ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL

A MOBILE APPLICATION DESIGN OF CANCER FOLLOW-UP CARE FOR BREAST CANCER SURVIVORS

M.Sc. THESIS

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ

MEME KANSERİNDEN MÜCADELEDE TEDAVİ SONRASI TAKİP BAKIMI İÇİN BİR MOBİL UYGULAMA TASARIMI

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Hossein POURGHAEMI ANBARDAN, a M.Sc. student of ITU Graduate School student ID 403181013 successfully defended the thesis entitled "A MOBILE APPLICATION DESIGN OF CANCER FOLLOW-UP CARE   FOR BREAST CANCER SURVIVORS", which he/she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

Thesis Advisor :   **Prof. Dr. Hatice CAMGÖZ AKDAĞ**   ....
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....

Date of Submission :
Date of Defense :

To my father,

FOREWORD

I would like to sincerely thank my thesis adviser, Prof. Dr. Hatice CAMGÖZ AKDAĞ for her guidance and support throughout this study. I wish to also thank my parents, sisters, brother, and friends for their love and understanding throughout my life.

Hossein POURGHAEMI ANBARDAN

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ABBREVIATIONS

ER-	**:**	Estrogen Negative
ER+	**:**	Estrogen Positive
ER/PR+	**:**	Estrogen /progesterone Positive (
ET	**:**	Endocrine Therapy
CA15-3	**:**	Antigen 15-3
CEA	**:**	Carcinoembryonic Antigen
DCIS	**:**	Ductal Carcinoma in Situ
ASCO	**:**	American Society of Clinical Oncology
AGO	**:**	Independent Gynecological Oncology Group
ESMO	**:**	European Society for Medical Oncology
MBI	**:**	Body Mass Index

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A MOBILE APPLICATION DESIGN OF CANCER FOLLOW-UP CARE FOR BREAST CANCER SURVIVORS

SUMMARY

In this thesis a mobile application is designed, to help breast cancer survivors with the cancer follow-up care. One of important challenges of the breast cancer survivors is to track follow-up appointments; such appointments aim to provide medical and psychological support after the breast cancer treatment. There are few advance digital solutions to document and track follow-up care of breast cancer survivors, but it is worth noting that, such systems are designed for professionals and care providers. To the best of our knowledge, there is no digital solution that can be used by patients at this time.

Facilitating the follow-up care and motivating the breast cancer patients to continue their treatment is the main aim of this work. The mobile application designed in this thesis, generates a default follow-up care plan based on the latest literature, allows user to set Manuel follow-up appointments, allows to document and share complaints, and helps to track her lifestyle habits and interventions. Presenting push notification about upcoming appointment helps user to continue the follow-up and make progress as planned. On the other hand, information gathered from users in long term will be a reliable data to forecast best possible follow-up care plan of new breast cancer survivors in the future.

As this application is designed for non-professionals who usually have very limited knowledge of medical terms, it is tried to use simple questions instead of medical terms. Furthermore, by employing simple design elements like, checkbox and drop-down menus, a simple and easy to use application is provided.

In order to evaluate the usability of the application and elicit suggestions and improvement ideas, two semi-structured and independent interviews with medical oncologists were conducted. Interview conducted in two parts: first, a brief explanation about the application, its users and possible benefits for the breast cancer survivors provided, then interviewees were asked to focus on the information gathered from users and provide their improvement ideas. Each interview lasted approximately 30 minutes.

MEME KANSERİNDEN MÜCADELEDE TEDAVİ SONRASI TAKİP BAKIMI İÇİN BİR MOBİL UYGULAMA TASARIMI

ÖZET

Meme kanseri, meme hücrelerinin kontrolden çıkmasıyla başlar; bir başka deyişle, meme kanseri, meme dokusu hücrelerinin DNA'sındaki bir değişikliğin sonucudur. Meme kanseri kadınlarda en sık görülen kanser türüdür, ancak erkeklerde de nadiren oluşabilir. Meme kanserinin erken evrelerinde genellikle belirli bir semptomu veya belirti yoktur. Ancak bazen kendi kendine muayene sırasında memede oluşan tümörü kişinin kendisi dokunarak hissedebilir. Tüm meme tümörlerini ölümcül veya kanserli olmadığını belirtmekte fayda var. Kanser riskini azaltmak ve erken teşhis için memenin görünümündeki herhangi bir yumru veya değişikliğin bir tıp uzmanı tarafından kontrol edilmesi önerilir.

Meme kanserleri memenin herhangi bir yerinden başlayabilir; meme kanserinin en sık başlangıç noktası Duktal kanallardır, bu kanallarda başlayan meme kanserlerinede Duktal kanser adı verilir. Bazı meme kanserleri ise Lobüllerde başlar, ve bu kanserlerde Lobüler kanser ismi verilir. Bazen kanser, kan dolaşımı veya lenf sistemi yoluyla vücudun diğer bölgelerine geçerek akciğer, karaciğer, beyin gibi diğer organlara zarar verir, böyle etkileri gösteren kanserlere metastaz yapmış kanser denir. Meme kanseri, ilk tanı ve tedaviden aylar veya yıllar sonra vücudun başka bir yerinde tekrar ortaya çıkabilir. Bir kanser keşfedildiğinde, boyutunu ve orijinal konumundan yayılıp yayılmadığını belirlemek için testler yapılır. Buna kanser evresi denir. Daha düşük bir aşama (evre 1 veya 2), kanserin fazla yayılmadığını gösterir. Daha yüksek bir sayı (evre 3 veya 4 gibi) hastalığın daha da ilerlediğini gösterir; dördüncü aşama en ileri aşamadır. Kişiye uygun tedavinin belirlenmesinde söz konusu kanser evresi çok önemlidir.

Bu tezde meme kanserinden kurtulanlara kanser sonrası takip konusunda yardımcı olmak için bir mobil uygulama tasarlanmıştır. Meme kanseri hastalarının tedaviden sonra kanser bakım ekibiyle iletişim halinde olmaları gerektiğinden kanser sonrası takibin sistematik olarak yapılması gerekir. Tedavisini başarıyla tamamlamış ve ilerlemiş meme kanseri olmayan hastaların sıklıkla psikolojik destek almaları ve şikayetlerini doktorlarla paylaşmaları gerekir. Öte yandan ileri evre meme kanseri olan hastaların ana tedaviden sonra tedaviye devam etmesi gerekebilir. Takip eden bakım randevularında hastanın her türlü sorununu ve şikayetini paylaşması gerekir. Ayrıca tedaviye bağlı olarak hastalar tedaviden hemen sonra veya uzun vadede yan etkiler yaşayabilirler. Meme kanserinden kurtulanların tedavi sonrası sorunları üzerinde çeşitli çalışmalar yapılmıştır. Meme kanseri tanı ve tedavisi sonrasında hastanın yaşamında hem fiziksel hem de psikolojik değişiklik ortaya gelmektedir. Araştırmalar, en sık görülen semptomların yorgunluk, kilo değişiklikleri, halsizlik ve uyku bozukluğu olduğunu göstermektedir. Öte yandan kanser sonrası belirtiler ile

kanserin dönme korkusu arasında bir bağlantı olduğu belirtilmektedir; Kanserin dönme korkusunun psikolojik sorunlar, ağrı, yorgunluk, evlilik ve cinsel yaşamdaki zorluklar gibi önemli bir sorun kaynağı olduğunu belirtmektedirler.

Hastaların tüm takip seanslarına gitmesi ve kanser bakım ekibine istenen testlerin sonuçlarını iletmesi gerekir. Bu yüzden kanser sonrası takib çok önem arz ediyor.

