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IoT-Driven Innovations in Psychosocial Care for Breast Cancer Survivors - A Review

Wuraola Foluke OWOLABI[1], Olufunke Agatha OGUNKORODE[1], Oluwaseyi Abiodun AKPOR[1], Sunday Adeniran AFOLALU[2,3]

[1]*Faculty of Nursing Sciences, Afe Babalola University, Ado Ekiti, Nigeria*
wuraowolabi01@gmail.com/ogunkorodeao@abuad.edu.ng/akporoa@abuad.edu.ng

[2]*Department of Mechanical Engineering, Afe Babalola University, Ado-Ekiti, Nigeria*
adeniran.afolalu@abuad.edu.ng

[3]*Department of Mechanical Engineering Science University of Johannesburg, South Africa*
adeniran.afolalu@abuad.edu.ng

Corresponding Author: wuraowolabi01@gmail.com +234 8067151600
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Abstract: *Internet of Things (IoT) technologies are developing at a rapid pace, which could greatly improve the psychosocial support provided to breast cancer survivors. The intersection of Internet of Things (IoT) technologies and psychosocial care represents a transformative avenue for improving the quality of life of breast cancer survivors. This review explores recent advancements in IoT applications in psychosocial care, focusing on their role in addressing emotional, psychological, and social challenges faced by survivors. The discussion encompasses IoT-enabled wearable devices, mobile health applications, and smart environments that facilitate remote monitoring, real-time interventions, and personalized support. Challenges and future research directions are also examined to guide stakeholders in leveraging IoT innovations for holistic care. This also explores the integration of IoT innovations in addressing the unique psychosocial challenges faced by these individuals. By examining existing literature and case studies, we identify key areas where IoT can facilitate improved mental health support, enhance communication between patients and healthcare providers, and promote a sense of community among survivors. The findings suggest that IoT-driven solutions can lead to better health outcomes and quality of life for breast cancer survivors.*

Keywords: *IoT, Psychosocial, Care, Breast, Cancer, Survivors*

1. INTRODUCTION

Breast cancer is one of the most prevalent forms of cancer affecting women worldwide, with an estimated 2.3 million new cases diagnosed in 2020 alone [1]. Advances in early detection and treatment have significantly increased survival rates, with the five-year survival rate now exceeding 90% for localized breast cancer [2]. Different therapy are needed for different forms of BC. The primary strategy for lowering the death rates of breast cancer is early diagnosis, even though contemporary therapeutic options like immunotherapy or targeted therapy are also utilized, even though surgery, radiation, and chemotherapy are some of the most often used techniques for treating patients with the disease. It is commonly known that the 5-year survival rate for patients with BC in its early stages is approximately 99% [3]. Early diagnosis also refers to the identification of cancerous cells before they spread to other organs, lymph nodes, or the lungs. Breast cancer can be detected early via a physical examination, ultrasound, X-ray mammography, magnetic resonance imaging (MRI), lab results, or biopsy.

Breast cancer survivors often face enduring psychosocial challenges, including anxiety, depression, and social isolation, which affect their quality of life [3]. With the advent of IoT, healthcare delivery has transitioned towards more patient-centric models, offering novel solutions to these challenges. IoT's potential to connect devices, collect data, and provide real-time feedback creates opportunities to enhance psychosocial care by enabling continuous support and monitoring [4].

However, despite these advancements, breast cancer survivors often face a myriad of psychosocial challenges that can persist long after treatment has concluded [4,5]. Issues such as anxiety, depression, and social isolation are common among survivors, highlighting the need for innovative approaches to psychosocial care [6, 7].

The Internet of Things (IoT) refers to the interconnected network of devices that can collect and exchange data through the internet. With expanding adoption and use of Internet of Things (IoT) technologies across a number of industries, including healthcare, manufacturing, transportation, and agriculture [8]. With the aid of Internet of Things (IoT) technology, it is already recognized that solutions must be found to reduce the burden on healthcare systems while

preserving the delivery of high-quality healthcare [9-11]. IoT technologies are still in their infancy when it comes to healthcare, but their potential for use in a variety of medical contexts has grown in importance [12]. For example, even prior to the pandemic, healthcare systems around the world had difficulty offering patients high-quality care, and medical professionals were searching for ways to reduce the costs of the aging population and the rise in chronic illnesses [12]. This technology has the potential to revolutionize healthcare by facilitating real-time monitoring and communication between patients, healthcare providers, and caregivers [13]. In the context of psychosocial care for breast cancer survivors, IoT-driven innovations can address the unique challenges these individuals face, providing tailored support and enhancing overall well-being.

