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Olga Stepanova

Interprofessional interaction during breast cancer therapy in European countries

Scoping Review Study

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Breast cancer is one of the most widespread cancer types in the world. Most effective breast cancer treatment is realized by multiprofessional breast cancer units/teams. Breast cancer treatment strategy transfer occurs in Europe also. European experience in breast cancer care is diverse. A lot of barriers are met on the way of breast care transformation. This review is dedicated to description of professionals implicated in breast cancer treatment, their specific roles and current characteristic of interprofessional interaction.

Scoping review method was used to produce comprehensive perception of the field. Wide range of publications from professional data bases and complementary resources were analyzed. The most acceptable publications were used after study quality assessment using Critical appraisal tool by J.Briggs institute.

Physicians, nurses, radiologist, genetic counselor, histologists, breast surgeons were identified as obligatory members of multiprofessional breast cancer teams. Plastic surgeons, cardioncologists, neurosurgeons, psycho-oncologists, administrative employees and wide range of rehabilitation service specialists are optional team members. Multiprofessional collaboration depends significantly on local regulation of health care and traditions. Common gap is the absence of standardization of breast cancer education and practice. Inclusion of different professionals in multiprofessional discussion and decision-making has pivotal significance for breast care improvement. Current barrier is poor acknowledgement of allied professional's roles. Interprofessional communication intensification stays the challenging task still. Various duties distribution approaches are possible within countries, but strict coordination and information exchange are mandatory factors for treatment process development. European and international experience allows to conclude that rational administration, more complete inclusion of team members and close interaction can be achieved by separation of breast cancer care to independent discipline. Digital tools utilization is useful in information exchange intensification.

Keywords	Breast cancer, multiprofessional team, collaboration, interprofessional communication, Europe

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1 Introduction

Breast cancer is the most often diagnosed cancer type all over the word according to cancer report of International agency for research. Furthermore, breast cancer has the greatest stake amongst female cancer mortality (Sung, H et al.: 2021). Current technologies and breast cancer treatment methods afford to transform breast cancer from life-threatening pathology to chronic pathology state in some cases. As a consequence of such transformation appears a demand of complex and long-lasting breast cancer treatment that involve wide range of diverse health care practitioners. Unfortunately breast cancer mortality rate continues to grow during last 25 years in Europe and other regions (Azamjah, N. et al.: 2019). This statistics emphasizes the actuality of breast cancer treatment development.

Breast cancer as a complex disease requires multidisciplinary professional participation (Green, B.N. & Johnson, C.D.: 2015). European Partnership Action Against Cancer recommends creation of multidisciplinary teams to provide the best effectiveness in cancer treatment and individual patient-orientated tactic of treatment (Borras, J.M., et al. 2014). Multidisciplinary approach involves the use of various practices and their combination. European parliament resolution (B6-0528/2006) ordered to establish Breast Units in European member states by 2016. Implementation goes with different effectiveness: multidisciplinary teams approach is mandatory for some countries (Belgium for instance (Horlait, M. et al.: 2019)), multiprofessional cancer treatment units are actively developed in Italy and Germany, multiprofessional approach is only in the beginning of implementation in Eastern European countries (De Bont, A. et al.:2016). A wide variety of specialists is constantly interacting throughout all stages of treatment according to this strategy – diagnostic, active cancer treatment and rehabilitation. Insufficient communication and lack of coordinated team activity lead to insufficient patient information provision, high potential for treatment errors and ineffective treatment (Steven, B et al: 2019, Campbell-Enns, H.J. et al.: 2017). Furthermore, establishment of integrated practical units demonstrated breast cancer therapy efficiency improvement and cost decrease in Netherlands (Wind, A et al.: 2018).

Multidisciplinary breast cancer unit must involve at least radiographer, radiologist, histo/cytopathologist, surgeon, nurse, counselor and radiotherapist/medical oncologist are needed for proper diagnostic the following treatment according to EUSOMA (European Society of Breast Cancer Specialists) recommendations (Perry, N.M.: 2001).

Multidisciplinary care processes include various activity types like team working, meeting logistics, infrastructure and equipment for clinical experience exchange, quality audit and barriers to and facilitators of multidisciplinary care implementation (Shao, J. et al.: 2019). Most significant barriers are stuff lack of time, resistance of employees and organizational structure.

Teamwork is extremely important in breast cancer treatment but isn't established automatically. Teamwork has a key difference from group communication as demands significant efforts to coordination and communication to effectively achieve the collective goal that is patient's wellbeing (Taplin, S.H. et al.: 2015). Important role plays team leader whose task is creation of comfort atmosphere of effective cooperation and functional activity of all members. Other important part of interprofessional communication is information exchange (Kreps, G.L.: 2016). This is usually achieved by multidisciplinary meetings and reviews. Work roles of specialists during teamwork are clearly defined and all team members act coordinated in the case of well-organized team. There is no duplication and gaps in role distribution. A shared understanding of goals and interdependencies across teams is the key characteristic of effective teams. Teamwork creates continual patient flow amongst professionals and increases healthcare quality in cancer treatment (Taplin, S.H. et al.: 2015). Creation of balanced and comprehensive teamwork is complicated task. Various barriers for interprofessional communication are mentioned. Historical traditions, distant background and misunderstanding could be potential barriers for collaboration, and make different focus of specialists during the therapy.

Improvement of interprofessional partnership is expected as one of effective mechanism of timely cancer diagnosis according to the survey research amongst European primary care practitioners (Harris, M., et a.: 2019). Multidisciplinary discussion has a significant impact to patient management plans in 41% cases of breast cancer treatment according to investigation of Foster, T.J et al. (2016). Multidisciplinary team's generation and development has heterogeneous temps within European countries and meet barriers despite existing European recommendations regarding breast cancer units. Relevance of this review is in analysis of quite fragmented information about interprofessional communication in the field of breast cancer treatment.

2 Aims, research objectives and actuality of the study:

The aim of this review is to characterize approaches and ways of interprofessional communication in breast therapy in European countries. Objectives of the study were:

-identify all the specialists who are involved in breast cancer therapy in European countries;

- characterize the role of specialists and areas of their responsibility;

- describe ways of interprofessional communication during breast cancer therapy in European countries;

-identify gaps and barrier in interprofessional communication during breast cancer therapy;

- propose points to improve in interprofessional communication during breast cancer therapy.

3 Background

3.1 Breast cancer unit organization

Recent tendency in European breast cancer therapy is reorganization of breast cancer treatment to breast cancer units and centers. Multidisciplinary teams' implementation is prevailing approach in Breast Units and centers but there is no unified approach to professional duties distribution. Consequently interaction algorithms are still unclear amongst specialists in European countries. Responsibilities delegated to professionals are contextual and depend on existing relationships between colleagues often and. Attitude to innovations play a significant role in multiprofessional team building. It is possible to divide countries to at least three groups according to type of health care system (de Bont, A. et al.: 2016):

1. with innovative delivery systems (Scotland and the Netherlands), that are characterized with new professional roles appearance as a consequence of continuous new services implementation;
2. stable delivery system (Germany, Italy) have often clinical specialists and administrative stuff as a team members. Breast units' creation is a chal-

lenging task in Italy as traditional organization is different from concentration of different specialists within one clinic. At the same time breast pathologies specialists tried to get maximum consultations from the colleagues in related fields even before breast units formation (Sena, B. & Liani, S.: 2019).

3. at the back front of innovation in delivery systems (Czech Republic and Poland) often have mostly specialized roles .

Description of unified picture is complicated because of diverse development of breast cancer services amongst Europe countries. There are no unified titles of all specialists participating in breast cancer treatment throughout the Europe. The same job titles can imply diverse professional tasks in different countries. In these conditions not only the structure and state protocols influence to professional roles distribution, but also personal experience and existing practice (De Bont, A. et al.: 2016). Professional and cultural boundaries still exist. Overcome of boundaries is a challenging task. Collaboration brings better results and quicker treatment beginning (Sena, B. & Liani, S.: 2019). Multiprofessional team activity requires to reorganization of traditional ways of work, treatment and professional communication.

3.2 **Breast cancer treatment pathway**

Breast cancer treatment can be conditionally divided to diagnostic stage, active cancer treatment stage, rehabilitation and recovery stage. First diagnostic stage involves both breast cancer specialists and primary care practitioners. Leading professionals managing patient are physicians, nurses, radiographers and radiologists on this first stage (Strom, B. et al.: 2019). The task of professionals is not limited only with diagnosis manifestation on the first stage but also patient management and support. The choice of tools and methods is optional. Most protocols include following methods for breast cancer diagnostic: mammography, ultrasound and rarely magnetic resonance. These tools give malignant tissue visualization. Each method has own advantages and disadvantages. Mammography is preferred diagnostic method though results give not well-defined mass lesions and accessibility of lesions close to the chest wall. Ultrasound imaging is chip, useful and comfortable method that can complement breast tissue description and have prospects in future. Mammography is not applicable in the case of contraindications like some genetic mutations, low breast cancer risk or radiation received earlier, etc. Then magnetic resonance is the method of choice (Peart, O.: 2015).

Radiographers and radiologists are responsible for choice of the best suitable and functional visualization tool. The nurses provide patient management and support. Histological and cytological confirmation of malignancy is used after visualization (Peart, O.: 2015). Molecular methods are also widely used for breast cancer typology nowadays. Biomarkers analysis gives information about cancer aggressiveness level, sensitivity to hormone therapy and presence of target molecules. Thus molecular description provides better cancer classification and targeted therapy (Yoon, E.C., et al.: 2018). Psychological support executed by psycho-oncologists can be necessary from the very beginning till rehabilitation and recovery stage.

Many techniques are applied during the treatment process. Surgery and radiotherapy play an important role in early breast cancer. Breast cancer can be metastatic or not, sensitive to hormone therapy or not. Surgical resection of breast tissue and axillary lymph nodes with optional postoperative radiation in combination with endocrine systemic therapy are applied for nonmetastatic cancer cases. Local therapy goes by the wayside and neoadjuvant/adjuvant approaches is of fundamental importance in the case of metastatic cancer (Waks, A.G. & Winner, E.P.: 2019). Surgery practice evolved significantly during last decades. Mastectomy is the most deforming surgery procedures and almost always require following breast reconstruction. Lumpectomy is less invasive surgery procedure that goes together with radiation course (Peart, O.: 2015). Chemotherapy can be applied before and after surgery alone or in combination with another systemic treatment. Physician's sphere of responsibility is the choice of drug for chemotherapy course (Peart, O.: 2015). Prescribing hormone therapy is closely connected with genetic profile. Radiologist, surgeon, oncologist, dosimetrist, radiation therapist, pathologist, reconstructive or plastic surgeon, gynecologist and an oncology social worker are practitioners who take part in active breast cancer treatment (Peart, O.: 2015). Breast cancer except the local problem often has metastasis to lungs, liver, bones, brain (Krishnan, M. et al: 2019; Zagar, T.M. et al.: 2016) and some other organs. Therefore breast cancer multidisciplinary team should be not only be concentrated on breast cancer treatment but pay attention to possible complications and include practitioners specialized in wide range of interests. Breast cancer therapy has developed significantly now and includes not only physical but psychological approaches also.