Meme kanserinden kurtulanların takip bakımını belgelemek ve takip etmek için birkaç gelişmiş dijital çözüm mevcut, ancak bu tür sistemlerin profesyoneller ve kanser bakım ekipleri için tasarlandığını belirtmekte fayda var. Bildiğimiz kadarıyla şu anda hastalar tarafından kullanılabilecek dijital bir çözüm mevcut değil. Hastalar için mevcut bir çözüm olarak, takip planının manuel olarak takip edilmesi ve ASCO takip formunun kullanılması olmak üzere iki ana takip yöntemi vardır. Manuel yöntemde hasta, bakım verenlerden gelen her öneriyi not alır, şikayetlerini dijital veya kağıt bir deftere kaydeder ve gerektiğinde bakım ekibiyle paylaşır. Bu yöntemde genellikle takip kanser sonrası sürecinin takibi hastanın sorumluluğunda. Amerikan Klinik Onkoloji Derneği (ASCO) tarafından sağlanan başka bir yöntemde ise, meme kanseri hastalarının takip bakımı için gerekli bilgileri organize edildiği için bir form kullanılmaktadır. Bu form, hastaların tedavi ve takip bakım planıyla ilgili önemli bilgileri belgelemelerine ve saklamalarına yardımcı olur. Bu form genel bilgiler, tedavi özeti ve takip bakım planı olmak üzere üç ana bölümden oluşmaktadır. Hastalar bu formun genel bilgi ve tedavi geçmişi ile ilgili kısmını kendileri doldurabilir ve takip bakım planını doldurmak için doktorlarından yardım alabilirler. Bu formu diğer sağlık hizmeti sağlayıcıları ile paylaşmak, takip bakım planı konusunda uyumlu olmalarına yardımcı olur. Bu yöntemde de genellikle takip kanser sonrası sürecinin takibi hastanın sorumluluğunda.

Bu tezde, meme kanserinden kurtulanların takip bakımını kolaylaştırmak amacıyla, takip bakım planının takibi için bir mobil uygulama tasarlanmıştır. Bu çalışma üç ana adımda hazırlanmış olup, ilk adımda meme kanserli hastaların takibinde ihtiyaç duyulan tüm gerekli bilgiler toplanmıştır, ikinci adımda uygulamanın özellikleri meme kanserinin önemli problomleri temel alınarak tasarlanmıştır. Son adımda, uygulamayı değerlendirmek için deneyimli meme kanseri cerrah ve onkologları ile iki bağımsız görüşme yapılmıştır.

Uygulama özelliklerini tasarlanmasında ve kişiye özel bir takip bakım oluşturması için literatürdeki en son takip planları ve hastaya özel bilgiler kullanılmıştır. Literatürden elde edilen meme kanserinden kurtulan hastaların temel önemli problemlerine dayanarak, bu tezde dört farklı uygulama özelliği tanıtılmıştır; (1) Hastaya özel bir takip bakım planı hazırlamak için iki farklı kaynak kullanımı (güncel literatüre dayalı takip bakım rutini önerisi ve hastanın bakım sağlayıcıları tarafından sağlanan öneriler), (2) semptomların ve yan etkilerin belgelenmesine ve paylaşılmasına yardımcı olmak için bir şikayet yönetimi özelliği, (3) hastanın yaşam tarzı alışkanlıklarını ve müdahalelerini takip etmesine yardımcı olacak bir özellik, (4) hastaya bir sonraki randevularını hatırlatın otomatik olarak bir bildirim sistemi. Öte yandan, uzun vadede kullanıcılardan toplanan bilgiler, gelecekte meme kanserinden kurtulan yeni hastalar için mümkün olan en iyi takip bakım planını tahmin etmek için güvenilir bir veri olacaktır.

Bu uygulama, tıp terimleri hakkında genellikle çok sınırlı bilgiye sahip, profesyonel olmayan kişiler için tasarlandığından, tıbbi terimler yerine basit sorular kullanılmaya

çalışılmıştır. Ayrıca onay kutuları ve açılır menüler gibi basit tasarım ögeleri kullanılarak basit ve kullanımı kolay bir uygulama sağlanmıştır.

Uygulamanın kullanılabilirliğini değerlendirmek, öneri ve iyileştirme fikirlerini ortaya çıkarmak için tıbbi onkologlarla yarı yapılandırılmış ve bağımsız iki görüşme yapılmıştır. Görüşmeler iki bölümde gerçekleştirilmştir: ilk bölümde uygulama kullanıcılar, ve uygulamanın meme kanserini atlatan hastalara olası faydaları hakkında kısa bir açıklama yapıldı, ardından görüşülen kişilerden, kullanıcılardan toplanan bilgilere odaklanmaları ve iyileştirme fikirlerini sunmaları istendi. Her görüşme yaklaşık 30 dakika sürmüştür. Görüşmelerin ardından alınan geridönüş ve öneriler göre uygulama son halini almıştır.

1. INTRODUCTION

Breast cancer starts when cells of breast tissues grow out of control; strictly speaking, breast cancer is the result of a change within the DNA of breast tissue cells. Breast cancer is the most common cancer in women, but men also can get it rarely. It usually does not have any specific signs or symptoms in the early stages. But, sometimes during the self-examination, the person himself can feel the tumor formed in the breast. It is worth noting that not all breast tumors are life-threatening or cancerous, but some benign breast masses increase the risk of breast cancer in women [3]. In order to reduce the risk of cancer, it is recommended that any lump (mass of tissue) or change in the appearance of the breast be checked by a medical professional.

The breast has different parts namely: Lobules, Ducts, Nipple, and Areola. Lobules make milk, ducts carry the milk from lobules to the nipple, the nipple is where milk can secrete, Adipose store and release energy when it is required, and finally, Areola is a thicker and darker skin that surrounds the nipple (please see Figure 1.1). Breast cancers can start from any of the aforementioned parts; the most common starting part for breast cancer is the ducts, which is called Ductal cancer. Some of them start in the Lobules, which is called lobular or invasive cancer. Other types of breast cancer, such as Phyllodes or Angiosarcoma, are less common [4]; these cancers commonly happen in younger women who are in their 40s or 50s [5]. A limited number of cancers start in other breast tissues, which are called Sarcomas or Lymphomas; these are not considered breast cancer [5].

Sometimes cancer travels through the bloodstream or lymphatic system to other parts of the body and damage other organs such as the lungs, liver, and brain, in such a situation it is called that breast cancer has metastasized. Breast cancer may return to another part of the body months or years after initial diagnosis and treatment [6].

It is essential for breast cancer survivors to stay in touch with their care providers for a long period; that is why all cancer survivors should be provided with a follow-up care

plan. This plan helps the patient to meet her health care provider regularly and receive medical and psychological support. As the possibility of breast cancer returning is 10 years or even more for some cancer types, the follow-up also should continue at least for 5 years [7]. Considering the fact that follow-up care is long and complicated, it is usually difficult for patients to keep track of it. Some care providers have digital or Manuel systems to remind patients about follow-up care plans; informing patients by calling, or sending text messages via Short Message Service (SMS), email or social media are the most common ways to notify patients about a future appointment. But, it is worth noting that patient herself needs to keep track of the follow-up care too; for example, if the care provider asks the patient to provide a blood test before the next follow-up session, the patient needs to manage it herself. That is why it becomes challenging for the patient to record and manage a follow-up care plan. On the other hand, documenting and sharing the symptoms, treatment side effects, and other complaints are very important in the follow-up period.