As shown in Table 1, research indicates that breast cancer survivors experience high levels of psychological distress such as anxiety and depression. Some studies also reported that up to 35% of survivor's experience clinically significant levels of anxiety and depression [14, 15]. The emotional toll of a breast cancer diagnosis can lead to feelings of isolation and a diminished sense of self-worth [16]. Traditional psychosocial interventions, such as support groups and counseling, are beneficial but may not always be accessible or sufficient [17]. This gap in care underscores the importance of leveraging technology to enhance psychosocial support.

Table 1: Depression and anxiety in patients with breast cancer [18]

Time	Anxiety		Depression	
	Mean (SD)	Number (%)	Mean (SD)	Number (%)
Before chemotherapy	6.0 (3.6)	91 (31.4)	4.6 (3.6)	58 (20.0)
After 2 cycles of chemotherapy	5.7 (3.5)	84 (29.0)	5.1 (3.8)	73 (25.2)
After completion of chemotherapy	5.8 (3.6)	85 (29.3)	4.9 (3.6)	72 (24.8)

IoT technologies offer several advantages that can address these gaps. Wearable devices can monitor physiological and emotional states, providing healthcare providers with valuable data to inform interventions [19]. Mobile applications designed specifically for breast cancer survivors can facilitate peer support, symptom tracking, and access to mental health resources [20]. Furthermore, telehealth solutions enable virtual consultations, ensuring that survivors can connect with mental health professionals without geographical constraints [21].

The integration of IoT in psychosocial care not only enhances communication and monitoring but also fosters a sense of community among survivors. Online platforms can connect individuals with shared experiences, reducing feelings of loneliness and promoting emotional well-being [22]. This holistic approach to care can lead to improved health outcomes and quality of life for breast cancer survivors, as evidenced by multiple studies demonstrating the effectiveness of technology-driven interventions [23, 24].

In summary, the psychosocial challenges faced by breast cancer survivors are significant and often require innovative solutions. The integration of IoT technologies into psychosocial care presents a promising avenue for addressing these challenges and improving the overall well-being of survivors. This paper reviews the current literature on IoT-driven innovations in psychosocial care, highlighting successful interventions and identifying areas for future research.

2. IOT-DRIVEN SOLUTIONS FOR PSYCHOSOCIAL CARE

The incorporation of Internet of Things (IoT) technologies into psychosocial care represents a groundbreaking approach to addressing the complex emotional and social challenges faced by individuals, particularly those dealing with chronic illnesses such as breast cancer. As patients navigate the emotional landscape post-diagnosis and treatment, IoT-driven solutions can offer innovative support mechanisms that enhance mental health, facilitate communication, and foster community engagement. This section explores the various IoT-driven solutions that are reshaping psychosocial care, focusing on their applications, benefits, and potential challenges. IoT Applications in Psychosocial Care. The integration of Internet of Things (IoT) technologies into psychosocial care offers innovative avenues to enhance communication and support for individuals facing emotional and social challenges. IoT-driven solutions designed to foster better connectivity among patients, caregivers, and healthcare professionals [19]. By leveraging wearable devices, mobile health applications, and smart communication platforms, IoT enables real-time monitoring, tailored interventions, and seamless interactions. Psychosocial care is critical for individuals coping with mental health issues, chronic illnesses, or post-treatment recovery. Effective communication and support are essential components of this care IoT technologies have emerged as transformative tools in healthcare, facilitating continuous connectivity and interaction [22].

2.1 Enhancing Communication and Support

Effective communication is crucial in psychosocial care, particularly for individuals who may feel isolated due to their health conditions. IoT technologies facilitate seamless communication between patients and healthcare providers through telehealth platforms and mobile applications. These tools enable virtual consultations, allowing patients to access mental health professionals from their homes, which is essential for those with mobility issues or in remote areas [25]. Moreover,

IoT applications can provide reminders for medication adherence, therapy appointments, and self-care activities, thereby enhancing the overall support system for patients [13].