Breast cancer can be treated successfully or take a form of chronic disease. Perception of new body state is difficult and challenging task for the patient in both cased. Rehabil-

itation process plays a pivotal role in recovery and includes physical activity, psychological support and cognitive rehabilitation, occupational rehabilitation. Rehabilitation physicians, psychologists, social workers are professionals involved on this stage. Integrative therapies are also widely used during cancer treatment. Acupuncture, massage, relaxation, yoga and some other approaches are used in oncology for pain management and other neurological complications and stress consequences during chemotherapy (Greenlee, H. et al.: 2017). Rehabilitation measures can be provided both intramural in health care organizations and remotely using some control activities and consultations. Rehabilitation process doesn't start after the surgery or radiotherapy. Rehabilitation program provision starts from pre-treatment stage in the form of educational activity and lasts throughout the entire course of treatment. Close interprofessional communication increases effectiveness of breast cancer therapy because of more close communication of treatment team with the patient according to newest investigations (Mokhatri-Hesari, P. & Montazeri, A.: 2020). Rehabilitation process includes active patient self-management. Coordinated activity of treatment team should lead to patient health care literacy and opportunity to monitor and manage everyday life with the best outcome. Communication can be divided to formal and informal inside rehabilitation multiprofessional team (Paxino, J. et al.: 2020). The first one has the appointed time frame and are governed by the leaders or highly qualified specialists. Formal communication is only a part of collaboration process inside multiprofessional team. Informal communication is mentioned at the core of effective teamwork inside rehabilitation multiprofessional team (Paxino, J. et al.: 2020). Informal communication can has various forms, be both contact and use digital tools. Nurse's active engagement is often limited to contact interaction in clinic but they are rear included in informal type of communication. At the same time nursing stuff participation can be useful in treatment decision-making as nurses have a continuous close contact with patient. Professional medical language is sometimes inexplicit for patient. Then educational and broadcast role of health care specialists like nurses is especially important. Communication plays the greatest role amongst patients with low level of health literacy due to satisfy patient's need in guidance to cope with breast cancer (health care coordination and self-monitoring actions) that finally improve health care provision (McDowell, B.D. et al.: 2020). Life quality is influenced with cancer coordination, patient care during and after cancer treatment.

Psychological issues play a significant role in successful rehabilitation process and therapy results achievement except clinical issues. Treatment specialists (neurologist,

oncologist, physician) are involved in rehabilitation activity realization also. Anxiety, depression, stress, altered emotional reactions, sleep disturbance and social isolation are common psychological issues accompanying breast cancer (Amatya, B. et al: 2017). Women with diagnosed breast cancer feel vulnerable often. Each country has its own traditions and standards in breast cancer treatment teams and approaches. Beauticians were included in the multiprofessional breast cancer treatment team in Japan to help women who lose their hair, eyelashes and eyebrows during the therapy. Perception of new appearance is also one of psychological stages of treatment and one of the approaches to overcome depression (Ikeda, M. et al: 2020). Everyday patient care standards change because of such collaboration of healthcare specialists with beauticians.

Breast cancer has some specific features during therapy. One of these is importance of patient involvement in informed decision-making (Berger- Höger, B. et al.: 2019, Abt Sacks, A. et al.: 2016). Efforts of multiprofessional team should be concentrated on the patient needs and opportunities. Patient participation in treatment process supposes new way of practitioners and patient interaction according to the health care approaches changings (Muller, E. Et al. 2016).

4 Methodology

This study uses a descriptive literature review approach.

4.1 Scoping review

A scoping review method was used. This method is useful for qualitative description of matter from the perspective of previous research findings and gaps identification, have broad research questions to be solved. Scoping review is suitable approach in the case of description of complex and diverse information as provides broad overview of existing literature (Sucharew, H. & Macaluso, M.: 2019). Search strategy permits to contain in scoping review variable resources including editorials, presentations, conference abstracts, etc. Grey literature utilizing permitted in scoping review also expands research opportunities in comparison with typical peer-reviewed articles. This affords to get comprehensive information about topic investigated. The method was relevant for clarifying the key components of breast cancer treatment, main spheres of involved professional's responsibility and characteristics of interprofessional communication. Scoping review methodological framework includes several mandatory steps in common case:

1) identifying research questions;
2) identifying relevant studies;
3) definition of inclusion/exclusion criteria and study selection;
4) chart the data;
5) collate, summarize and report the results (Sucharew, H. & Macaluso, M.:2019).

A scoping literature review method was based on guidelines provided by Joanna Briggs institute (The Joanna Briggs institute 2015). Review preparation process started from protocol composition. The objectives of research were determined. Inclusion and exclusion criteria were defined in cooperation with instructor. Search focus was system of interprofessional communication and information exchange during breast cancer treatment in European countries. Actual publications' screening was based on title, abstract and finally the full text evaluation. Search was limited in time, location and origin. Statistical analysis was not executed and was not needed. Data systematization and analyzing were needed as for qualitative analysis. References in the text increase trustworthiness of used information.

4.2 Inclusion/exclusion criteria

Inclusion criteria for the selected studies were focused on description of specialists involved in breast treatment and spheres of their responsibility in European countries, clinical practice, education and training in breast cancer therapy as well as describe ways of interprofessional communication during breast cancer therapy. Articles published in English language between January 2015 and February 2021 were included only. Qualitative and quantitative peer-reviewed studies, intervention studies, pilot studies, empirical studies and clinical audits, research and development projects were included.

Reasons for exclusion were associated with the lack of relevance for the search questions, the type of the article or the target group. Exclusion criteria's were publication date before January 2015, articles written in language different from English language, location of investigated case out of Europe, investigation of other cancer types.

4.3 Search strategy and retrieval of studies

Study selection was an iterative process of screening abstracts and revising the inclusion and exclusion criteria. The titles of the references were screened, and abstracts were read if the title had a slightest possibility of being relevant to the subject. Full text was read in the case if abstract seemed to be relevant to the topic of research, exclusion and inclusion criteria.

Results were obtained with the selected keywords and their combinations, using the databases. The following electronic search engines and databases were used: PubMed, EBSCO Host (including CINAHL complete, eBook collection, Medline, OpenDissertation). A web search in Google Scholar and Google was conducted for gray literature. Multiple search combinations were used, such as "breast cancer interprofessional/multiprofessional/interdisciplinary communication", "breast cancer multiprofessional teams", combination of "breast cancer therapy"+ "specialists/professionals" (nurse, physician, psycho-oncology, radiologist, surgeon, surgeon assistant, genetic counselor, cardioncology, neurooncologist) + "Europe" + "collaboration": for instance "breast cancer nurse Europe collaboration". Inclusion of "interprofessional communication" point in search requests can cause loss of publications for the detailed description of specific professional's duties. But without this limitation literature search could result in great amount of publications dedicated to clinical aspects of breast cancer treatment discon-

nected with interprofessional communication field. The screening process was conducted by one researcher. Research strategy was discussed with thesis curator and student society.

In total 13967 studies were identified by literature search and reference search (n = 15) (Figure 1). Duplicates were removed. The remaining studies (n = 13839) were screened for inclusion. Furthermore, 13138 studies were excluded by title and 571 studies after abstract reading because of deviating the inclusion criteria. The remaining studies (n = 108) were read in full text. Study methods were heterogeneous and included 29 surveys, 17 reviews, 5 randomized controlled trials, 7 editorials, 6 position papers, 6 case studies, 3 retrospective cohort studies, 1 prospective cohort studies, 1 case-based comparison, 1 statistic report, 1 pilot study, 1 clinical practice guidance, 1 clinical audit, 3 commentary on the reviewed article and 1 policy statement.

Forty three readings out of 108 were finally selected for this coping review inclusion. The quality of articles was assessed by using the JBI's critical appraisal tools.

4.4 Data description and processing

The following information was collected: the author(s), the year of publication and country, purpose of the study, study design and sample size, and the key findings and output. Information was fixed in extraction form together with assessment result. Study assessment was realized using Critical Appraisal Tools by Joanna Briggs Institute. Quality was quantified by assigning scores of either 0 or 1 point per criterion. One point was assigned if the item was mentioned in the study, and zero if the item was not mentioned or was unclear. Overall quality of the selected studies was assessed as good.

Intervention contents were divided into subgroups according to source, topics and professionals involved in treatment process. First level subgroups were divided according to database name used for data obtaining. Second level subgroups were organized according to territorial affiliation of described data to "European countries" and "non-European countries". Third level subgroups were organized inside second level' subgroups according to professional specialization: "nurses", "physicians", "psycho-oncology service", "oncologists", "complication solving specialists", "supportive clinical services", "supportive non-clinical (public) services". Publications were divided to forth level subgroups inside third level subgroups to "professional duties" and "interprofessional connections". Forty three articles and documents were used in main analysis.

Twelve were dedicated to interprofessional collaboration, two – to breast unit's standards, two – to role distribution in cancer care and breast cancer care, five articles examined the role of nurses, two – role of physicians, two – role of biomedical laboratory scientist, one – roles of radiography department stuff, two – role of surgeons, one article examined role of genetic analysis in breast cancer, six examined psycho-oncology support, two articles explored cardioncology support, three – breast cancer brain metastases management and three articles discussed breast cancer rehabilitation services. Sixty seven articles were not used in main analysis because of inconsistencies with territorial parameters of inclusion but were useful in introduction and discussion part. Data extraction was documented in data chart (Appendix 1, 2 and 3). (JBI manual for evidence synthesis: 2020).

Majority of publications about breast cancer multi-professional team's activity were published in USA, less in UK, Canada and Australia. Italy, Germany and UK can be characterized amongst European countries with active publication activity and development of breast cancer treatment.

Key professionals involved in breast cancer care were identified, their roles were described and main characteristics and challenges of interprofessional communication were summarized as a result of review.

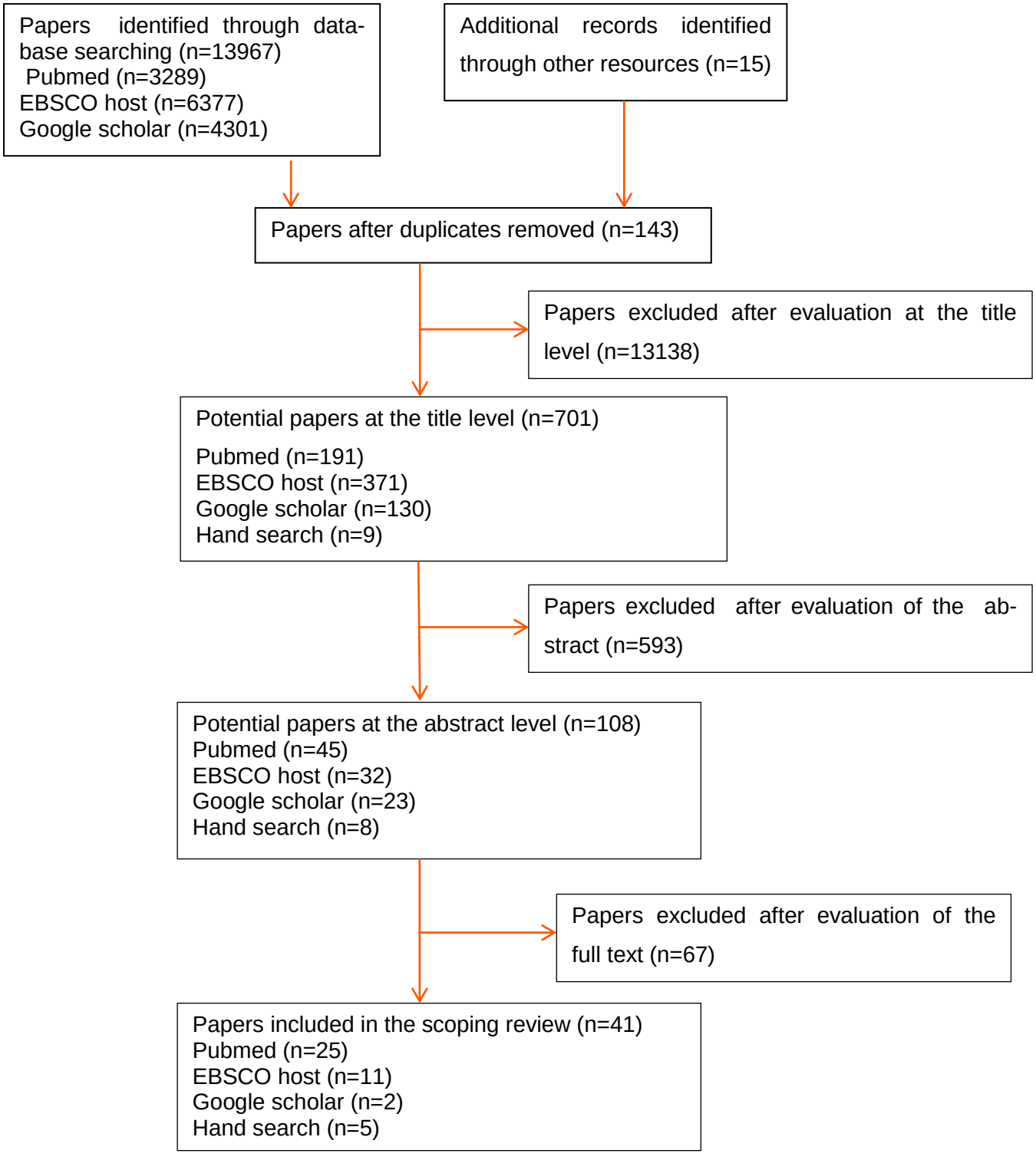

Figure 1. Selection process for included studies.