In this thesis, with the intention of enhancement of the follow-up care for breast cancer survivors, a mobile application is designed for tracking the follow-up care plan. For this, the latest follow-up plans in the literature, as well as patient-specific information are used to generate a follow-up care plan. Based on the main pain points of breast cancer survivors extracted from the literature, four different application features are introduced in this thesis; (1) two different sources are used to prepare a patient-specific follow-up care plan (follow-up care routine recommendation based on the state of the art literature, and recommendations provided by the care providers of the patient), (2) a complaint management feature is designed in order to help with documenting and sharing symptoms and side effects, (3) a feature to help the patient to keep track of her lifestyle habits and interventions is provided (4) a notification system is designed to automatically remind the patient about her next appointments. In order to validate and evaluate the application features, two independent semi-structured interviews with medical oncologists were conducted, and their suggestions and recommendations were used to improve the application. Furthermore, data gathered from this application will be a reliable source that can be used in forecasting the best possible customized follow-up care plan in the future.
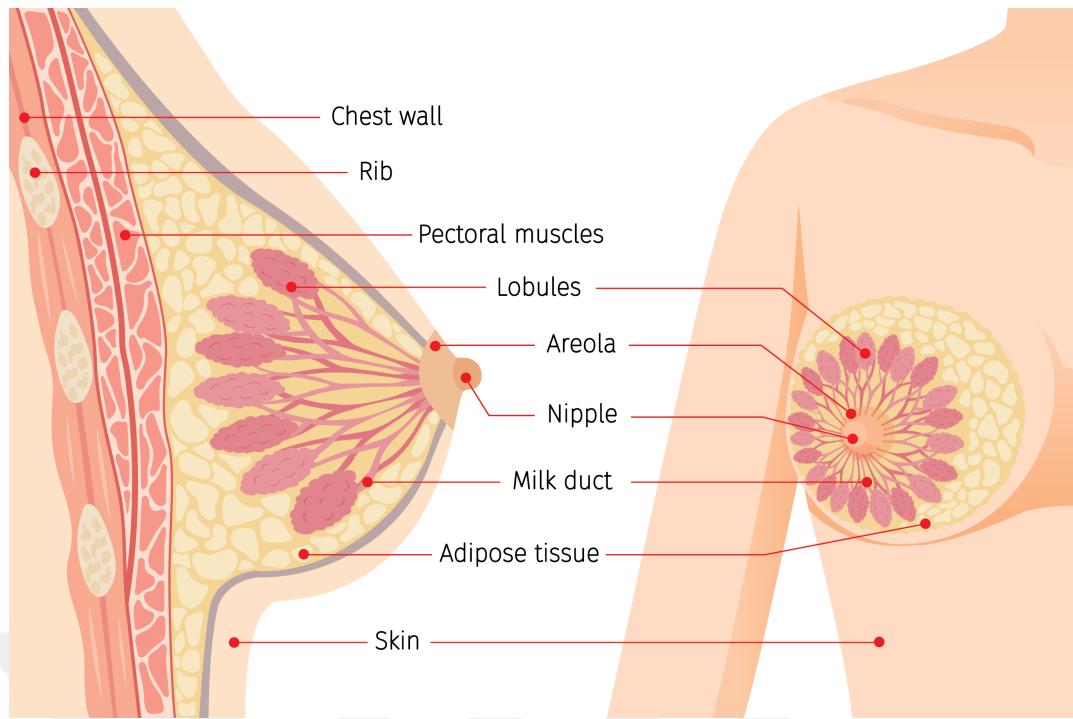
Figure 1.1 : Different parts of the female breast namely: Lobules, Ducts, Nipple, Adipose tissue, and Areola [2].

The Rest of this thesis is as below:

In Chapter 2, studies about breast cancer, follow-up care details, and present follow-up care solutions are discussed in detail.

In Chapter 3, background information needed to understand the application, including user pain points, and features and interviews are described.

In Chapter 4, the designed application with all details is discussed.

Finally, in Chapter 5, the thesis is concluded and possible future implications are discussed.

2. Literature Review

2.1 Breast Cancer

breast cancer is the result of a change within the DNA of breast tissue cells, and it is the most common cancer in women. Although usually there is no obvious reason behind cancer research has shown that genetic causes, smoking, alcohol, and other lifestyle habits can lead to cancer [8]. Other factors that increase the risk of breast cancer in women are pregnancies, multiple pregnancies and miscarriages, use of birth control pills, obesity, red meat consumption, and caffeine consumption [9].

When a cancer is discovered, tests are performed to determine its size and if it has spread from its original location. This is referred to as the cancer stage. A lower stage (stage 1 or 2) indicates that cancer has not spread far. A higher number (such as stage 3 or 4) indicates that the disease has progressed farther; the fourth stage is the most advanced. When it comes to determining the appropriate therapy for a person, the stage of cancer is crucial.

Several stduies working on breast cancer pathogenesis have gategorized breast cancer molecular targets in two main groups, namely Estrogen Receptor Alpha (ER) and epidermal growth factor 2 (ERBB2); another related receptor is Progesterone Receptor (PR) which is considered as enabler of ER [10,11]. In case that at least 1% of breast cancer tumors have ER or PR, the cancer is categorized as HR+ [12]. Breast cancer is divided into three major subtypes: hormone receptor positive/ERBB2 negative (HR+/ERBB2−), ERBB2 positive (ERBB2+), and triple negative. The most common breast cancer subtype is HR+/ERBB2−which makes up 70 percent of patients, and ERBB2+ makes up 15%-20% of patients [11]; triple-negative cancer which lacks ER, PR, or ERBB2 target makes up 15% of breast cancer [13].Systemic therapy of breast cancer is decided by these subtypes, but it is worth noting that the main goals of the therapy for nonmetastatic and metastatic cancer are different; while removing the tumor from the breast and regional lymph nodes, and preventing the metastasis the

goal of earlier therapy, prolonging life and symptom relief are goals of later [11]. In the case of nonmetastatic Patients, those with hormone receptor-positive tumors receive endocrine therapy, with a small percentage receiving chemotherapy as well; patients with ERBB2-positive tumors receive ERBB2-targeted antibody or small-molecule inhibitor therapy in combination with chemotherapy, and patients with triple-negative tumors receive chemotherapy alone [11,14]. A combination of local therapy(surgery), and systemic therapy(may be performed before the operation (neoadjuvant), or after the operation (adjuvant), or both) is used for the treatment of both nonmetastatic and metastatic cancer [15].

Although the majority of people with breast cancer will not die from the disease, their comorbidities (such as obesity, hypertension, hyperlipidemia, and diabetes mellitus) will almost likely have an impact on disease-free survival and, eventually, overall survival [16]. Diet, physical activity, and weight all play a role in breast cancer patient survival; A total-health approach to enhancing long-term survival in breast cancer involves a focus on healthy nutrition, an active lifestyle, and a balanced weight [17]. After breast cancer therapy, lifestyle changes, primarily aimed at lowering BMI, have been demonstrated to enhance overall survival [16]. Mehra et.al in their work investigate the relationship between BMI and cancer recurrence in breast cancer survivors and suggests that keeping BMI between 18.5 and 35 kg/m2 increases the Chance of survival [18].

2.2 Follow-Up Care

Breast cancer patients usually need to stay in touch with their cancer care team after the treatment, it is referred to as breast cancer follow-up care. In the case of patients who have successfully finished the treatment and do not have advanced breast cancer, they often need to receive psychological support and share their concerns with doctors. On the other hand, patients who suffer from advanced Breast cancer may need to continue the treatment after the main treatment. In follow-up care appointments, a patient needs to share any problem and complaint. Also, depending on the treatment, patients may experience side effects right after the therapy or in long term. Patients need to go to all follow-up sessions and provide the results of required tests to care providers.

Several works have studied after treatment problems of breast cancer survivors. It is stated that an important biographical change happen after the diagnosis of cancer [19,20], as both physical and psychological life aspects of the patient changes dramatically after the diagnosis. The STEP project focuses on the physical aspects of the treatment on 1748 breast cancer patients and specifies post-cancer needs [21,22]. It showed that the most frequently seen symptoms are fatigue (66.6%), weight changes (57%), weakness (61.6%), and sleep disruption (60%). On the other hand, Vandendorpe et.al study the complaints of cancer survivors and connection between the after cancer symptoms and the fear of cancer return [23]. They state that the fear of cancer return is an important source of problems including psychological problems (20.5%), pain (51.9%), fatigue (51.9%), and hardships in marriage and sexual life (13.1%).

