for reporting symptoms when receiving chemotherapy for colorectal, lung, or breast cancer. The intervention showed improved symptom management and communication between patients and health-care professionals while the patients felt a sense of safety in relation to the management of their symptoms.

What Are Some of the Threats of Utilizing Technology within Health Care?

Despite the many advantages that digital health solutions bring to the management of cancer care, they also have several limitations that should also be considered. For example, while informatics can facilitate the availability of important information, information technology can also increase bureaucracy, contribute to dehumanization, and interfere with health-care provider–patient relationships.^[14] Furthermore, not all digital health solutions appropriate for all the groups of patients. For example, VR applications are not appropriate to be used by patients with a history of seizures or brain tumors. Furthermore, smartphone applications might be challenging in specific subgroups such as elderly patients with digital literacy.

Conclusion

Digital health has transformed the traditional health-care system, where the patriarchal hierarchy of traditional medicine has been disrupted by empowered patients who have previously unmet needs. Digital health is not a transformation only occurring within the health-care context but one that also affects many other aspects of people's lives. As such, it creates a new way of approaching

health care where patients' right and autonomy, shared decision-making, getting more access to information, and technologies are now considered standards of care.

The paper has demonstrated the great potential of digital health solutions toward promoting and managing cancer care within a patient-centeredness framework. These can be achieved in different contexts by providing better access to health information and health services, improved patient care and safety, greater coordination of care, and more empowered patients.

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Conflicts of interest

There are no conflicts of interest.

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