5 Results

First section of current investigation was to describe and demarcate the most frequently mentioned professional tasks and professional roles and then describe the characteristics of interprofessional communication. Physician, breast clinician, breast surgeons, radiologists, radiographer, pathologists, medical oncologists, breast care nurses, advanced nurse practitioner, therapists, psycho-oncologists are multidisciplinary teams members involved in breast cancer therapy. Reconstructive surgeons, nurse navigators, clinical trials nurses, physiotherapists, psychologists, genetic counselors, social workers, pharmacists, clinical trial coordinators, trainees, researchers, anesthesiologists, data managers, palliative care specialists and health care assistant are less frequently mentioned team members (Shao, J. et al.: 2019; Cardoso, F. et al.: 2017; de Bont, A. et al.: 2016).Some specialists are mandatory team members and some specialists are included optionally.

Second section of current investigation was to clarify the ways of interprofessional communication during breast cancer treatment. Investigation was dedicated to European practice investigation.

5.1 Roles of specialists in treatment process and their interactions

Primary care nurses and physicians are the most numerous professional categories within care units (Schärli, M. et al.: 2017). They are foreground of healthcare service. Physician's role is significant. Physician provides communication with the patient during first visit to breast cancer center and during following consultations, composes the treatment plan (Berger-Höger et al.: 2019). Physician plays a key role in multiprofessional team coordination and work distribution amongst specialists during the treatment process (de Bont, A. et al.: 2016). For instance physician determines computer tomography scanning strategy together with radiographer. Then physician defines the observation and treatment plan, the target dose, and dose limits for critical organs after getting scanning results. Decision is made by discussing diagnosis and treatment strategy, possible consequences and outcome of treatment with the patient (Steven, B. et al.: 2019, Huhlweg, P. et al.: 2017). Realization of informed decision making is another aspect of physician's activity. Verhaegh, K.J. et al. (2017) declares that practitioners are concentrated on short-term planning, in particular treatment strategy creation.

Nurse's role in treatment process is debatable. Nurses are strongly involved in treatment process and communication with patient from one point of view. Main nurse's

responsibilities are participation in early cancer detection and initiation of medical examination, patient's informational and mental support, management during therapy including the schedule keep. Providing manuals and patient's consultations is important part of nurse's activity (Coolbrandt, A. et al: 2018). Verhaegh, K.J. et al. (2017) described that nurses are the active actor in treatment process in Netherlands. They mostly participate in long-term treatment planning like discharge planning.

Nurses take part in treatment decision-making indirectly even in conditions of poor involvement in multiprofessional discussion (Hahlweg, P. et al.: 2017). Intensive implementation of nurses consultation is challenging task for providing valid informed shared decision-making (Decadt, I. et al.: 2020, Vandezande, L. et al.: 2020). Nurse's communicating increase significantly patient's involvement in decision-making process (Berger-Höger, B. et al: 2019). Nurses have an important role in guiding and supporting the patient through the breast cancer care pathway, provide patient support during chemotherapy in Turkey (de Bont, A. et al.: 2016). Analyzing experience of Belgium can be concluded that nursing support have a great value for patient treatment. For instance informed and confident patients have fewer complications during courses of chemotherapy. Nurse intervention for coaching patients to adequately self-manage treatment-related symptoms at home made negative consequences of chemotherapy less harmful (Vandezande, L. et al.: 2020). Training nurses as decision coaches was realized and their role was to provide of high quality information material about pathology (disease) to patient and contribute to outcomes (Decadt, I. et al.: 2020).

Nurse's task is to clarify the social resources during the communication with patient (relatives, friends, etc.) for rehabilitation taking into consideration not only personal characteristic features but also cultural background. Danish experience confirms that the nurse's responsibility includes the tasks of rehabilitation needs identification after the surgery, providing information about rehabilitation services and rehabilitation management (Nyholm, N. et al.: 2018). Nurses monitor patient wellbeing and give useful contacts and marks besides other tasks in Netherlands (de Bont, A. et al.: 2016). Nurse's influence to treatment strategy is realized by communication between professionals and patient, relatives also after the surgery.

Nurses are poorly integrated in multiprofessional teamwork from other point of view. Low nurse's integration in decision-making process is character for German healthcare system (Huhlweg, P. et al.: 2017). Nurses have some influence as a source of infor-

mation for practitioners about patient personal characteristics. Nurses are involved in breast cancer units activity as specialists who make a schedule in Italy, but their close communication with the patient is not used fully for the better treatment outcome (Sena, B. & Liani, S.: 2019). Nurses have often lack of time for psychological support and patient's future perspective discussion (Cruickshank, S. et al.: 2020). By the way nurse and physician complement each other to create comprehensive therapy strategy inside the multiprofessional team.

Patient's self-awareness and quality of life are vulnerable during breast cancer therapy in addition to common negative effects from surgery and chemotherapy. Between 20-70% of patients with breast cancer need psychosocial support (Ernstmann, N. et al.: 2020). Psycho-oncology is relatively new interdisciplinary field (Lang-Rollin, I. & Berberich, G.: 2018). Approximately 30% of cancer deaths are attributable to lifestyle, behavioral and psychosocial risk factors that emphasize the importance of this field (Watson, M. & Dunn, J.: 2016). Psycho-oncology support is addressed to distress patient, provide psychosocial cancer care and increase of quality of care (Neamtiu, L. et al.: 2016). Psycho-oncology includes working out of pain consequences, mental changes and various fears, depression, stress and anxiety effects, risk of reproduction function disruption and some other (Lang-Rollin, I. & Berberich, G.: 2018). Maximum distress level accompanies the first stage of breast cancer treatment – diagnosis establishment (Dionigi, F. et al.: 2019).

Austria, Belgium, Germany, Luxemburg, Netherlands, Poland, Spain, Switzerland, Scotland and Northern Ireland are European countries that have the most detailed recommendations, indicators and measures description of psycho-oncology support (Neamtiu, L. et al.: 2016). Psycho-oncological care providing is required certification criteria for breast cancer centers in Germany (Ernstmann, N. et al.: 2020) and include diverse professionals (social workers, nurses, psychological service, etc.). The psycho-oncology care to breast cancer patient is developed quite well in Germany and development of this field still continues (Kowalski, C. et al.: 2016). Alongside psychological comprehensive screening isn't executed in about one-fifth of the centers in Germany (Ernstmann, N. et al.: 2020). Psycho-oncology service integration into cancer treatment is insufficient in UK (Watson, M. & Dunn, J.: 2016). There cognitive-behavioral therapy is realized by nonpsycho-oncologists in common case. Psycho-oncologists are involved in the most complex and severe cases only (Watson, M. & Dunn, J.: 2016). Significant amount of breast cancer patients avoid communicating with psycho-oncologist

in Italy (Dionigi, F. et al.: 2019) because of cultural preconceptions. Tests prepared by psycho-oncologist can be provided to patients by the nurses at the initial stage to avoid miscarriage of supportive care during therapy in this case.

Radiography service is another one important service of breast cancer care. Effective radiography service includes radiographers and also non-medical services. Role of radiographers is pivotal as a part of multidisciplinary cancer teams (Balasubramaniam, R. et al.: 2015). Breast imaging reporting and differentiation of pathological cases depends on the radiographer. Clear images of radiography observation have to be discussed after analyzing by radiographer with breast surgeon and have a great significance in preoperative cycle and preparation for the resection planning. Radiography examination of tissue specimen obtained during resection have some advantages over histological methods of examination (Tan, M.P. et al.: 2017) and determines the treatment strategy. Radiologists use new equipment with the elements of machine learning and artificial intelligence now. This approach affords decrease percentage of false-negative examinations results (Watanabe, A. et al.: 2019). It is extremely important to decrease the rate of malignant recurrences in the case of multifocal and multicentric breast (Tan, M.P. et al.: 2017). Radiologist and radiographer develop treatment plan from physician into radiation plan during treatment stage. They are involved in venous access procedures (Shay, W. et al.: 2017), imports the computer tomography images into the planning system, creates a 3D reconstruction of the patient's body and draws the outline of the body and bone structures (de Bont, A. et al.: 2016). Radiation oncologist is a doctor who treats cancer using radiation.

Radiographer's qualification is as important as they are the only professionals during the radiological image procedure. Radiographer and nurse are perceived by patient as a common duty, but each has his own task in reality. Radiographer prepares patient during radiography procedure and makes radiographic pictures in diagnostic stage (Sena, B. & Liani, S.: 2019). Radiographer makes radiation plan according to treatment plan made by physician during treatment phase (de Bont, A et al.: 2016). Radiographer is more concentrated on technician point of view like proper patient possession during procedures and clear pictures outcome. Nurses accompany the patient and are more concentrated on intravenous procedures, communication with the patient and explaining the processes (Sena, B. & Liani, S. 2019).

Implication of histology service is significant in breast cancer unit activity. This position can be named pathologist also. Histological analysis is useful during both diagnostic and treatment stages. Firstly histology is applied during the diagnostic surgery to ensure the nature of breast neoplasm. Tissue estimation during the surgery is the second important application point of histology. Histopathologist confirms pathological report. Abnormalities detected during tissue analysis can guide therapy strategy. Inclusion of histopathologists in multiprofessional team discussions and conferences improve whole perception of the treatment process by histopathologist (Blackwood, O. & Deb, R.: 2020) and simplify interprofessional interaction.

Appropriately trained genetic counselor consultations are important part of breast cancer treatment process (Rutgers, E. et al.: 2019). First application of genetic analysis is predictive healthcare. Predictive genetic testing is used to identify the risk of cancer development amongst people without any visible or diagnosed current pathological breast alterations. Predictive test for BRCA1/2 is available in European countries to select a high risk patient group. Access to this testing is limited and after-testing support is not provided in appropriate ways (Genetic testing for the BRCA mutations, 2019). Proper genetic test interpretation is challenging task that brings opportunity for the wide early breast cancer diagnostic. Simultaneously predictive breast cancer diagnostic based on genetic tests only is complicated still. This is because of unclear modified genes panel connected with breast cancer progression. Association of family cancer history and genetic test result affords to make a treatment strategy as genetic test only doesn't give univocal conclusion. Second genetic testing application is to identify the cancer "fingerprint" during cancer treatment to make treatment more specific.