When it comes to cancer recurrence, even though 5-year survival can be a sign of successful treatment for most cancer types, it is revealed that for patients with breast cancer there is a possibility of recurrence for >10 after treatment [24]. The highest annual risk of breast cancer recurrence is in the second year after diagnosis, there is still 2%–5% risk in five to twenty years after diagnosis [7]. Also, for some patients, the annual risk of recurrence is higher than other patients. Park et al. classified the breast cancer subtypes and studied the recurrence patterns; it is stated that, even though the risk of recurrence is higher for Estrogen Negative (ER-) cancers in the first years, the annual risk of recurrence falls off below the level of Estrogen Negative (ER+) tumors after 5–8 years [25]. Especially for patients with Estrogen receptor/progesterone receptor (ER/PR+) tumors, breast cancer may return even more than 20 years after the diagnosis [7]. Ten-year survival of breast cancer exceeds 70% in most European regions, with 89% survival for local and 62% for regional disease [26]. The lifetime risk of breast cancer return in patients with specific mutations (e.g BRCA1) changes from 65% to 90%; there is also 25% to 31% possibility of contralateral breast cancer in 10 years [27]. Hence, another important objective of follow-up care is identifying contralateral breast cancer.

Another main objective of follow-up care is the detection of in-breast and loco-regional curable recurrence in early stages [1]. Bock et al. conducted twelve studies involving a

total of 5,045 patients, in which 378 isolated locoregional recurrences were identified [28]. For asymptomatic patients, 40% of locoregional recurrences are identified during conducting routine visits or tests where, 47% of those were diagnosed after mastectomy, and 36% after breast-conserving therapy [28]. It's worth emphasizing that loco-regional recurrence is linked to a higher risk of mortality in patients who are node-positive, PR-, younger, and have a short period between first diagnosis and recurrence [1]. Furthermore, recurrence of locoregional breast cancer is linked to a significant increase in the risk of metastasis [29].

Senkus et al. [7] summarise goals of follow-up care as bellow:

- To identify new local recurrences or contralateral breast cancer.

- To assess and provide treatment for treatment-related complications.

- To drive motivation in patients to continue Endocrine Therapy (ET).

- To help treated patients to return to normal life through psychological support and providing information.

2.2.1 Routine Follow-up Examinations

During the follow-up appointment, it is necessary to go over the medical history with the patient, identify any treatment-related side effects, conduct the clinical examination, and asks the patient to provide test results. For example, an MRI of the breast, in addition to regular mammography and breast ultrasonography, may be required for young individuals, particularly in situations with dense breast tissue and hereditary or family predispositions [30]. Other laboratory or imaging tests (e.g. blood counts, routine chemistry tests, chest X-rays, bone scans, liver ultrasound exams, CT scans, FDG-PET-CT) or any tumor markers such as cancer antigen 15-3 (CA15-3) or carcinoembryonic antigen (CEA) do not produce a survival benefit in asymptomatic patients [30]. It is worth noting that routine transvaginal Ultrasonography is also not advised since it results in an unacceptable number of false-positive findings [31].

AGO [1] (an independent Gynecological Oncology group) investigated and ranked grade of recommendation for such experiments and tests; the grade of recommendation

Table 2.1 : AGO Grades of recommendation [1]

Symbol	Explanation
++	This examination or therapeutic intervention is extremely advantageous to patients, and it should be carried out without reservation.
+	This examination or therapeutic intervention has a little benefit for patients but it can be done.
+/-	This examination or therapeutic intervention has not been proved to help patients and should only be used in exceptional circumstances. A broad advice is not possible based on existing understanding.
-	This examination or therapeutic intervention may be harmful to patients, and it may not be carried out.
–	In any event, examination or therapeutic intervention is clearly harmful to patients and should be avoided.

is shown using +, ++, +/-, -, – signs (Please see the Table 2.1 for the meaning behind each symbol). Based on the work of AGO, routine follow-up experiments and grade of recommendation of each can be listed as history (++), physical examination (++), self-examination (+), Mammography (++), breast Sonography (++), MRI of the breast (+/-), Pelvic examination (++), DXA-scan (+), routine biochemistry (-), blood tests for monitoring severe toxicities (+), liver Ultrasound (-), bone scan (-), chest X-ray (-), CT-scan of the chest, CT-scan of the abdomen, CT-scan of the pelvis (-), identification of isolated or circulating tumor cells (-), Positron Emission Tomography scan (-), and whole-body MRI (-).

Furthermore, follow-up should not be seen solely in terms of the physical aspects; Patients' anxiety levels typically rise once therapy is completed, as their interaction with the treatment team diminishes [30]. For Example, in the months following the completion of adjuvant Chemotherapy and Radiotherapy, depression and extreme exhaustion are common [32].

2.2.2 Follow-Up Care Routine Recommendation

European Society for Medical Oncology (ESMO) [7] recommends routine visits every 3–4 months for the first 2 years, every 6 months for years 3–5, and yearly afterward, balancing patient demands and follow-up expenditures. Follow-up care

routine recommendations for patients with invasive and non-invasive breast cancer can be seen as follow [1,30,33,34]:

- In the first two years, regular follow-up visits are advised every 3–4 months (every 6 months for low-risk and Ductal carcinoma in situ (DCIS) individuals), every 6–8 months from years 3 to 5, and yearly after that. History, physical examinations, and counseling are recommended in these sessions.

- A monthly self-examination is recommended.

- Annual bilateral (after BCT) and/or contralateral (after mastectomy) mammography is advised, with ultrasonography and breast MRI if needed.

- Imaging, modalities, and biochemistry should be considered only in case of complaints, clinical findings, or the possibility of cancer return.

- Echocardiography is recommended 6-12 months and 5 years after the patient completes the cardiotoxic therapy.

2.3 Present Solutions for follow-up Care

There are few advance digital solutions to document and track follow-up care of breast cancer survivors such as ODSeasyNet, Celsius37, and Onkys; these software are called Tumor Documentation Systems(TDS).

ODSeasy [35] is the TDS market leader that focuses on only breast cancer documentation. It is designed to be used by physicians where it helps professionals to document all information from the decision support step to the aftercare treatment. ODSeasy provides all required tools to document both anamnestic and diagnostic data; furthermore, it is possible to manage surgical, systemic therapy, and radiation therapies data distinctively. The evaluation of patient data for quality assurance is one of the many options that ODSeasy offers. It is not specified in ODSeasy documents if it provides specific tools for follow-up care, but it is stated that it can be used in follow-up care.

Celsius37 [36] as a TDS system provides interdisciplinary documentation for all types of cancer. The follow-up care tools of Celsius37 provide the necessary tools to

generate patient calendars, appointment notifications, and reminders. It also provides web-based tools to visualize related data for statistical evaluations.

Finally, Onkys [37] helps oncologists to structure oncological data so that the data can be used more effectively and efficiently. It also provides necessary tools that facilitate treatment-related communication among professionals who are involved in the treatment.

As can be inferred from the explanations, such systems are designed for the professional care provides who use this system to document and manage all treatment and after-treatment information. To the best of our knowledge, there is no digital solution that can be used by patients at this time. Two main follow-up methods are used by patients, (1) keeping track of the follow-up plan manually, and (2) using follow-up form provided by American Society of Clinical Oncology (ASCO) [38]. The advantages and disadvantages of each method are discussed in the rest of this chapter.

2.3.1 Manuel Follow-up

The main follow-up method that is used by breast cancer survivors is keeping required follow-up records and information manually. In this method after the cancer treatment, the care provider team provides a follow-up plan, mainly based on the state-of-the-art routine follow-up recommendation. This plan is usually not precise at the beginning and needs to be revised frequently, that is why in the follow-up sessions, the patient usually takes notes in her paper or digital notebook based on the advice of the case provider; possible side effects of medicines, tests that need to be done between two sessions, and details of the next session are needed to be recorded by the patient. In this method, patients are usually responsible to keep track of their follow-up plan. As the follow-up period is long and can be complicated, this method usually is difficult and error-prone.