2.2 Mobile Applications for Mental Health

Mobile applications specifically designed for psychosocial support can serve as a vital resource for breast cancer survivors. Mobile applications integrated with IoT systems offer platforms for psychosocial support, including mindfulness exercises, cognitive-behavioural therapy modules, and peer support networks [20]. Apps like My Breast Cancer Journey provide tailored content and reminders to encourage adherence to psychosocial care plans. These apps often include features such as symptom tracking, mood monitoring, and access to educational resources about coping strategies [20]. For instance, applications that facilitate peer support networks allow survivors to connect with others who share similar experiences, fostering a sense of community and reducing feelings of loneliness [22]. The ability to share experiences and coping strategies can significantly enhance emotional well-being and resilience among survivors.

2.3 Personalized Interventions

IoT technologies enable personalized care plans tailored to the unique needs of each patient. By collecting and analysing data from wearable devices and mobile applications, healthcare providers can gain insights into patients' emotional and physical states, allowing for targeted interventions [19]. For example, wearables that monitor physiological parameters such as heart rate variability can provide real-time feedback on stress levels, prompting timely interventions from healthcare providers [26]. This data-driven approach ensures that care is not only reactive but also proactive, addressing issues before they escalate into more significant problems.

2.4 Behavioural Health Monitoring

The ability to monitor behavioral health through IoT devices is another significant advancement in psychosocial care. Wearable devices can track indicators of mental health, such as sleep patterns and physical activity levels, which are closely linked to emotional well-being [27]. By understanding these patterns, healthcare providers can develop comprehensive care plans that address both physical and mental health needs, ultimately leading to improved outcomes.

2.5 Community Engagement and Support Networks

IoT-driven solutions foster community engagement by creating platforms for social interaction among patients. Online forums and social media groups can be enhanced through IoT applications, providing survivors with opportunities to share their stories, experiences, and coping strategies in real time [23]. This sense ofbelonging is critical in mitigating feelings of isolation and enhancing emotional resilience. Studies have shown that individuals who engage in peer support networks report higher levels of emotional well-being and satisfaction with their care [5].

2.6 Virtual Support Groups

Virtual support groups facilitated by IoT technologies can offer a safe space for individuals to discuss their feelings and experiences related to their health challenges. These groups can be structured to include guided discussions, expert-led sessions, and peer-to-peer interactions, providing a comprehensive support system for participants [24]. The flexibility of virtual meetings allows more individuals to participate, thereby expanding access to psychosocial support.

3. THE ROLE OF IOT IN HEALTHCARE

The benefits of IoT in different industries are numerous, and the healthcare industry is no exception. Figure 1 shows the advantages of IoT in healthcare sector Here are some of the top advantages of IoT in healthcare.

Figure 1: Advantages of IoT in healthcare sector [28]

3.1 Simultaneous Reporting and Monitoring

According to the report of Research and Markets, the projected growth of the Global RPM (Remote Patient Monitoring) systems market to over $175.2 billion by 2027 indicates that there is a significant and growing demand for remote patient monitoring technologies. Here below in Figure 2 shows the global remote patient – monitoring market trend

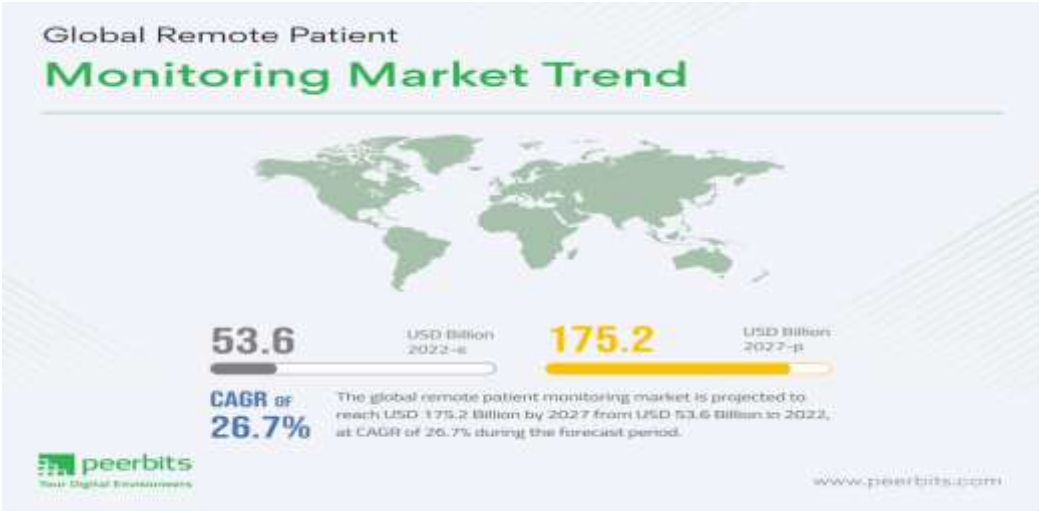

Figure 2: Global remote patient monitoring market trend [28]