There are gaps and problems with breast cancer genetic test implementation in Europe (Rutgers, E. et al.: 2019). Test application is not standardized enough (Rutgers, E. et al.: 2019). Local regulation of genetic tests involvement in treatment process exists in some European countries (UK and France for instance). Genetic tests provision is not mandatory in Breast units till 2022. Eurogentest project is founded for harmonization of genetic tests implication and professional recognition (Rutgers, E. et al.: 2019). Unfortunately lack of test results standardization and lack of experience in dealing with genetic test's results often leads to poor diagnostic effectiveness in Europe (Genetic testing for the BRCA mutations, 2019).

Biomedical laboratory scientists can execute comprehensive laboratory diagnostic including histology and genetic tests. This position proposes broad laboratory activity including laboratory tests' execution, management and quality control, diagnostic protocols' development, test's results interpretation, teaching and some others (Diamandis, E.P., 2002). This service is developed in UK (Bortesi, M. Et al.: 2018), Denmark (Smith, J. et al.: 2017), and some other European countries.

Surgical oncologists (surgeons) are considered to be obligatory breast cancer treatment team member. Diverse preoperative diagnostic is available in most cases nowadays and the surgery for malignant tissue extraction is needed only (Biganzoli, L. et al.: 2017). Surgeon's task is to take out malignant tissue with serving healthy tissue as much as possible. In some cases biopsy can be needed on the first stage of breast cancer diagnostic. Then surgeon executes diagnostic biopsy.

Surgeon's decision-making about tools and drugs used during the surgery influence significantly to the following treatment processes. Persistent pain of various types and location accompanies breast cancer patients in their everyday life (Hamood, R. et al.: 2017) and decreases significantly quality of life (Costa, W.A. et al.: 2017). Surgeon's role in pain management is to choose the less invasive techniques of treatment (Rawal, N.: 2016). Pharmacological management and selection of anesthesia drugs during the cancer surgery influence to postoperative pain level and common patient wellbeing (Rawal, N.: 2016). Thus surgeons influence to treatment strategy choice and make an investment in postoperative recovery.

Current tendency is combination of oncologic and plastic surgical approaches to breast cancer surgery (Kaufman, C.S.: 2019). Part of the patients is needed to make breast reconstruction during mastectomy according to standards established by European Society of breast cancer (Biganzoli, L. et al.: 2017). Breast reconstruction can be realized together with tumor tissue removing surgery or after some time. Clinical case demands active preoperative evaluation by both plastic and breast surgery before the surgery (Kaufman, C.S.: 2019). Plastic surgery is not the first-stage task within breast cancer treatment though it is widespread and actively developing. Priority is given to cancer treatment.

Breast cancer and its treatment are strongly connected with side effects. One of the most frequent side effects is cardiovascular complications. Cardioncology is recently

developed interdisciplinary healthcare area. Cardioncologists are obligatory multiprofessional breast cancer treatment team members. European Society for Medical Oncology formulated clinical practice guidance for management of chemotherapy induced cardiovascular toxicity since year 2012 (Curigliano, G. et al.: 2012). Mutual effects are observed: cancer therapy can cause cardiovascular diseases and cardiovascular diseases can limit therapy methods. The task of cardioncologist is to maintain balance between cancer care and cardiovascular safety. Cardiac monitoring by tissue Doppler together with biochemical markers (troponin, myeloperoxidase level) are made on the early stages, ace-inhibitors treatment implication is applied if needed (Cardinale, D. et al.: 2018). Troponin monitoring during the breast cancer treatment and after treatment observation is important approach embedded in post cancer treatment monitoring to prevent cardio complications. Cardio protection therapy is applied in the case of increased troponin level identification. European Society for Medical Oncology adopted cardiotoxicity monitoring for the patients receiving chemotherapy. Primary prevention of cardiological complications is cardio-protectants prescription to all patients prior to chemotherapy starting. Secondary prevention is addressed to high-risk patients demonstrating preclinical signs of cardiotoxicity. Cardiovascular monitoring is critical for survival breast cancer patients ratio. Close cardiovascular monitoring can be canceled after the year of chemotherapy provision according to European countries experience (Cardinale, D. et al.: 2018).

Second type of most frequent breast cancer complications is brain metastasis. Brain metastases are the major cause of breast cancer patient's mortality (Krishnan, M. et al.: 2019). Only certain types of breast cancer give rise to brain metastasis (Krishnan, M. et al.: 2019, Zagar, T.M. et al.: 2016). However about 24-34% of women with stage IV breast cancer have brain metastases (McArthur, H. et al.: 2016). Thus neurosurgery participation in breast cancer treatment team is critical. Laboratory recognition of breast cancer subtype using genomic testing and brain metastasis risk estimation are important points of personalized breast cancer treatment (Zagar, T.M. et al.: 2016). Neurosurgery and supportive care services (like nutrition, psycho-oncology) are needed additionally to the patients with brain metastasis (Zagar, T.M. et al.: 2016). Neurosurgeries are optional breast cancer multiprofessional team member.

Breast cancer therapy is continual process. It is accompanied with high distress level that is not eliminated with the therapy conclusion (Dionigi, F. et al.: 2019) because of both relapse possibility and remaining cosmetic (visual) consequences of the surgery.

Post treatment rehabilitation has a great importance. It includes physical training (cardiovascular training, muscular endurance training) and psycho-educational session (psychological aspects, stress management, sexuality) (Leclerc, A.-F. et al.: 2017). Therefore rehabilitation stage can include wide range of diverse specialists. It is directed by personal needs and patient's expectations. Post-treatment service's team personnel is reliant significantly on cultural context and personal needs.

Main breast cancer multiprofessional team members were discussed in this section. The number of specialist involved in multiprofessional breast cancer treatment team is variable. Physician, nurse, surgical oncologist, radiologist, radiation oncologist and cardioncologist are the professionals participating in disease curing. Involvement of additional specialists like neurosurgeon and plastic surgeon is optional. Wide range of supportive specialists like genetic counselor, histologist, psycho-oncologist and rehabilitation professionals provide various services for comprehensive breast cancer diagnostic, treatment and breast cancer survivors life quality improving. Their engagement is sufficient for comprehensive discussion of prevailing part of breast cancer cases.

5.2 Interprofessional interaction and communication during breast cancer therapy

Constant development of cancer treatment and implementation of new tools and approaches are realized in cancer centers or cancer units. Structure of health care organization implies multiprofessional consolidated solutions in breast cancer units. Popularity of this approach is growing due to association of optimal decision-making in cancer therapy with multidisciplinary teams. At the same time individualized clinical care is traditional approach and can be hardly modified in some situations. A great number of specialists are involved in all stages of cancer treatment. Close collaboration within the cancer treatment units affords to create new treatment protocols. Creation of highly specified and comprehensive documentation templates facilitates the information exchange and promotes mutual improvement. Traditional information exchange and decision-making models are not affective any more in multiprofessional units. It requires whiling to absorb and exchange experience of other specialists from all the members. Multiprofessional collaboration skills should start to form from the stage of education. There is no homogeneity in educational and training programs of breast care special-

ists unfortunately (Marcopoulus, C.: 2019). It is expected that medical students communicate with other professionals inside the treatment team, learn to collaborative work and roles distribution inside the team for the goal of patient's wellbeing during education (Knoop,T. et al.: 2017).

Multiprofessional collaboration has several characteristic approaches and tools. Weekly meetings are one of such tool. Specialist's involvement depends on the stage of cancer development and treatment prospects. Training courses are forming common approaches between team members and are needed prior to team activity realization. Digitalization is essential feature of communication style modification. Modern communication tools can be useful to improve interprofessional communication. For instance video-based consultation that brings patient, general practitioner and oncologist together. It is appreciable to improve cancer treatment services and patient's quality of life (Trabjerg, T.B. et al.: 2019). New standards of data provision and storage, implementation of common software tools seems to be useful in communication and information exchange intensification improvement (Hequet, D. et al.: 2017). Digital data exchange has a great significance in inter-professional communication between oncologists, nurses, inpatient and outpatient physicians. Consultation report, examination result, treatment report and multidisciplinary meeting report can be shared (Hequet, D. et al.: 2017).

Non-health professionals play a significant role in informational exchange during cancer treatment. The service *Improving the Cancer Journey (ICJ)* was implemented in Glasgow in 2014. It combines data from governmental and non-governmental organization, services and some other specific information. ICJ service office specialists are people with professional backgrounds in housing, financial inclusion, home care, social care and healthcare support. ICJ service creates community of the patients and comprehensive informational support about treatment and financial opportunities. This service implication gives opportunity to practitioner to focus on clinical patient's treatment and have no deal with social aspects of treatment (Young, J. & Snowden, A.: 2020). Interprofessional communication improvement was solved with colocation of health and non-health services. Decrease of patient vulnerability and fear is another positive point of such service that improves patient's well-being and health complications.

Effective team leadership is another challenging task during multiprofessional team health services provision. Analysis of different leader models applicable to multiprofes-

sional team was explored in the context of cancer services in UK. Shared leadership model intends several leaders' involvement in team's actions coordination. Shared leadership creates comprehensive approach throughout different disease stages (for instance diagnostic, therapy and rehabilitation) during cancer treatment process. Treatment stage determines the leading person and patient "flows" from one treatment stage and professional to another. Each leader is responsible for limited patient journey fragment. Shared leadership is the most effective model in breast cancer, but requires a significant shift from traditional practice. Another variant is task-orientated leadership model when leadership function is provided by one manager of team members. Leading role is often provided by physician, oncologist or non-medical administrator. Goal setting, stuff engagement, coordination and monitoring are the sphere of responsibility of such leader. Relations-oriented leadership task is to create emotionally comfort inside the team and common negotiation. Personal emotional intelligence is important factor for such leader role. Position of such leader can be variable. Change-orientated leadership covers the need in implication of innovative strategy to reality. Each breast cancer team member can exhibit features of change-orientated in own area during optimal treatment strategy search. Connective leadership creates connection across practice settings and providing information exchange. Nurses can provide connective and relations-orientated leadership as their patient-orientated approach can help significantly in situation analysis (Willcocks, S.G.: 2018). Leadership model's various combination can be applicable. Effective leadership ensures rational decision-making process and quick coordination of treatment procedures.

Affective patient journey is achieved with high coordination of breast cancer team members. Prevailing part of newly diagnosed breast cancer cases are seen by primary care physicians. Post-operative rehabilitation management is the area of responsibility of primary care physician also. That's why the important area is information supply to primary care physicians with breast cancer treatment team members. Resent investigations identified the significant positive shift in communication between physicians in primary care and cancer units or hospitals in France (Hequet, D.et al.: 2017).

Physicians and nurses are main participants in decision-making during breast cancer therapy according to Netherland's practice (Verhaegh, K.J. et al.: 2017). Information exchange and collaboration between physicians, nurses and oncologists is extremely important for treatment progressing. Unfortunately current organization characteristics and traditional time planning often prevent from effective communication. Briefing for-

mat and time should be corrected to deliver best care quality and information exchange. Trial investigation in Germany demonstrates that educational interventions like nurses training and physician participation in workshops made decision making more rational, resulted in time saving for physicians and better cooperation of nurses and physicians (Berger-Höger, B.et al.: 2019).