2.3.2 ASCO Follow-up Care Form

Another method which is provided by the ASCO, offers a form to organize information needed for follow-up care of breast cancer patients (please see Appendix A). This form

helps patients to document and keep important information related to their treatment and follow-up care plan. This form consists of three main parts including general Information, treatment summery, and follow-up care plan. Patients can fill out part of this form related to general information and treatment history by themselves, and get help from their doctor to fill follow-up care plan. Sharing this form with other health care providers helps them to stay aligned regarding the follow-up care plan. Each section and detailed information are discussed as below:

The first section (general information) contains general information about the patient and the care providers. Patient name, phone number, date of birth, and email as well as the name of primary care provider, surgeon name, radiation oncologist name, and medical oncologist are asked in this section.

The treatment Summary section consists of 4 subsections namely: Diagnosis, Treatment Completed, Treatment Ongoing, and Familial Cancer Risk Assessment. In the Diagnosis subsection, the Type of cancer, its location, histology subtype, receptor type as well as, and diagnosis date and stage of the breast cancer are required. Treatment Completed subsection covers systemic therapy and local therapy details; in case of the local therapy surgery date, surgical procedure, surgery location, and related findings are asked. For the systemic therapy, it is asked if the patient has undergone radiotherapy, also body area which was treated, and the end date of radiotherapy are requested. In this subsection patient also is asked to specify if she has undergone the chemotherapy or hormonal therapy, the name of the agents used in this therapy (5-Fluorouracil, Carboplatin, Cyclophosphamide, Docetaxel, Doxorubicin, Epirubicin, Methotrexate, Paclitaxel, Pertuzumab, Trastuzumab), and if they have faced long term symptoms or side effects after the completion of therapy. Then, in the Treatment Ongoing subsection, the patient is asked to fill out other treatments including Tamoxifen, Aromatase Inhibitors (anastrozole, exemestane and letrozole), and GnRH agonist (Zoladex, Lupron) for ovarian suppression, as well as their planned duration. In this subsection, the side effects of mentioned medicines are explained to the patient; the patient can fill out the form if she has experienced any symptoms or side effects e.g. fatigue, menopausal symptoms, numbness, pain, or depression, after completion of this treatment. Finally, the familial risk assessment subsection requires

information about breast and or ovarian cancer in relatives of the patient, and also about the genetic test and its results if exists.

When it comes to the follow-up care plan, clinical visit plan, and recommended tests are scheduled in this section. Not much default schedule can be found here; it is only indicated that annual mammography and bone density test (every 2 years, in case the patient is using an aromatase inhibitor) should be conducted. Plan schedule for breast MRI, pap/pelvic exam, and colonoscopy, are left to the care provider.

Furthermore, as the patient may have concerns with different areas in her life, the patient is recommended to talk to her doctors or nurses about such cases. The aforementioned areas are namely: anxiety or depression, insurance, sexual functioning, emotional and mental health, memory or concentration loss, stopping smoking, fatigue, parenting, weight changes, fertility, physical functioning, financial advice or assistance, and school or work. In this section, a variety of lifestyle/behavioral factors that can have an impact on long-term health is presented, including alcohol use, physical activity, diet, sunscreen use, management of medications, tobacco use, Management of other illnesses, and Weight management.

As described in this section, ASCO Follow-up Care Form provides essential information all in one form; filling and updating this form helps the patient to keep track of her follow-up care plan and share this form with her care provided when needed. The patient can print a copy, or fill out and update it as a digital file. Even though this method is a much more easy and more effective follow-up method, just like manual follow-up has some disadvantages. In both methods, the patient needs to employ a digital or analog reminder in order not to miss appointments. Furthermore, even if the patient manages to follow the sessions in short term, it would be very difficult to keep the different versions of documents in the long term. As software development and cloud storage technologies are more advanced and available now, it is essential to carry the follow-up care process to a digital environment.

3. Methodology

After an extensive literature review, the main resources for follow-up breast cancer care were identified. Some resources like AGO [1] are not suitable to be used directly by patients, as these guidelines are prepared for specialists. ASCO follow-up care is a resource that is mainly used by patients used as one of the resources of this work. As these resources are considered the most trusted references used at the time, and considering the fact that independent research with proper sample size is not possible in the scope of this master thesis, this work heavily relied on these resources.

This work is prepared in three main steps, at the first step all necessary information needed in the follow-up care of patients with breast cancer is gathered, in the second step features of the application were designed based on the main pain points of breast cancer patients, finally, in the last step, two independent interviews with experienced breast cancer oncologists and surgeons was conducted to evaluate the application.

3.1 Application Features

When it comes to follow-up care of breast cancer survivors, they have three main pain points, as below:

- As the follow-up plan can be as long as 10 years or even more in some cases, patients struggle with keeping track of their follow-up plan.

- Most breast cancer survivors -even those with a less severe cancer- experience symptoms and side effects. Documenting and sharing such complaints with care providers is one of the most important aims of follow-up care.

- Interventions affecting lifestyle risks and comorbidity need to be tracked by the patient to minimize the negative impact on disease outcomes.

Application features are designed based on the aforementioned pain points. So, four main feature based on those pain point was designed in this application. In the following paragraphs, each feature is explained in detail.

3.1.1 Customized follow-up Plan

Two different sources were used to prepare a patient-specific follow-up care plan; first, follow-up care routine recommendations based on the state of the art literature[ASCO-ACS recommendations 2016, NCCN 2021, ESMO 2019, and S3-guidelines 2017], and second, recommendations provided by the care providers of the patient.

In case of the first source, in order to calculate the exact date of each follow-up session, the surgery date of the patient is required (the patient is asked to enter her surgery date when starts to use the application). A simple algorithm is used to calculate all following follow-ups based on the surgery date and recommended follow-up routine in the literature. For example, if the surgery date of the patient is 01/01/2022, the algorithm sets a monthly self-examination on 02/01/2022, 03/01/2020, and so on.

In the case of the second source, when the care provider recommends a new appointment for the patient, the patient can create a new follow-up appointment manually in the application. Where she can enter all details of the session, including date, test type (if needed), care provider, location, and personal notes. The manual appointment is listed in the appointments.

3.1.2 Complaint Management

In order to help breast cancer survivors to document and share symptoms and side effects, an complaint management feature is designed. This feature allows patients to select among common symptoms and side effects; this list is prepared based on the side effects of the Tamoxifen, Aromatase Inhibitors, GnRH agonist, and other common side effect and post-treatment symptoms. The list includes Endometrial cancer, bone loss, major blood clots, vision issues, joint/muscle aches, vaginal dryness, hair thinning, fatigue, menopausal symptoms, numbness, pain, and depression[ASCO]. Furthermore, the patient can take notes of other possible symptoms and side effects that she is facing

manually. For enriching the complaint management feature, the patient is enabled to take pictures related to her complaint too. Finally, in order to facilitate the sharing task, the patient is enabled to share a copy of a saved complaint to her doctor through a messaging platform or email.

3.1.3 Lifestyle Guide

The aim of this feature is to help the patient to keep track of her lifestyle habits and interventions. For this, the patient needs to enter some information, including height, weight, average nightly fasting hours, amount of alcohol consumption per week, smoking status, and physical activities per week. Evaluation of these intervention parameters altogether and coming with a unique value that describes the overall impact of these interventions is not investigated in the scope of this thesis; to the best of our knowledge, there is no study that investigates the effect of these parameters all together on the improvement of overall survival. Hence, all information asked from the patient in this feature is evaluated individually, and the patient is informed if any of her interventions are not going right. For this, we use interventions recommended by Ago guideline as below:

- BMI is recommended to be between 18.5 and 30 intervals.

- Overnight fasting is recommended to be more than 13 hours per day.

- Smoking is not recommended.

- Alcohol consumption is recommended to be kept below six grams per day.