Remote health monitoring via connected devices can save lives in the event of a medical emergency like heart failure, diabetes, asthma attacks, etc. Real-time health condition monitoring is possible through smart medical devices that are connected to smartphone apps. These devices can gather medical and other necessary health data and use the smartphone's data connection to send the information to a cloud platform or a doctor. According to a study from the Centre of Connected Health Policy, remote patient monitoring of heart failure patients reduced the 30-day readmission rate by 50%. Blood pressure, oxygen and blood sugar levels, weight, and ECGs are among the health data that the Internet of Things gathers and transmits. These data are saved on the cloud and can be shared with a designated individual, such as a doctor, your insurance provider, a collaborating health organization, or an outside consultant, so that they can view the information gathered from any location, at any time, or on any device.

3.2 End-to-End Connectivity and Affordability

Next-generation healthcare facilities, healthcare mobility solutions, and other innovative IoT technologies can all help IoT automate the patient care workflow. IoT in the form of data transportation, information interchange, artificial intelligence, and machine-to-machine connectivity makes effective healthcare service delivery possible. Connectivity protocols: With the use of Bluetooth LE, Wi-Fi, Z-wave, ZigBee, and other contemporary protocols, medical professionals can improve their ability to identify patients' conditions and develop ground-breaking treatments for a variety of medical specialties. Consequently, by reducing unnecessary visits, employing higher-quality resources, and enhancing allocation and planning, a technology-driven setup lowers healthcare costs.

3.3 Data Assortment and Analysis

A healthcare device's real-time application sends many data in a short period, making it difficult to store and manage if cloud access is not available. It is difficult, even for medical professionals, to gather data from many sources and equipment and manually analyze it. IoT devices eliminate the need to keep raw data by gathering, reporting, and analysing information in real time. All of this can take place overcloud, and the providers will only be able to view the final reports that include graphs. Additionally, healthcare operations give firms access to critical healthcare analytics and data-driven insights that reduce error rates and expedite decision-making.

3.4 Tracking and Alerts

Being on time is essential while dealing with chronic diseases. Using mobile apps and smart sensors, medical IoT devices collect vital indicators of any illness and provide the information to physicians for real-time tracking. They also notify people about important components.

Regardless of location or time, reports and notifications provide a definitive assessment of a patient's condition. Figure 3 shows the tracking and alert system, It also aids medical professionals in making informed choices and delivering timely care. As a result, IoT makes real-time alerting, tracking, and monitoring possible, which allows for hands-on treatments, increased accuracy, appropriate medical intervention, and better overall patient care delivery outcomes.

Figure 3: Tracking and alert system [28]

3.5 Remote Medical Assistance

Patients can use a smart smartphone app to contact a doctor who is many kilometres away in case of an emergency. Healthcare professionals can quickly assess patients and diagnose conditions while on the go, thanks to mobile solutions. Furthermore, many IoT-based healthcare delivery chains intend to construct devices that may disperse medications based on patient prescriptions and condition-related data that is accessible through connected gadgets. IoT will enhance hospital patient care. As a result, people's healthcare costs will decrease.

3.6 Research

Research can also be conducted using IoT healthcare apps. The reason behind this is that, thanks to IoT, we are able to gather a vast amount of data regarding the patient's condition that would have taken years to gather manually. Medical research can be supported by statistical analysis of the data thus gathered. As a result, IoT not only saves time but also money that would otherwise be spent on research. As a result, IoT has a significant influence on medical research. It makes it possible to introduce more extensive and advanced medical treatments. Numerous devices that improve the standard of healthcare services people receive use the Internet of Things. IoT is now updating even existing devices by simply using embedded chips of smart hospital devices. This chip enhances the assistance and care that a patient requires.

4. PSYCHOSOCIAL CHALLENGES FACED BY BREAST CANCER SURVIVORS

Breast cancer survivors encounter a range of psychosocial challenges that can significantly influence their quality of life and overall well-being. While advancements in early detection and treatment have led to increased survival rates, many survivors face ongoing emotional, social, and psychological issues long after their medical treatment has concluded [4; 5]. Understanding these challenges is crucial for healthcare providers to develop effective interventions that address the unique needs of this population.