Surgeons have the best communication with primary care physicians nowadays while medical oncologists and radiation therapists have some points to be improved (Hequet, D. et al.: 2017). Structural features of treatment organization have a great influence to character of informational exchange also. The worst primary physician communication was observed with teaching hospitals and the best one with cancer centers.

Let's consider interprofessional contact points more detailed. Responsibility for treatment outcome gets a physician in most cases. Unfortunately interaction between nurses and physicians has barriers (Schärli, M. et al.: 2017). Mistrust to nurse's competences prevent effective teamwork. Investigation carried out in Chronic-care units (Tuscany, Italy) demonstrated that nurses had a significantly higher attitude towards collaboration than physicians whereas physicians can hardly see the nurses as an equal treatment process participant (Vegesna, A et al.: 2016). These data are applicable to the breast cancer therapy also. Analysis of European and international survey's results demonstrate that physicians are less prone to collaboration than nurses (Sollami, A et al.: 2015). A particular effect of nurse's low involvement in decision-making is weak cancer pain management skills. Cancer pain is manifested at all stages of disease. Pain assessment is mostly executed by nurses. Non-recognition of nurses as a full-fledged multiprofessional cancer treatment team lead to inadequate knowledge regarding the cancer pain (Ferreira, F.S. et al.: 2016). Complete disease perception including pain management is achieved by inclusion nurses in multiprofessional team as full-fledged members.

Nurse-physician communication improvement is observed due to organizational meetings and other events emphasizing importance of inter-professional collaboration (Sollami, A et al.: 2015). Some shift is observed recently in nurse's prospects. Medical and nursing schools encourage shared experience and enhance understanding of the roles of nurses and physicians. Multidisciplinary team's creation results in skill-mix reforms in European countries. New organizational type gives motivation to expand new roles much more effectively and new career opportunities for the nurses (Köppen J, et al.

2018). Personal satisfaction plays as a strong motivating factor almost among all nurses (95,7%) in the countries with skill-mix reform (England, Scotland, Netherlands) that characterize high quality of their activity.

Connection of multiprofessional team leader with psycho-oncology service is not established clear in European countries. Barriers are poor informational transfer between physicians and psycho-oncologists concerning patient's psychological or psychiatric comorbidities, poor physician's informedness about opportunity of psycho-oncological help, deficiencies of psycho-oncologists in surgery departments. Physician recommends or directs patient to psycho-oncology support in Germany. Then provision of psycho-oncology service depends totally on physician's informedness. Inpatient physician prevents often initiation of psycho oncology to cancer patients. Whereas outpatient physicians are often informed about psycho oncology support specialist's opportunities (Steven, B. et al.: 2019).

Surgeons play one of the leading roles during the treatment phase. Their interconnection with other practitioners affects the treatment strategy and stimulates professional development. Radiologist and surgeon communication is pivotal during diagnosis estimation and particularization. Case discussion with participation of these specialists after the surgery has a great meaning for treatment decision-making. Radiologist and surgeons participation in postoperative conferences plays a critical role for treatment outcome analysis (Tan, M.P. et al.: 2017). Surgical specimen's investigation indicates relevance of applied therapy. Surgery treatment procedures become more evidence-based through this communication. Surgeon and cancer nurses' direct interaction seems to be weak, but its indirect connection is quite significant. Nurses are the main personalities in after-surgery monitoring and are coping with surgery consequences a lot. Surgery technologies' progress result in time-lapse decrease for the surgery and hospital stay time after surgery. It can be pointed as a positive tendency. At the same time this positive shift complicates nurse's activity as disruption of getting patient's feedback. That causes complicated rehabilitation needs diagnostic and coaching (Nyholm, N. et al.: 2018). Consequently changes in surgery stage of treatment should cause alteration in other breast care services organization for cancer care quality maintaining.

Cancer and plastic surgeon dialog attracts attention as one of the most complicated elements in multiprofessional breast cancer care in such a way. Conflicts regarding

quantity and location of removable tissue appear between these professionals quite often (Sena, B. & Liani, S.: 2019). Breast surgery goal is to remove malignant tissue to eliminate the possibility of relapse that led often to radical surgery. Breast reconstruction surgery demands minimal breast tissue damage at the same time. Combined surgery is connection of malignant tissue removal and breast reconstruction in one surgery procedure. Conflict of interests can lead to conflicts inside the treatment team and decrease the rate of combined operations in the absence of common experience. Furthermore combined surgery can induce additional following therapy barriers. All these facts decrease combined surgery's applicability. This results in more complicated patient journey and additional risks in turn. It is complicated as it can induce additional barriers on the stage of following therapy prescription. Panel surgery discussion is highly desirable to implicate combined surgeries as much as possible.

Complication management is always interdisciplinary medical area. Close collaboration of cardiologist and oncologists is pivotal for treatment strategy selection (Cardinale, D. et al.: 2018). Cardioncologist works closely to cardiologist to estimate properly EKG and other monitoring measures, to cardioncologic nurse – for performing the monitoring activity. Publications dedicated to neurooncologist's connection with other breast cancer team members were not identified.

Post-treatment patient support plays a pivotal role in treatment outcome. At the same time lack of communication between treatment and rehabilitation specialists is often observed. The newest publications emphasize that interprofessional communication disruption results in gap between rehabilitation need and rehabilitation practice in Sweden, e.g. prolonged rehabilitation waiting time (Möller, O. et al.: 2020). Greater part of follow-up breast cancer teams that are not directed by radiologist or primary care physicians , have poor data collection and integration opportunity according to another investigation made by Italian Group of Mammography screening in Italy (Morrone, D. et al.: 2017). Follow–up programs are not unified and have diverse protocols that can include or exclude tumor markers, tomography and other analyzing methods. About 60% of follow-up services use protocols that are not optimal for reducing mortality. Moreover, half of screen-detected breast cancer cases are not assisted by an active follow-up service (Morrone, D. et al.: 2017). Palliative physicians are rarely involved in decision-making process though their view can be useful in chemotherapy strategy choice (Sena, B. & Liani, S.: 2019). Defective connection between treatment and reha-

bilitation services decreases significantly positive treatment achievements in long-lasting prospects.

Successful innovative multidisciplinary team's activity demands new relational model focused on patient's need. Patient's inclusion in breast cancer decision-making process is debatable question (Verhaegh, K.J. et al.: 2017). Patient is often confused by big quantity of professionals that form breast cancer multiprofessional team and can hardly critically perceive all information to participate in treatment decision-making rationally from one point of view (Quinn, G.P. et al.: 2012). Patient informed involvement in decision-making can bring significant impact to optimal treatment decisions, treatment effectiveness improvement and treatment and rehabilitation time decrease from another point of view (Huhlweg, P. et al.: 2017, Verhaegh, K.J. et al.: 2017). There is no doubt that on the stage of post-treatment rehabilitation patient engagement in decision-making is essential and improve significantly outcome. Shared decision-making is poorly implemented in cancer care now. Patient involvement in decision-making is formal in most cases In Germany (Huhlweg, P. et al.: 2017, Berger-Höger, B. et al.: 2019). Patient engagement in decision-making process during cancer treatment is interrupted with time pressure, responsible physician's rotation, poor coordination of care and misunderstanding of medical issues by the patient. Patient education is needed for treatment continuous maintaining and psychological comfort. Cancer care nurse's poor engagement in multiprofessional team (Huhlweg, P. et al.: 2017) contributes to insufficient patient's engagement in treatment process and hence negative effects to treatment outcomes. High –quality patient involvement can be achieved by communication improvement through both nurses and physicians. Tools of communication can be diverse. Development points can be modification of communication time possibilities or implementation some additional digital forms for communication with patients.

Requirements concerning breast unit's structure published by EUSOMA were not met completely by most countries till now. Voluntary basis of breast cancer centers accreditation makes a contribution to a slow harmonization of breast cancer care in Europe (Markopoulos, C.: 2019). Creation of local protocols is long lasting process and is still desirable and challenging task despite of numerical European recommendations.

Summarizing the chapter is worth mentioning that multiprofessional teams are quite recent development as task-orientated units. European countries have diverse level of multiprofessional teams culture development and further evolving is needed. All the

systems of professional education and training, organizational structure and treatment approaches need to be modified further. Surgery service connection with all other services has a strong effect to the treatment outcome. Treatment strategy choice is influenced significantly by collaboration of specialists responsible for complication. Traditional task distribution is subject of transformation. Nurse services potential is great and is poorly used now, psycho-oncology service is insufficiently implicated in breast cancer care.

6 Discussion

The aim of research was analysis of European breast cancer services. The list of services and specialists of breast cancer department and units is diverse within European countries. The most frequently mentioned participants of treatment process are physicians, nurses, oncologists, cancer surgeons and plastic surgeons, radiologists, genetic counselor, psychological support services stuff members. Process of multiprofessional breast cancer unit's formation is not finished. It has different stages of development among European countries. Moreover the duties' distribution is variable within countries. Common clusters of successful practices and challenging areas can be seen at the same time. Exclusion of some specialists from the multiprofessional team causes significant damage to breast cancer services on the whole. The most frequently exclusion reasons are administrative barriers, arrogant attitude of some professionals to other and professional interest's conflicts. The most accepted tool for multiprofessional team collaboration is regular meetings, but other communication tools are also developing. Intensive development of breast cancer units is registered in countries all over the world. Development features and approaches are variable.

6.1 Discussion of the results

6.1.1 International experience

Multiprofessional breast cancer units' development is actual task in international context. Examples of international experience are useful for comprehensive analysis of interprofessional communication approaches, barriers and challenges. Moreover European standards recommended for breast cancer treatment contain the chapters adopted from guidelines of American society of Clinical oncology (Biganzoli, L. et al.: 2017) that emphasize the actuality of American experience in breast cancer therapy treat-

ment. A lot of publications identified during literature research are from USA, Canada and some other countries.

Australian pilot study revealed that close interprofessional team communication clarifies each professional's role, decreases treatment errors, improve appreciation of the patient journey through breast cancer therapy, makes health care delivery more efficient. Effective tool to improve interprofessional communication is learning and training within such groups (Giles, E.M. et al.: 2017). Learning can take place as simulation activities, seminars for variety of professionals and some informal activities increasing communication.

Treatment processes administrating impacts significantly to treatment outcomes. For instance Canadian investigations recognized some administrative barriers in breast reconstruction delivery. Administrator and professionals (e.g. physicians) have diverse professional perspective and play quite diverse roles: physician executes clinical management of treatment and administrator organizes resources for comprehensive treatment program. If physician executes administrator role along with own responsibilities, there is no clear administrator's role and roles of each team member understanding often. Some treatment options (like breast reconstruction) can be not provided to the patient then (Retrouvey, H. et al.: 2020). Such interruption makes treatment options provision dependable from personal professional level and values of the team leader. List of provided services is influenced with character of leadership in multiprofessional teams within breast cancer therapy (Retrouvey, H. et al.: 2020).

Pivotal physician's task is communication with other professionals and treatment coordination within treatment process. Lack of communication between primary care physicians (PCP) and oncologist was mentioned as one of severe problems during post-operational breast cancer therapy for breast cancer survivor's care in USA (Krok-Schoen, J.L. et al.: 2020, Stephens, C. et al.: 2021). PCPs have no enough education and training to maintain patient healthcare after breast cancer diagnosis establishment alone. Instructions and plans provided to PCPs are insufficient and contain often very common information. PSPs become less confident if communication with oncologists is disrupted and their decision-making becomes less effective. Consequently PSPs have limited opportunities to help their patients. Some variations of this situation occur in European countries too. Mutual intensification of information exchange is needed to improve breast cancer survivor's post-treatment (Krok-Schoen, J.L. et al.: 2020).