- Moderate sport for at least two times and more than 150 minutes per week is recommended.

In this application, based on the weight and height of the patient, Body Mass Index (BMI) is calculated simply by dividing the weight over the squire of height (unit of measurement for weight and height are kilogram and meter, respectively).

3.1.4 Notification System

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A notification system is developed to remind the patient about her next appointments. Such notifications help the patient to be prepared for the next session; for example, she will be notified to take a blood test before an appointment. These notifications are set based on the auto-generated and manual follow-up plan.

3.2 Interview

Two semi-structured and independent interviews with medical oncologists and breast cancer surgeons were conducted to evaluate the usefulness of the application and to elicit suggestions, and improvement ideas. Interviewees had an average field experience of 10 years, and each interview lasted approximately 30 minutes.

The interviews were conducted in two parts: first, a brief explanation about the application, its users, and possible benefits for the breast cancer survivors was provided, then interviewees were asked to focus on two specific aspects of the application. Regarding those two aspects, firstly, interviewees were asked to carefully review all information asked from the user in the sign-up process, evaluate the importance of this information in follow-up care, and specify if any of those are non-required information. Secondly, they were asked to navigate the application, examine the features and provide their feedback regarding the utility of the application and possible improvements.

Based on the feedback gathered from the oncologists, (1) optional and required fields were specified considering the importance of such information in the quality of the follow-up care, and the quality of the data which will be gathered in long term, and (2) questions were simplified to be more understandable by patients.

3.3 Application Design

Using mobile applications for managing the personal tasks has gain a great popularity in recent years. Using mobile phone to set reminders and check daily activities is more convenient than using personal computers, hence a mobile application prototype is designed in this work. To design the mobile application prototype, Uizard web-based software is used as a digital prototyping tool [39]. Uizard provides essential tools including different shapes, text boxes, icons, buttons, and forms. Furthermore, it

allows to upload images and and other graphical elements from personal computers. Forms elements such as input stepper, input field, drop-down menu, switch on/off, and check-boxes enhance the usability of the application and make the user interface more pleasant. As for the breast cancer follow-up care we need to gather many information from the user, in this work form elements are heavily used to make the data gathering entering more comfortable for the user.

4. Application Design

This application consists of different pages; a sign-up page, two pages to gather the diagnosis and treatment history of the user, two pages that ask for further information regarding ongoing treatment and care providers, a home page, two pages for setting appointments and observing recommended follow-up care, a page for recording and sharing complaints, and finally, a page to help the user with lifestyle habits.

4.1 Sign-up Page

Sign-up page (please see Figure 4.1) is the first page that the user sees after installing the application. On this page, the user enters basic information that is needed to open an account, including name and surname, date of birth, sex, and education. Furthermore, an email address and password are asked from the user for future log-ins.
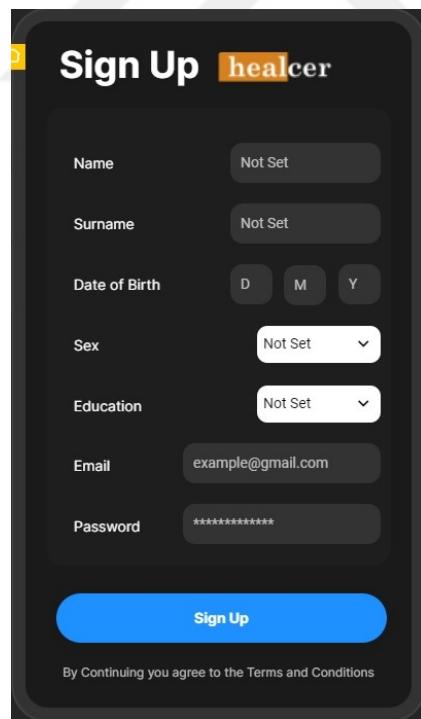
Figure 4.1 : Sign-up page, where user enters basic personal information and creates an account.

4.2 Diagnosis and Treatment History Pages

After signing up, two consecutive pages are allocated for details of diagnosis and treatment history (please see Figure 4.2). On these pages, the user is required to fill out necessary information regarding cancer diagnosis and treatment. This information can be shared with care providers to provide a better follow-up plan. As can be seen in Figure 4.2 (a), the patient is required to provide a diagnosis date and surgery date(surgery date will be used to schedule the routine follow-up care plan). A drop-down list is used to guide the user to select among possible options for cancer place (left, right, both) and receptor type (ERBB2-,ERBB2+, and triple-negative). Here, the user is also asked if any of her family is diagnosed with cancer; the user can select among a list of options including mother, sister, aunt, daughter, and others.

On the treatment history page 4.2 (b), the user is required to answer three questions and select among provided options: type of the surgery (mastectomy, and conservation therapy), the result of the genetic test (BRCA1, BRCA2), and type of lymph removal surgery (Axillary Dissection, and Sentinel Biopsy). Furthermore, the user is also asked to indicate if she has undergone radiotherapy, chemotherapy (before surgery (Neoadjuvan), or after Surgery (Adjuvan)), and hormonal therapy.

4.3 Ongoing Treatment Pages

The ongoing Treatment page consists of two pages titled Complete Your Profile 1 and 2 (please see Figure 4.3) . The first page is related to the medicines that the user takes currently (see Figure 4.3 (a)). User can select among options including Tamoxifen, Aromatase Inhibitors (anastrozole, exemestane, and letrozole), and GnRH agonist (Zoladex, Lupron). Planned duration by month is also asked, but it is not a required field. Furthermore, users can click on the information icon close to each medicine to see the possible side effects. The second Page (please see Figure 4.3 (b)) asks the user to provide the names of the main care provider, surgeon, radiation oncologist, and medical oncologist; It is worth noting that these fields are optional. Another optional question on this page is regarding agents which were used during the chemotherapy; the user can select among options including 5-Fluorouracil,

(a) Diagnosis History   (b) Treatment History

Figure 4.2 : Diagnosis and treatment history Pages, where user provides necessary information needed in follow-up care period.

Carboplatin, Cyclophosphamide, Docetaxel, Doxorubicin, Epirubicin, Methotrexate, Paclitaxel, Pertuzumab, and Trastuzumab.

4.4 Home Page

The home page is the main page that is presented to the user when opening the application (please see Figure 4.4). This page is where users can see important follow-up care notifications, navigate to other pages (appointment, complaint, lifestyle, and setting page), see important notifications, and receive lifestyle recommendations. Furthermore, the user can see how complete is her profile and is encouraged to navigate to the profile page to enter further information about her treatment. Lifestyle recommendations presented on this page are based on the recommendation provided by AGO [1];

4.5 Appointment Setting, and Recommended Follow-up Care Pages
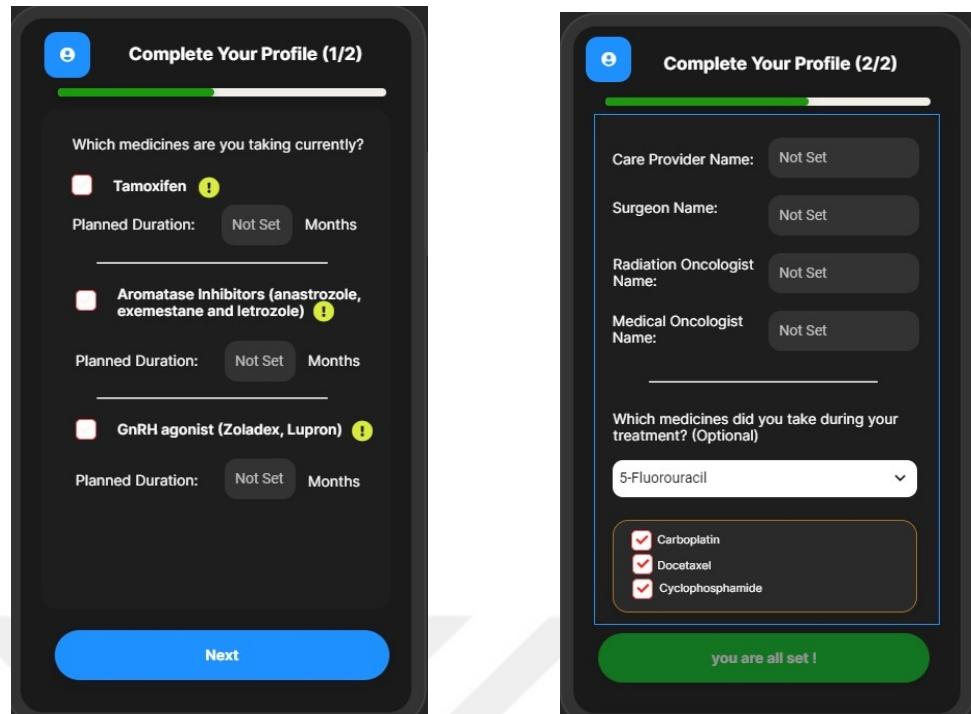
(a) Ongoing Treatment   (b) Optional Treatment Information