Psychological distress is one of the most significant challenges faced by breast cancer survivors. Studies indicate that many survivors experience high levels of anxiety and depression, with estimates suggesting that up to 35% of individuals report clinically significant symptoms [14, 15]. The fear of cancer recurrence is a prevalent concern, leading to heightened anxiety that can persist for years after treatment [16]. Survivors may also grapple with feelings of helplessness and loss of control, contributing to emotional distress [7].

Changes in body image are common among breast cancer survivors, particularly for those who undergo mastectomy or other types of surgery [7]. These physical changes can lead to a diminished sense of self-worth and lower self-esteem, impacting interpersonal relationships and social interactions [17]. Survivors often report feeling less attractive or feminine, which can exacerbate feelings of isolation and contribute to mental health issues [4].

Social isolation is a significant psychosocial challenge for breast cancer survivors. Following treatment, many individuals find it difficult to reintegrate into their social circles, leading to feelings of loneliness and disconnection [6]. The stigma associated with cancer and the perception that others do not understand their experiences can further isolate survivors [15]. This lack of social support can negatively impact mental health, making it essential to foster community connections and peer support among survivors [5].

The emotional toll of a breast cancer diagnosis can strain personal relationships, including those with partners, family members, and friends. Survivors may experience shifts in dynamics as loved ones struggle to cope with the implications of the diagnosis [17]. Partners may feel overwhelmed by the caregiving role, while survivors may become increasingly dependent on their loved ones, leading to feelings of guilt and frustration [20]. Open communication and support are critical in navigating these challenges and maintaining healthy relationships.

Breast cancer treatment often leads to disruptions in employment, which can create additional stress for survivors. Many individuals face challenges in returning to work due to physical limitations, fatigue, or lingering psychological issues [4]. The financial burden of treatment and potential loss of income can exacerbate anxiety and stress, impacting overall quality of life [14]. Addressing these financial concerns is crucial for supporting survivors during their recovery.

5. FUTURE DIRECTIONS IN PSYCHOSOCIAL CARE FOR BREAST CANCER SURVIVORS

As the landscape of healthcare continues to evolve, particularly in the realm of cancer care, it is essential to explore future directions in psychosocial support for breast cancer survivors. With advancements in technology, an increasing focus on holistic care, and a growing recognition of the importance of mental health, several key areas warrant attention. This section outlines potential future directions that can enhance psychosocial care for breast cancer survivors, emphasizing the integration of innovative strategies, interdisciplinary collaboration, and patient-centred approaches.

The integration of technology, particularly digital health solutions, holds significant promise for enhancing psychosocial support for breast cancer survivors. Mobile health applications, online support groups, and telehealth services can provide survivors with accessible resources and real-time support [25]. Future developments could focus on creating personalized apps that offer tailored coping strategies, access to mental health professionals, and opportunities for peer engagement [22]. Additionally, artificial intelligence (AI) could play a role in identifying individuals at risk for psychological distress, enabling proactive interventions.

Emerging technologies such as virtual reality (VR) and augmented reality (AR) can revolutionize psychosocial care by providing immersive therapeutic experiences. For example, VR can facilitate relaxation and stress reduction through guided imagery and mindfulness practices, helping survivors manage anxiety and improve emotional well-being [29]. AR applications could enhance patient education by providing visualizations of treatment processes and recovery, thereby reducing the uncertainty and fear associated with cancer. Future psychosocial care for breast cancer survivors should prioritize holistic and interdisciplinary approaches that address the physical, emotional, and social dimensions of health. Collaborations among oncologists, psychologists, social workers, and nutritionists can create comprehensive care plans that encompass all aspects of a survivor's life [17]. Integrating complementary therapies, such as yoga, art therapy, and nutrition counseling, can further enhance overall well-being and resilience [23]. Addressing the unique psychosocial needs of minority and underserved populations is essential for equitable care. Future initiatives should focus on understanding the cultural, economic, and social factors that impact these groups, ensuring that interventions are culturally sensitive and accessible [6]. Community-based programs and outreach efforts can help bridge gaps in care and provide tailored support to those who may face additional barriers to accessing psychosocial resources.