Breast cancer survivors' outcome can be improved directing communicational interruption between PCPs and oncologists. Inclusion of PCPs in multidisciplinary groups can be one of possible decisions. PCPs' oncology training is strongly desirable as breast cancer oncology becomes more and more frequent event throughout the population (Stephens, C. et al.: 2021).

International experience points out an important role of nurses in patient's data collection, communication with patient, patient's education and psychological support. Character of personal and medical patient data made by the nurses indirectly influence to therapy strategy (Tariman, J.D. et al.: 2016). Patients declare that personalized care and nonverbal signs play an important role in treatment process (Abt Sacks, A. et al.: 2016). Nurses have great influence to the patient in Israel as they constantly communicate with patients and discuss the treatment strategy (Kadmon, I. et al.: 2015). Close attention is paid to breast cancer detection and management in Brazil (Teixeira, M.S. et al.: 2017) where breast cancer is one of the most frequent cancer type among women (Melo, F.B.B., et al.: 2017). Nurse's duties are wider there than in some other countries. Investigation of personal risk factors, management of observation of risk group women, educational activity with women and consultation providing were identified amongst primary care nurses' functions in Brazil (Melo, F.B.B., et al.: 2017). These primary monitoring actions have a great significance for breast cancer early detection and effective treatment. Oncology nurses' role in decision-making grows together with patient's growing implication in decision-making (Tariman, J.D. et al.: 2016). But physicians are not willing close collaboration with nurses still (Zheng, R.M. et al.: 2016, Ahmadieh, H. et al.: 2020) that stimulates exclusion of nurses from the multiprofessional team discussions. Disruption of surgeons-nurses collaboration contributes to healthcare fragmentation in USA. Interaction of surgeons with the nurses outside of operating room increase significantly information exchange and team performance (Braun, H.J. et al.: 2015). Experience and continuing education of nurses play a critical role in their permanent professional development in Brazil (Melo, F.B.B., et al.: 2017, Teixeira, M.S. et al.: 2017). Nurses' training programs increases significantly nurses' confidence in patient's care and help to cope the patient distress in Japan (Kubota, Y. et al.: 2015).

Physicians have significant influence to patient education and patient inclusion in decision-making in USA on the other hand (Farias, A.J. et al.: 2017). All nurses' functions mentioned in previous chapter (communication with patient, patient education, emo-

tional support and rehabilitation management) can be realized also by physician. Additional physician's training and qualification are needed for such extended duties performance.

Widespread European approach is separation of psycho-oncology service to independent units. Psycho-oncologists are the member of multiprofessional team as others in this case. Another approach is integration of psycho-oncology education amongst other professional and development of psycho-oncology as integrated part of all stages of breast cancer treatment. Second approach is promoted in Japan as it was concluded that psycho-oncology service doesn't influence to therapy outcome (Akechi, T. et al.: 2021).

Effective information exchange from radiologist is one of the principal treatment points. Radiologist is not isolated from the patient in USA. Patient educating is one of radiologist's responsibility as a way of patient's anxiety decrease (Lourenco,A.P. & Baird, G.L.: 2017). Radiographer involvement reduces procedure time significantly, enhance productivity of radiology and patient care quality (Shay, W. et al.: 2017). Radiation team coordinated work leads to high quality images obtaining and careful patient's personal care. Radiologists realize additionally everyday communication with non-medical specialists like IT team who are involve in patient care indirectly. IT specialists serve as a bridge between radiologists and physicians in the field of internal information exchange. Communication and informational exchange barriers between radiologist and IT specialist makes significant impact to interprofessional communication disruption in USA. These barriers are connected with unclear duties perception, discomfort from different working timeframe (Kaye, A. & Cook, T.: 2015). Digital data movement is disrupted consequently.

Increase of genetic and genomic education is documented in breast cancer treatment in USA (Haidle, J.L. & Whitworth, P.: 2015). Genetic counselor helps to evaluate risks realistically that's why collaboration between breast surgeon and genetic counselor is critical for efficient care provision. Simultaneously there are some gaps between existing highly technological molecular analysis methods and its application in clinical practice. Main reasons are traditional structure of treatment teams, deficiency in genetic background amongst surgeons and other breast cancer specialists. Administrative gaps prevent wide screening programs spread (DeSimone, L.M. et al.: 2020) that influence negatively to treatment outcome.

Conflict of interests is often detected between oncologist and plastic surgeon in USA. Misunderstanding between these specialists is initiated with low knowledge of plastic surgeon about possible future treatment opportunities according to investigation executed in University of North California. Breast reconstruction can interrupt chemotherapy initiation for instance. Increased recovery time after mastectomy made together with breast reconstruction and poor healing management knowledge about breast reconstruction makes oncologists skeptic about surgeries' combining (Milucky, J.L. et al.: 2017). These mutual fears of practitioners are sometimes inadequate. Other significant barrier is that plastic surgeons are not considered as a member of breast cancer treatment team by other participants of such interprofessional team. Thus plastic surgeons are not attending the multidisciplinary cancer conferences and are not fully engaged in oncological team in Canada (Retrouvey, H. et al.: 2020). Administrator can manage inclusion plastic surgeon to breast treatment team, but this approach is not strictly described. Administrator behavior is guided by personal position (Retrouvey, H. et al.: 2020). Furthermore radiation oncologists and plastic surgeons often have a conflict of local interests that negatively influence to interprofessional communication and treatment performance (Retrouvey, H. et al.: 2020).

International experience emphasizes importance of interprofessional trainings and meetings, need of treatment administrating standardization, informational exchange intensification and continuous interdisciplinary professional education. Breast cancer nurses, variable forms of psycho-oncology support, intensive radiologist's and genetic counselor's engagement in breast cancer treatment are needed. Mutual education of multiprofessional team members is pivotal part of effective transformation.

6.1.2 Gaps in interprofessional communication and points to improve

Wide spread of breast cancer and transformation of this disease to the chronic state dictates modification of treatment approaches. At the same time diagnostic and treatment became knowledge-intensive. Stuff qualification standards became subject of transformation. Multiprofessional teams approach fulfills the best request for patient-orientated and high qualified breast cancer care. European guidance for the breast cancer screening and diagnosis (2006) was promoted to adopt common progressive strategies. Further steps have been taken to improve European guidance concerning breast cancer services in year 2012. Several European breast cancer clinical guidances have been developed but its adherence meet barriers. The worst situation is ob-

served in the field of supportive and follow-up services according to European countries investigation (deGuzman, E.N. et al.:2020).

Lowest breast cancer mortality amongst European countries was achieved in UK. It is result of doth progress in treatment and screening. That's why the tools of breast cancer management in UK are worthy of close attention. Separation of breast cancer in independent discipline with own programs and standards is observed in UK and is highly desirable for breast therapy progression in other European countries. Field-specific education and practice are needed in breast cancer surgery (Wyld, L. et al.: 2019). Modern breast cancer surgery is quite complicated and complex. Therefore breast surgeons should have focus to breast surgery and be recognized as separate from emergency and common surgery practice disciplines beginning from the education and during following trainings. Breast surgery is recognized as a sub-specialism in USA. This is a first step towards independent study and development of breast surgery. Situation is non-homogenous among European countries. UK has no separation of breast cancer surgery, but has specialized training certification in breast surgery. There is mandatory level of breast surgeries per year for surgeons who can act as a breast surgeon in Germany. Besides that there is practical examination also. Breast cancer surgery isn't separated in other countries. Breast surgeries are made by gynecologists and common surgeons that decrease the quality of breast cancer care. Some success in the field of certification is achieved by adoption of European breast exam by EUSOMA (Wyld, L. et al.: 2019). Enhanced trainings, high quality fellowship, courses and standardized examination are required for further development of breast cancer surgery as a separate discipline and outcome improvement. Current situation with poor regulated surgeon training and absence of unified standard of breast surgeon education has negative influence to treatment outcomes across the Europe (Wyld. L. et al.: 2019). Rigid requirement to certification can trigger EUSOMA recommendations absorption. Some resent developed services like genetic and psycho-oncology further standardization is highly desirable.

Strict definition of team member's role and clear administrating are connected directly with the quality of breast cancer treatment and patient's outcome. Administration includes provision of comprehensive services and treatment options to the patient, interprofessional informational exchange and quick decision-making. Absence of strict duties specialization results in personal biases display and low level of healthcare services received by women with breast cancer. Formal relationship and organizational

structure influence significantly to task distribution also. For instance interprofessional communication and new specialized roles implementation is often determined by personal interprofessional relationships on the stage of breast unit formation.

Wide view of treatment opportunities is needed for qualified breast cancer treatment management. Administrating is often executed by breast cancer nurses or physicians in European countries. Transfer of some administrative and coordinating functions to the nurses is one of the possible ways of nurse's better involvement in decision-making and treatment process inside the multiprofessional team. Administration executed by non-medical specialist seems to be persuasive idea because such employees can be more objective. This step help to overcome healthcare professional's overloading connected with constantly growing dataflow associated with clinical activity also.

Improved breast cancer management is one more priority of treatment improvement in patient-orientated manner (Curigliano, G. & Cardoso, F.: 2017). European practice of nurse involvement in treatment process highly corresponds with international practice of active participation of nurses in communication with patients. Nurse's acknowledgement as a fully competent team member is a point to improve at the same time. Nurses present a low profile in breast cancer therapy in Europe though the resource of these professionals is great. Nurses can be effective in all stages of breast cancer treatment as was demonstrated in Brazilian practice. They communicate intensively with both patient and health care professionals.

Special education and training is needed for nurses handling the breast cancer patients. Higher qualifications of both primary care nurses and breast cancer nurses creates best conditions for the effective treatment providing broad education and training in breast cancer aspects. Psycho-oncology, cancer pain management and corresponding informational management are needed for effective breast cancer patient care. Fully engagement can be stimulated by transference of additional duties to the nurses to increase their reputation amongst other multiprofessional team members also. The need in nurse education grows together with growing patient engagement in decision-making process.

Duties distribution has no exact boundaries in the sphere of patient education. Gaps in patient education can be critical while duplication of information is preferable. Nurse's traditional duties of patient communication and education can be executed by physi-

cians also as we can see from American experience. There is opposite situation in Brazil: breast cancer nurses can provide some physician's functions. The same consideration appears observing the practice of psychological support. Prevailing tendency is separation of psycho-oncology service to independent discipline in Europe. Whereas second psycho-oncology service development pathway is training of all the specialists to cope successfully with patient's vulnerability and poor health care literacy. Drawing together of breast cancer and plastic surgery is inevasible also. Thereby mutual integration of disciplines is coming along with separation of breast cancer to freestanding discipline. Interdisciplinary decision-making approach has a great potential inside the breast cancer units. Pervasion of contemporary areas goes intensively to traditional practice. Continuous physician's education is pivotal as their role is significant. But enforced training in cancer care management can be excessive task because of intense workload. Part of practitioner's duties can be handed over to nurses to relieve physicians.