Figure 4.3 : Complete Your Profile pages, where user provides ongoing treatment details and optional details about the care providers and chemotherapy agents.
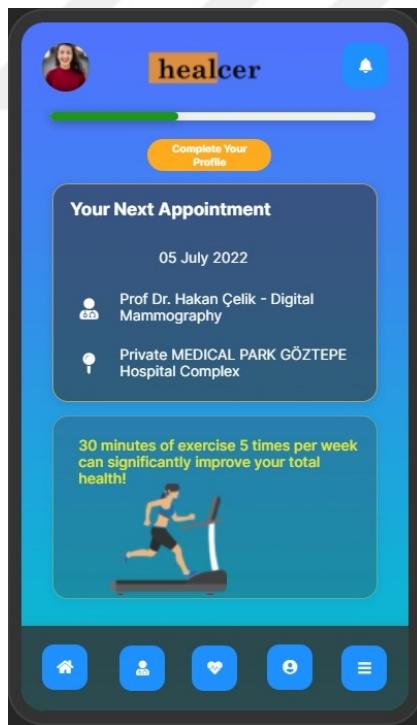

Figure 4.4 : Home Page, where upcoming appointment, important notifications, and lifestyle recommendations are presented to the user.
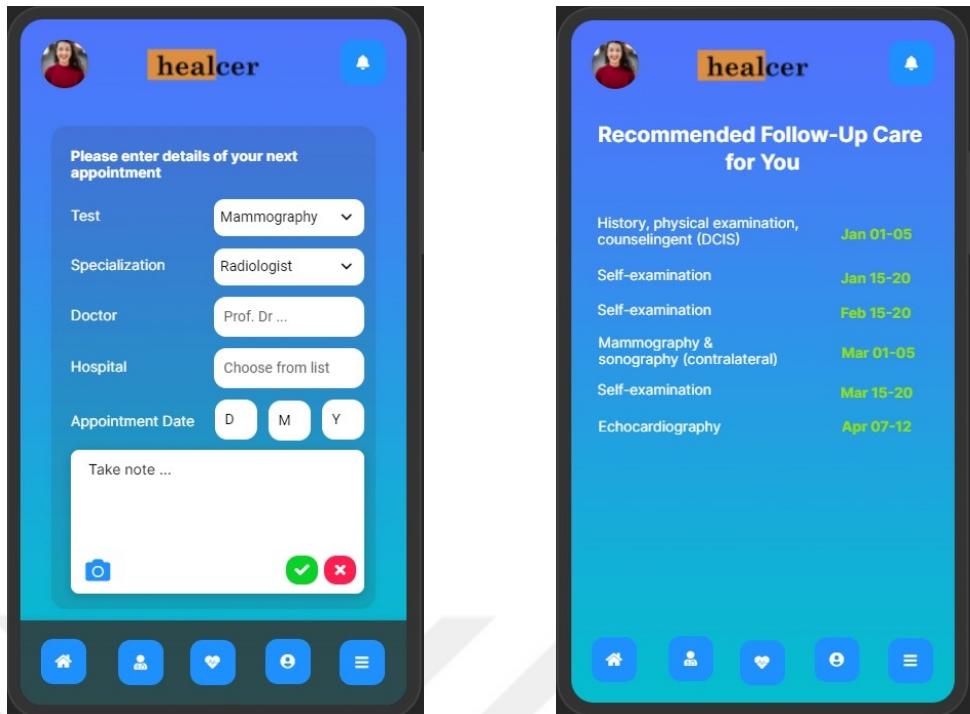
(a) Appointment Setting (b) Recommended Follow-up Plan

Figure 4.5 : Appointment Setting, and Recommended Follow-up Care Plan pages, where user can set a new appointment and view all future appointments in a single page.

User can set an appointment or test reminder on this page easily (please see Figure 4.5) (a)). All essential options to set an appointment or reminder are provided on this page including test type, specialization, doctor name, location, and appointment date. Provided options for test type are prepared based on AGO guidelines and are namely: Mammography, breast Sonography, MRI of breast, DXA-scan, biochemistry, blood tests, liver Ultrasound, bone scan, chest X-ray, CT-scan of the chest, CT-scan of the abdomen, and CT-scan of the pelvis, Positron Emission Tomography scan, and whole-body MRI. In case the user is not willing to choose among options on the page, she can only set the appointment date and take a brief note and leave all other fields blank.

Recommended Follow-up Care page lists both auto-generated and Manuel follow-up appointments (please see Figure 4.5 (b)). In the sake of simplicity, details of the appointments are not shown on this page, so that user can see more appointments at a glance. By clicking on an appointment, details of that appointment are presented to the user.

4.6 Complaint Page

As the user faces different symptoms and side effects in the follow-up period, this pages help the user to record her complaints and share them when needed (please see Figure 4.6). At the top of this page, all previous complaints are listed, where user can navigate through and see each one in detail. To record a complaint, the user can select among common side effects explained in Chapter 3. Enabling the user to take personal notes and photos help her to document her complaint precisely. Sharing feature provides an easy way to user to send all or part of her complaints to care providers via email or any messaging platform.

4.7 Interventions Guide Page

On this page, by asking simple questions, essential information to evaluate the interventions and lifestyle habits are gathered from the user (please see Figure 4.7). Questions are including weight and height, amount of overnight fasting hours, smoking status, alcohol consumption, and amount of exercise per week. After filling these fields and pressing the calculate button each answer is evaluated individually and the user is informed if any of those are not in a healthy state.
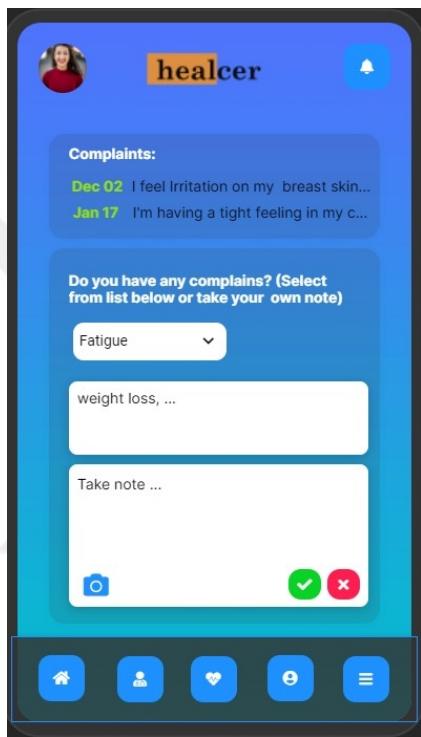
Figure 4.6 : Complaint Setting Page, where user can view previous complaints, set a new complaint, and share it with a care provider.
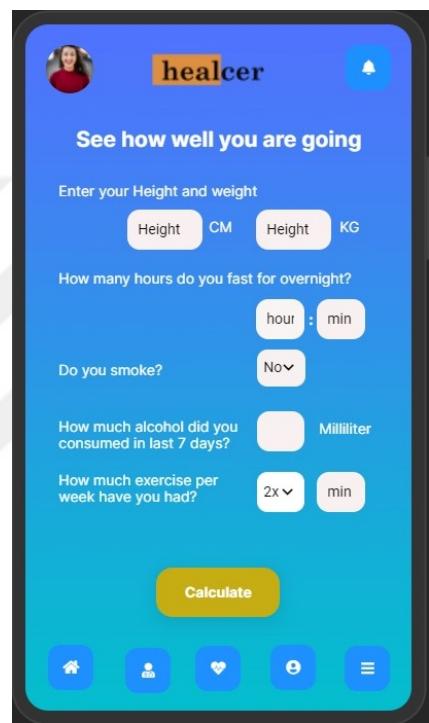
Figure 4.7 : Interventions Guide page, where user can enter lifestyle related information and evaluate quality of her lifestyle.