As survival rates for breast cancer continue to improve, there is a growing need to address the long-term psychosocial challenges faced by survivors. Future research should focus on understanding the unique experiences of long-term survivors, including the impact of late effects of treatment, the fear of recurrence, and the transition to survivorship [5]. Developing targeted interventions that support long-term emotional health and quality of life will be crucial in this evolving landscape.

Training healthcare providers to recognize and address psychosocial issues is vital for improving care for breast cancer survivors. Future educational initiatives should emphasize the importance of mental health in cancer care, equipping providers with the skills to screen for psychological distress and connect patients with appropriate resources [4]. Incorporating psychosocial care into routine oncology practice can foster a supportive environment for survivors.

6. CONCLUSION

The future of psychosocial care for breast cancer survivors is poised for transformative advancements that prioritize emotional, social, and psychological well-being. By integrating innovative technologies such as mobile health applications, virtual and augmented reality, and telehealth services, healthcare providers can enhance accessibility and personalization in support systems. Emphasizing holistic and interdisciplinary approaches will allow for comprehensive care that addresses the multifaceted challenges faced by survivors. Moreover, focusing on minority and underserved populations ensures equitable access to resources, while long-term survivorship initiatives will address the ongoing emotional challenges that many survivors encounter. Training healthcare providers to recognize and respond to psychosocial issues is crucial for fostering a supportive environment that promotes resilience and recovery.

As we look to the future, prioritizing psychosocial care as a core component of breast cancer treatment will significantly improve the quality of life for survivors, helping them navigate the complexities of their journey with enhanced support and understanding.

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REFERENCES

[1] Sung, H., Ferlay, J., Siegel, R. L., Laversanne, M., Soerjomataram, I., Jemal, A., & Bray, F. (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a cancer journal for clinicians, 71(3), 209-249.