Mistrust between the team members is one of severe barriers of multiprofessional coordination. Common discussion of future surgeries should be provided with both breast and reconstructive surgeries to find the optimal for patient level of removed tissues and make treatment more comfortable making only one combined surgery instead of two. Specialists who were recently implemented in breast cancer treatment teams are not always participating in real treatment strategy discussions. Regular common trainings and clinical case discussions as a teambuilding activity can be useful to increase all members engagement in treatment and discussion process. Partnership and trustfulness are the main motivation for close multiprofessional interaction. Professional acknowledgement plays a significant role in new tools implementation. Psycho-oncology service is long-lasting and is highly integrated in everyday treatment process. It can be hardly separated from the treatment process. Patient's education and support is executed by nurses, practitioners, radiologist, oncologist, surgeon and some other treatment provider's employees. All the members of multiprofessional team should act in agreement with each other not only in the field of administration, but also in the field of personal and psychological support. Future development of psycho-oncology is not only in inclusion of specialists in multiprofessional teams but in a greater degree in education of treatment team members in psycho-oncology basics. Diagnostic strategy development and deeper education of multiprofessional team member is needed. Cancer complication's prevention is an important part of treatment. Close communication of

cardioncologists and neurosurgeons to other breast care team members is obvious to decrease treatment risks and improve outcomes.

Red line of informational exchange is creation of clear digital database systems and clear communication between treatment providers. USA and UK experience emphasizes the importance of data bases for internal interprofessional use and also for the patient's usage. Technical tool's progression in radiography and surgery is not implemented in treatment process with the best effectiveness without other treatment process's support. Continuous informational flow is needed between IT specialists, surgeons, radiologist, physicians and rehabilitation services specialists. Specialists' personal meetings can be troublesome tool considering the high work commitment. It is important to create common digital communication medium for informational exchange, communication and education. The attempt of patient-orientated informational medium was made in UK. It impacts to the breast cancer care effectiveness significantly. Such comprehensive resource creation for internal multiprofessional group collaboration should be the next step. Collaboration of healthcare professionals with non-treating supportive services specialists are critical.. Regular consultation and discussion of challenges between radiologists, IT-members and physicians are aimed to improve collaboration.

Regular meetings only have no sufficient effect to interprofessional collaboration stimulation. Multiprofessional work culture development starts from education. Groundwork for multiprofessional team's culture and intensive interprofessional collaboration is laid during university education and trainings. Seminars and integrative trainings are extremely useful for better intercommunication of specialist and team working absorption. Additional training is needed to improve all team members' equal participation in treatment process. This affords increase patient's quality of life and decrease anxiety.

6.2 Ethical consideration

Ethical approval. TENK requirements are adopted in Finland. These requirements regulate ethical principal of research and information processing. Ethical approval was not required based on the study design. Current scoping review is based on published data and doesn't contain any new personal data requiring ethical standards implication. All included publications have ethical permission.

Conflict of interests. No conflict of interests has been declared by the author during the development and evaluation process involved in this review. No ethical issues have been noted. Review does not handle issue related to criminal law, immaterial rights or labour law or other issues related to violation.

6.3 Trustworthiness

The research topic was approved by a competent assigned representative from Metropolia University of applied sciences. Research design was discussed on group sessions. Research purpose, research questiones, research method, were determined (Schwartz-Shea, P. & Yanow, D.: 2011). Time limit of publications included in scoping review by years 2015-2020 was defined by the need of most contemporary data inclusion. Analyzed publications' quantity was quite big to insist on sufficiency of material for analysis of current situation in breast cancer treatment. Medical literature trustworthiness analysis is complicated and has some special features (Alahbad, F. et al.: 2017). Common criteria for qualitative research estimation are subjective meaning, participants validation, description of the context, lay knowledge, flexibility, sampling, generalizability (optional) (Horsburgh, D:2003). Included qualitative researches were highly consistent to these criteria. The quality of majority of analyzed publication was high according to J.Briggs scale evaluation. Wide range of various data affords to make generalization. Comparison of European and international experience affords to get comprehensive picture of current trends and extend solution alternatives in the field of breast cancer treatment.

Although the scoping review mapped the existing literature systematically, limitations were pointed out. Search strategy has variable key words because one search strategy does not provide comprehensive topic description. The inclusion criteria limited the results. Reviewing English language publications only limits the amount of analyzed information and leaves some gap due to local characteristics and challenges of breast cancer care. The exclusion criteria used narrowed the focus further. The list of professionals involved in breast cancer treatment is not comprehensive in this review. The most frequent mentioned professionals only and their roles within multiprofessional team were discussed in this review. There is a gap in the study related to neuroonclogist' interprofessional communication. However main trends and challenges were iden-

tified in the most indicative examples. Search realized by one person can have biases connected with cross-checking absence (Schwartz-Shea, P. & Yanow, D.: 2011).

7 Conclusion

Breast cancer is one of the most widespread diseases among women. Breast cancer mortality remains quite high despite methodological development that emphasizes importance of this issue. This review identifies main tendencies and challenges connected with breast cancer unit's foundation in Europe. European breast cancer care recommendations adoption varies significantly among countries. A lot of positive approaches are noticed in UK and Germany. Italy progresses actively also. Organizational structure, cultural context and leadership type influence significantly to treatment processes and patient's outcomes. Breast cancer treatment includes wide variety of professionals. Majority of breast cancer care units includes physician, breast clinician, breast surgeons, radiologists, radiographer, pathologists, medical oncologists, breast care nurses, advanced nurse practitioner, therapists, psycho-oncologists. Communication of specialists is complicated that influence negatively to patient outcome. Nurses' larger engagement is insufficient in interprofessional collaboration and decision-making nowadays. Continual education, training and various multiprofessional communication are needed to overcome challenges of multiprofessional team functioning. Interprofessional communication unification and optimization is highly desired to escape personal biases. Data flow inside the multiprofessional team is complicated and cross-linked. Effective informational exchange is impossible to imagine without close collaboration with technical and IT-specialists, supportive services. Complexity of current treatment methods dictates the need to separation of breast cancer treatment from common practice. European breast cancer treatment practice is modified actively but still has a lot of issues to modify.

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Appendix 1. Research studies' critical appritiation.

№	Study authors, year	Purpose	Sample and sample size Study design Data collection methods	Critical appraisal (Joanna Briggs Institute)
1	Balasubramaniam, R. et al: 2015	To quantify the changes in multidisciplinary team meeting workload for consultant radiologists working in a single UK tertiary referral cancer institution, assess its impact and suggest solutions to these challenges.	Questionnaire-based interviews were used for qualitative investigation. Forty-seven consultant radiologists were interviewed. A coding framework of common themes was constructed for data analysis.	7/10
2	Steven, B. et al.: 2019	Views of psycho-oncologists, physicians, and nurses on cancer care	Qualitative study used semi-structured interviews for data collection. Twenty five participants were included: 12 psycho-oncologists, 3 nurses, and 10 physicians). The data were analyzed using thematic analysis by Braun and Clarke.	9/10
3	Berger-Höger B. et al.:2019	To investigate whether an informed shared decision-making intervention	Cluster randomized controlled trial. Sixteen breast centers were randomized to in-	11/13

		for women with 'ductal carcinoma in situ' comprising an evidence-based decision aid with nurse-led decision coaching enhances the extent of the mutual shared decision-making behavior of patients and professionals regarding treatment options, and to analyze implementation barriers.	tervention or standard care, were recruited 192 patients (partially-blinded).Twenty one physicians were involved: intervention group - 13, control group - 8. Sixty seven patients took part in study. Data were collected using questionnaires.	
4	Biganzoli, L. et al.: 2017	Quality indicators for breast cancer care quality assessment are listed	Position paper	6/6
5	Blackwood, O. & Deb, R.: 2020	Review summarizes some of the most relevant research on the topic of multidisciplinary teams usage and efficacy in relation to breast cancer, attempting to draw together its advantages and challenges.	Review	6/11
6	Bortesi, M et al.: 2018	To summarize published data about the pathologist's assistant and biomedical scientists.	Review	10/11
7	Cardinale, D.et al.: 2018	To discuss approach of cardio monitoring during breast cancer therapy in	Review	8/11

		terms of risk stratification, monitoring for early diagnosis, prevention, and early treatment of cardiotoxicity		
8	Coolbrandt, A. et al.: 2018	To evaluate the efficacy of an individually tailored nursing intervention for reducing chemotherapy-related symptom distress in adult patients with cancer.	Cohort study Control group N=61, intervention group n=63 3 time points, questionnaires. Analyzing change scores were used. endpoints were analyzed using Mann-Whitney U tests	9/11
9	Cruickshank, S. et al., 2020	To determine specialist breast cancer nurses role in patient's psychological support and feedback about new psychological interventions.	Qualitative study A mixed method sequential design was used. First stage is qualitative survey and second phase – qualitative interviews. During the first phase survey about the fears of cancer recurrence identification and management was executed amongst breast cancer nurses. Phase 2 contained psychological intervention and feedback about its effectiveness. Ninety nurses responded to the survey during phase 1. Twenty responders were participating in phase 2.	7/10
10	Curigliano, G. et al.:	To provide strict criteria-based rec-	Clinical practice guidance, review.	6/11

	2012	ommendations on cardiovascular risk prevention, assessment, monitoring and management during anticancer treatment.		
11	Hequet, D. et al.: 2017	To evaluate physician-to-physician communication throughout the breast cancer endeavor, from both the primary care physicians and hospital-based physicians' perspectives.	Qualitative study. One hundred fifty five primary care physicians and thirty nine hospital-based physicians answered to questionnaires. .	8/10
12	De Bont, A. et al.: 2016	To identify extended health care teams' professional roles, tools of extended professional roles creation and its main drivers in different countries.	Qualitative study. Semi-structured interviews were used for data collection. 160 interviews of physicians, nurses and other health care professionals in new roles and observations in health care clinic were analyzed. All data coding was used.	9/10
13	Decadt, I. et. al.:2020.	To point out the current situation, the general profile and the advanced practice nurse (APN) roles in the field of oncology in Belgium	Review	6/11
14	Dionigi, F. et al.: 2018	The study aims to detect levels of patients' emotional distress and quali-	Qualitative study 149 patient passed all three time point of inves-	9/10

		ty-of-life at diagnosis and to observe their trend over the first 8 months of treatment.	tigation. The psycho-oncologist and the breast nurses separately met with patients. Breast nurses provided the questionnaire SF-36 Health Survey (SF-36) and the psycho-oncologist supplied the Hospital Anxiety and Depression Scale (HADS) and the Distress Thermometer (DT) after an interview. Data statistical analysis was used.	
15	Ernstmann, N. et al.: 2020	To describe psycho-oncological care structures and processes in German breast cancer centers from the perspective of the center administration.	Qualitative study Representative random sample method was used. A random sample of 53 surgical sites was included from 46 certified German breast cancer centers. Data were recorded electronically using the software. Statistical analysis was used.	9/10
16	Ferreira, F.S. et al.: 2016	To evaluate the knowledge of resident nurses regarding the management of cancer pain and the associated sociodemographic and professional variables.	Cross-sectional qualitative study. Target population included 22 nurses. Data were collected by using questionnaires. The statistical analysis included descriptive analysis, bivariate analysis, multivariate analysis and residue analysis.	9/10
17	Huhlweg, P. et al.:	To extend the understanding of cur-	Cross-sectional qualitative study	7/10