5. Conclusion Further Implications

A mobile application for follow-up care of breast cancer survivors was designed in this work. This allows patient who have finished their primary treatment to keep track of their long-term follow-up care treatment. Hence care providers need to benefit from more comprehensive tools and systems, this mobile application was designed to be used by patients only.

This mobile application benefits from state-of-the-art resources to generate an auto-generated routine follow-up care plan; the user is also provided with a simple feature to add other related appointments to the auto-generated list. The user also can easily document and share symptoms and side effects with her care provider. It also provides an easy-to-use feature to help user with keeping track of her lifestyle habits and interventions including BMI, alcohol consumption, overnight fasting, and other lifestyle habits. Mobile notifications which are considered the most effective notifying tool, are used to notify the user about the next upcoming appointment and test dates.

In order to validate and evaluate the application features, two independent semi-structured interviews with medical oncologists were conducted, and their suggestions and recommendations were used to improve the application.

Further implications of this research may be: (1) developing the back-end of the application and publishing it on the mobile application store platform, (2) gathering user feedback and improving the usability of the application, (3) analyzing the data coming from application to forecast best possible routine follow-up plan based on the cancer tumor specification and treatment history.

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APPENDICES

APPENDIX A : ASCO Form

APPENDIX A : ASCO Form

ASCO Treatment Summary and Survivorship Care Plan for Breast Cancer

General Information	
Patient Name:	Patient DOB:
Patient phone:	Email:

Health Care Providers (Including Names, Institution)
Primary Care Provider: NR
Surgeon: NR
Radiation Oncologist: NR
Medical Oncologist: NR
Other Providers:

Treatment Summary		

Diagnosis

Cancer Type/Histology Subtype: Left/Right/Both Breast Cancer Receptors: ☐Estrogen positive; ☐Progesterone Positive; ☐HER2 positive TNBC	Diagnosis Date (year):
Stage: ☐I ☐II ☐III ☐Not applicable	

Treatment Completed

Surgery: ☐ Yes ☐No	Surgery Date(s) (year):
Surgical procedure/findings: Lymph node removal: ☐Axillary Dissection ☐ Sentinel Biopsy	

Radiation: ☐ Yes ☐No	Body area treated:	End Date (year):

Systemic Therapy (chemotherapy, hormonal therapy, other): ☐ Yes   ☐No
☐ Before surgery ☐ After surgery

Names of Agents Used	End Dates (year)
☐5-Fluorouracil	
☐Carboplatin	
☐ Cyclophosphamide	
☐ Docetaxel	
☐ Doxorubicin	
☐ Epirubicin	
☐ Methotrexate	
☐Paclitaxel	
☐ Pertuzumab	
☐Trastuzumab	
☐ Other	

Treatment Ongoing

Additional treatment name	Planned duration	Possible Side effects
☐ Tamoxifen		Hot flashes and vaginal discharge (common); endometrial cancer, serious blood clots and eye problems (all very rare). Other rare side effects may occur.

- This Survivorship Care Plan is a cancer treatment summary and follow-up plan and is provided to you to keep with your health care records and to share with your primary care provider or any of your doctors and nurses.
- This summary is a brief record of major aspects of your cancer treatment not a detailed or comprehensive record of your care. You should review this with your cancer provider.

ASCO Treatment Summary and Survivorship Care Plan for Breast Cancer

☐ Aromatase Inhibitors (anastrozole, exemestane and letrozole)		Hot flashes, joint/muscle aches, vaginal dryness and bone loss (common); hair thinning (rare) Other rare side effects may occur.
☐ GnRH agonist (Zoladex, Lupron) for ovarian suppression		Hot flashes and vaginal dryness (common); other rare side effects may occur.
Other:		

Persistent symptoms or side effects at completion of treatment:

Fatigue: ☐ No ☐ Yes	Menopausal symptoms: ☐ No ☐ Yes
Numbness: ☐ No ☐ Yes	Pain: ☐ No ☐ Yes
Psychosocial/Depression: ☐ No ☐ Yes	Other (enter type(s)):

Familial Cancer Risk Assessment

Breast and or ovarian cancer in 1st or 2nd degree relatives: ☐ Yes ☐ No

Received Genetic counseling: ☐ Yes ☐ No Genetic testing: ☐ Yes ☐ No Genetic testing results:

Follow-up Care Plan

Your follow-up care plan is design to inform you and primary care providers regarding the recommended and required follow-up, cancer screening and routine health maintenance that is needed to maintain optimal health.
Possible late- and long-term effects that someone with this type of cancer and treatment may experience:
Weakening of the heart presenting as shortness of breath and swelling of legs (rare < 5%); and bones become weak and at risk for fracture (osteoporosis). It is important to remember that these symptoms can be due to other causes like diabetes or with normal aging. If these or any other new symptoms occur bring these to attention of your health care provider.

These symptoms should be brought to the attention of your provider:
1. Anything that represents a brand new symptom;
2. Anything that represents a persistent symptom;
3. Anything you are worried about that might be related to the cancer coming back.

Please continue to see your primary care provider for all general health care recommended for a woman your age such as routine immunizations, and routine non-breast cancer screening like colonoscopy or bone density exams. Consult with your health care provider about prevention and screening for bone loss using bone density tests.

Schedule for Clinical Visits

Coordinating Provider	When/How often

Cancer Surveillance Or Other Recommended Tests

Coordinating Provider	TEST	How often
	Mammogram	Annually
	MRI breast	As indicated by provider
	Pap/pelvic exam	As indicated by provider
	Colonoscopy	As indicated by provider
	Bone Density	Every 2 years if on an aromatase inhibitor or as indicated by your provider

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ASCO Treatment Summary and Survivorship Care Plan for Breast Cancer

Breast cancer survivors may experience issues with the areas listed below. If you have any concerns in these or other areas, please speak with your doctors or nurses to find out how you can get help with them.

☐ Anxiety or depression   ☐ Insurance   ☐ Sexual Functioning
☐ Emotional and mental health   ☐ Memory or concentration loss   ☐ Stopping Smoking
☐ Fatigue   ☐ Parenting   ☐ Weight changes
☐ Fertility   ☐ Physical functioning   ☐ Other
☐ Financial advice or assistance   ☐ School/work

A number of lifestyle/behaviors can affect your ongoing health, including the risk for the cancer coming back or developing another cancer. Discuss these recommendations with your doctor or nurse:

☐ Alcohol use   ☐ Physical activity   ☐ Other
☐ Diet   ☐ Sun screen use
☐ Management of my medications   ☐ Tobacco use/cessation
☐ Management of my other illnesses   ☐ Weight management (loss/gain)

Resources you may be interested in:
- www.cancer.net
- Other:

Other comments:

Prepared by: Delivered on:

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- This summary is a brief record of major aspects of your cancer treatment not a detailed or comprehensive record of your care. You should review this with your cancer provider.

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