[2] Wang R, Zhu Y, Liu X, Liao X, He J, & Niu L. (2019) The clinicopathological features and survival outcomes of patients with different metastatic sites in stage IV breast cancer BMC Cancer, 19 (1), 1-12
[3] Meyerowitz, B. E., & Chaiken, S. (1987). The effect of message framing on breast self-examination attitudes, intentions, and behavior. Journal of personality and social psychology, 52(3), 500.
[4] Abrahams, H. J. G., Gielissen, M. F. M., Verhagen, C. A. H. H. V. M., & Knoop, H. (2018). The relationship of fatigue in breast cancer survivors with quality of life and factors to address in psychological interventions: a systematic review. Clinical psychology review, 63, 1-11.
[5] Burgess, C., Cornelius, V., Love, S., Graham, J., Richards, M., & Ramirez, A. (2005). Depression and anxiety in women with early breast cancer: five year observational cohort study. Bmj, 330(7493), 702.
[6] Fobair, P., Stewart, S. L., Chang, S., D'Onofrio, C., Banks, P. J., & Bloom, J. R. (2006). Body image and sexual problems in young women with breast cancer. *Psycho-Oncology: Journal of the Psychological, Social and Behavioral Dimensions of Cancer*, *15*(7), 579-594.
[7] Fan YJ, Yin YH, Xu LD, Zeng Y, & Wu F. (2014), IoT-based smart rehabilitation system. IEEE Trans. Ind. Informat, 10(2), 1568–1577. doi: 10.1109/TII.2014.2302583.
[8] Gope P, Hwang T. BSN-care (2016): A secure IoT-based modern healthcare system using body sensor network. IEEE Sensors J 16(5):1368–1376. doi: 10.1109/JSEN.2015.2502401.
[9] Pradhan B, Bhattacharyya S, Pal K. (2021), IoT-based applications in Healthcare Devices. Journal of Healthcare Engineering. 2021:6632599. doi: 10.1155/2
[10] Yin Y, Zeng Y, Chen X, Fan Y. The Internet of Things in healthcare: An overview. J. Ind. Inf. Integr. 2016(1):3–13. doi: 10.1016/j.jii.2016.03.00.
[11] Baker, S.B., Xiang W., Atkinson I. (2017), Internet of Things for Smart healthcare: Technologies, Challenges, and Opportunities. IEEE Access. 5, 26521–26544. doi: 10.1109/ACCESS.2017.2775180.
[12] Kumar, A., & Singh, M. (2020). Challenges and opportunities in IoT in healthcare. Health Information Science and Systems, 8(1), 1-10.
[13] Zabora, J., BrintzenhofeSzoc, K., Curbow, B., Hooker, C., & Piantadosi, S. (2001). The prevalence of psychological distress by cancer site. Psycho‐oncology: journal of the psychological, social and behavioral dimensions of Cancer, 10(1), 19-28.
[14] Helgeson, V. S., Snyder, P., & Seltman, H. (2004). Psychological and physical adjustment to breast cancer over 4 years: identifying distinct trajectories of change. Health Psychology, 23(1), 3.
[15] Al-Azri, M., Al-Awisi, H., Al-Rasbi, S., El-Shafie, K., Al-Hinai, M., Al-Habsi, H., & Al-Moundhri, M. (2014). Psychosocial impact of breast cancer diagnosis among Omani women. Oman medical journal, 29(6), 437
[16] Steginga, S. K., Campbell, A., Ferguson, M., Beeden, A., Walls, M., Cairns, W., & Dunn, J. (2008). Socio‐demographic, psychosocial and attitudinal predictors of help seeking after cancer diagnosis. Psycho‐Oncology: Journal of the Psychological, Social and Behavioral Dimensions of Cancer, 17(10), 997-1005.
[17] Lan, B., Lv, D., Yang, M., Sun, X., Zhang, L., & Ma, F. (2022). Psychological distress and quality of life in Chinese early-stage breast cancer patients throughout chemotherapy. Journal of the National Cancer Center, 2(3), 155-161
[18] Powell, L., Parker, J., Martyn St-James, M., & Mawson, S. (2016). The effectiveness of lower-limb wearable technology for improving activity and participation in adult stroke survivors: a systematic review. Journal of medical Internet research, 18(10), 259
[19] Badr, H., Carmack, C. L., & Diefenbach, M. A. (2015). Psychosocial interventions for patients and caregivers in the age of new communication technologies: opportunities and challenges in cancer care. Journal of health communication, 20(3), 328-342.
[20] Chung, E. M., Demurchyan, A., Lu, D. J., Nguyen, A. T., Anderson, E., Atkins, K. M., & Kamrava, M. (2021). Telehealth for cancer care during COVID-19: patient satisfaction trends over time. International Journal of Radiation Oncology, Biology, Physics, 111(3), S66-S67.
[21] Tsuji, T., Kanamori, S., Miyaguni, Y., Hanazato, M., & Kondo, K. (2019). Community-level sports group participation and the risk of cognitive impairment. Medicine and science in sports and exercise, 51(11), 2217.
[22] Vogel, R. I., Niendorf, K., Lee, H., Petzel, S., Lee, H. Y., & Geller, M. A. (2018). A qualitative study of barriers to genetic counseling and potential for mobile technology education among women with ovarian cancer. Hereditary cancer in clinical practice, 16, 1-7
[23] Morris, B. B., Rossi, B., & Fuemmeler, B. (2022). The role of digital health technology in rural cancer care delivery: a systematic review. *The Journal of Rural Health*, *38*(3), 493-511.
[24] Madduri, S., Chowdhary, R., & Reddy, S. S. (2020). Telehealth adoption among endocrinologists during the COVID-19 pandemic. Endocrine Practice, 26(8), 846-856
[25] Malasinghe, L. P., Ramzan, N., & Dahal, K. (2019). Remote patient monitoring: a comprehensive study. Journal of Ambient Intelligence and Humanized Computing, 10, 57-76.
[26] Lu, L., Zhang, J., Xie, Y., Gao, F., Xu, S., Wu, X., & Ye, Z. (2020). Wearable health devices in health care: narrative systematic review. JMIR mHealth and uHealth, 8(11), 18907.

[27] Zambotti, M., Yuksel, D., Kiss, O., Barresi, G., Arra, N., Volpe, L. & Baker, F. C. (2022). A virtual reality-based mind–body approach to downregulate psychophysiological arousal in adolescent insomnia. Digital Health, 8, 20552076221107887.
[28] Kaur, P., Kumar, R., & Kumar, M. (2019). A healthcare monitoring system using random forest and internet of things (IoT). *Multimedia Tools and Applications*, *78*, 19905-19916.
[29] Bashshur, R. L., Krupinski, E. A., Thrall, J. H., & Bashshur, N. (2016). The empirical foundations of teleradiology and related applications: a review of the evidence. *Telemedicine and e-Health*, *22*(11), 868-898.
[30] Gonzalez-Usach, R., Yacchirema, D., Julian, M., & Palau, C. E. (2019). Interoperability in IoT. In *Handbook of research on big data and the IoT* 4(5), 149-173)