	2017	rent decision-making processes beyond the dyadic physician–patient interaction	Data from 54 outpatient consultations were collected. Observations at the two inpatient wards lasted for 1 week at each ward. Qualitative content analysis was executed.	
18	Kaufman, C.S.: 2019	To clarify the role of surgeon's skills in plastic medicine during breast cancer operations and current situation in oncoplasmic surgery	Review	9/11
19	Köppen J, et al. 2018	To examine the motivational factors of physicians and nurses to take up new roles in hospitals	Qualitative study. Written survey (n=1524) was made amongst physicians (n+395) and nurses (n+816) working in departments specialized in breast cancer and acute myocardium infarction. Data analysis was based on descriptive and bivariate analyses.	8/10
20	Kowalski, C. et al.: 2016	To investigate organizational and structural characteristics of hospitals with cancer units for equal access to psycho-oncology service amongst hospitals.	Cohort study. 879 Centers were included in investigation. Centers were located in Germany, Switzerland, Austria and Italy. Following variables collected during certification: center type (categorical variable; reference value: breast cancer center), numbers of primary patient s per year (continu-	8/11

			ous variable), time since first certification (in years; continuo us variable), and numbers of certificates (eg, prostate, breast, head and neck, etc) per hospital Descriptive statistical analysis was used.	
21	Krishnan, M. et al.: 2019	To discuss breast cancer brain metastasis risk depending on cancer subtype, special considerations for therapy selection. Are reviewed current focal and systemic treatments, recent advancements and potential future targets for successful treatment.	Review	8/11
22	Lang-Rollin, I. & Berberich, G.: 2018	To describe psycho-oncology discipline	Text Basic research	5/6
23	Leclerc, A.-F. et al.: 2017	To determine the benefits of a three-month multidisciplinary rehabilitation program among women after breast cancer treatment.	Controlled non-randomized trial 206 patients were included (103 experimental group, 106 control group). EORTC QLQ-C30 questionnaire was used. Statistical analysis with Student t-test evaluation was used.	8/9
24	Markopoulos, C.:	Editorial addresses the challenges of	Editorial	5/6

	2019	harmonization breast cancer care across Europe		
25	Möller, O. et al.: 2020	to explore health care professionals' (HCPs) experiences of current rehabilitation practice and describe current barriers and facilitators for individualized rehabilitation for patients following breast cancer treatment	Qualitative study 19 health care professionals working with breast cancer rehabilitation were included in investigation. Interviews were conducted with focus groups in hospital room. Semi-structured interview guide was used. Data were preceded using conventional qualitative content analysis.	9/10
26	Morrone, D. et al.: 2017	Discussion of reasons of low breast cancer follow-up provision in Italy	Editorial	6/6
27	Neamtiu, L. et al.: 2016	To describe how psychosocial support in breast cancer is incorporated in cancer-related policy documents, such as national cancer plans and breast cancer care certification schemes in Europe	Systematical review. .	10/11
28	Nyholm, N. et al.: 2018	To explore social categories in encounters between healthcare professionals and breast cancer patients.	Qualitative study Case-based design was conducted. Interviews with 12 patients and 8 nurses were done. Topic categorization was used for data	8/10

			analysis.	
29	Rawal, N.: 2016	To describe roles surgeries and nurses in pain management, influence of surgery protocols to following recovery process.	Review	6/11
30	Rutgers, E., et al.: 2019	Manifesto calls to unification and regulation of breast cancer genetic testing in Europe, encourages healthcare professionals and providers to participate in genetic testing program development and to ensure access of breast cancer patients to genetic analysis.	Position paper	6/6
31	Sena, B. & Liani, S.: 2019	To investigate perceptions of the interprofessional collaboration, their role and actual involvement in the team, the relational dynamics that they developed with each other and difficulties they encountered in implementing the different professional approaches.	Qualitative research	9/10
32	Smith, J. et al.:	To clarify if Danish biomedical scien-	Review	6/11

	2017	tist's education and qualification are sufficient to the current healthcare needs		
33	Sollami, A. et al.: 2015	To investigate the extent to which nurses and physicians differ in their ratings of interprofessional collaboration; to evaluate potential moderators of any observed differences.	Qualitative study. Fifty-one surveys were included, representing a total of 18 782 professionals and students (13 132 nurses and nursing students, and 5650 physicians and medical students). The mean difference was measured by Cohen's d.	9/10
34	Tan, M.P. et al.: 2017	To present operative approach of surgical interventions in breast cancer for achievement of clear margins with acceptable cosmetic effect.	Case study	7/8
35	Trabjerg, T.B. et al.: 2019	To examine whether a shared video-based consultation between the cancer patient, general practitioner and oncologist can simplify challenges and thereby enhance the patient-centeredness for the cancer patients	Randomized controlled trial. 278 adult patients were included in investigation. They are diagnosed with colorectal, breast, lung, gynecologic or prostate cancer. Interventions were video-consultations between the cancer patient, general practitioner and oncologist. Statistical analysis was used.	13/13
36	Vandezande, L. et	To investigate training intervention	Qualitative retrospective study.	7/10

	al.: 2020	among nurses, it's influence to patient consulting in period after breast cancer surgery.	One hundred fifty patient's files were analyzed, 625 consultations were provided.	
37	Vegesna, A. et al.: 2016	To explore attitudes towards collaboration of general practitioners and nurses In Tuscany (Italy).	Qualitative research 218 General Practitioners and 46 nurses took part in survey, Used the Jefferson Scale of Attitudes towards Physician Nurse Collaboration (JSAPNC) to determine current expectations of shared collaboration between GPs and nurses. Statistical analysis was used.	8/10
38	Verhaegh, K.J. et al.: 2017	To explore health care professional's perception on effective interprofessional communication during clinical rounds.	Qualitative study. Information was collected during the meetings. Participants were 3 residents, 27 nurses, 5 medical specialist, and 13 hospital staff members who were engaged in quality improvement and had a background in medicine or nursing. Descriptive method of context analysis was used for data analyzing.	7/10
39	Watanabe, A.T. et al.:2019	To determine whether AI-based computer detection algorithm improves	A blinded retrospective case series study. Seven radiologists participated in intervention.	7/10

		radiologists' sensitivity in breast cancer screening and detection	122 patients' screenings were performed. The statistical significance of findings was evaluated using Student's t test and bootstrap statistical analysis.	
40	Watson, M. & Dunn. J.: 2016	Discussion of psycho-oncology role in cancer care	editorial	6/6
41	Willcocks, S.G.: 2018	Explore team working and shared leadership in the context of multidisciplinary cancer care in the UK National Health Services.	Review (conceptual paper)	6/11
42	Young, J. & Snowden, A.: 2020	To examine how clinicians working in outpatient cancer care adapted to the co-location of a novel community support service (Improving the Cancer Journey (ICJ)) in Glasgow	Qualitative research, Semi structured interviews were used. Ten interviews were held. The results were discussed with the participants to find out whether they resonated with their experience. The data were analyzed following Braun and Clarke's (2012) thematic analysis. Coding was used to create an accurate representation of the whole.	7/10
43	Zagar, T.M. et al.: 2016	To describe multidisciplinary management of breast cancer brain metastases	Review	7/11

Appendix 2 Refered studies content

№	Study author, year	Study findings and biggest challenges	Country/area of investigation
1	Balasubramaniam, R. et al.: 2015	Multiprofessional team meetings are important instrument of cancer outcome's improvement. Radiologist's participation in regular multiprofessional meetings is valuable and complicated at the same time. Administration engagement is needed to increase popularity and effectiveness of multidisciplinary team meetings.	UK
2	Steven, B. et al.: 2019	Study showed deficiencies in communication among health care providers and patients.	Germany
3	Berger-Höger B. et al.:2019	Nurse-led decision coaching and structured physician's consultation resulted in higher shared decision-making ratio and less invasive treatment strategy. Duration of decision-making process increased In intervention group in comparison with control, but physician consultations were shorter. Shared decision-making demands additional time recourse of nurses and physicians for coaching activity provision. Shared decision-making in breast cancer demands shift in professional collaboration and patient communication.	Germany
4	Biganzoli, L. et al.: 2017	Quality indicators used in European countries in breast cancer treatment were collected. Some new quality indicators were included to improve follow-up patient care.	Europe

5	Blackwood, O. & Deb, R.: 2020	In article is reviewed multiprofessional team approach in breast cancer treatment. Multidisciplinary meetings, interprofessional communication, national standards of multiprofessional team regulation are mentioned as effective tools. Participation of physicians, oncologists, histopathologists and radiologists in multiprofessional teams improves patient survival. Interprofessional communication changes significantly the role of histopathologists in patient management.	UK
6	Bortesi, M. et al.: 2018	Duties and involvement of pathologist's assistant and medical scientist are described.	Italy
7	Cardinale, D.et al.: 2018	Main areas of cardioncology care are risk stratification, monitoring for early diagnosis, prevention (primary or secondary), and early treatment. Cardiotoxicity monitoring, prevention and treatment approaches and techniques, interdisciplinary collaboration are described.	International
8	Coolbrandt, A. et al.: 2018	Nursing interventions (motivation interviewing, goal-directed self-management coaching, tailoring) decrease significantly symptom distress during chemotherapy and less worsening symptoms. This positive effect highlights the nurse role in patient coaching and self-management.	Belgium
9	Cruickshank, S. et al., 2020	Study reported that nurses use variable tools for fear of cancer recurrence identification. Intervention (tool for fear assessment) seems to be useful in breast cancer nurse's everyday work and is important because of the frequency of this distress purpose.	UK

10	Curigliano, G. et al.: 2012	Publication provides guidance for cardiovascular risk prevention, monitoring and management during anticancer treatment.	European union
11	Hequet, D. et al.: 2017	Primary care unit's physicians and hospital-based physicians are constantly communicating in breast cancer treatment protocols. Physicians were asked about the information exchange between primary care and hospital unit's colleagues. Main tool for informational exchange are digital data bases. Primary care physician's satisfaction level was high.	France
12	De Bont, A. et al.: 2016	In review were identified specialized roles in care pathways for breast cancer, heart disease and type 2 diabetes in 8 European countries. Considerable differences were observed in both the number and the kind of roles in the three care pathways. Roles distribution is different amongst countries.	European countries: Czech Republic, Germany, Italy, Poland, Netherlands, Norway, Scotland and Turkey
13	Decadt, I. et. al.:2020.	Clinical practice; expert coaching and guidance; consultation; collaboration; improvement of quality care and innovation; leadership; research and ethical decision- making are the core competencies of advanced practical nurse (APN) in Belgium. APN share a care-oriented focus and person-centered approach. Besides these APN create an added value in quality improvement, innovation and	Belgium

		implementation of evidence-based nursing practice.	
14	Dionigi, F. et al.: 2018	Multy-disciplinary study of emotional distress and quality of life among Italian breast cancer unit's patients was performed. Breast cancer diagnosis establishment causes distress that can be diminished during treatment but not eliminated by medical treatment. Findings support the need to reinforce multi-disciplinary care programs.	Italy
15	Ernstmann, N. et al.: 2020	Psycho-oncology services in German breast cancer centers were characterized. Patient's needs in psycho-oncology care are not fully met. Additional investigation is needed.	Germany
16	Ferreira, F.S. et al.: 2016	There was a predominance of ignorance of cancer pain management among resident nurses. An adequate knowledge was dependent on professional training time.	Portugal
17	Huhlweg, P. et al.: 2017	In 98,1% of cases patients were participating in consultations together with physician, in 40,7% of cases family members also attended. Detailed discussion of treatment strategies with the patient, patient can hardly participate in decision-making process because of poor understanding of advantages and disadvantages of different treatment protocols. Finally the physician is responsible for the decision-making. Patient's concerns are rear taken into account. Nurses can transfer information prom patient to physician and back, but are not really involved in decision-making process. Barriers in shared decision-making are time	Germany

		pressure, responsible physician rotation and poor coordination of care. In conditions of physician's overwhelming with administrative work majority of observed cases real shared decision-making was absent.	
18	Kaufman, C.S.: 2019	Increased level of long-term survivors for breast cancer patients makes the term of aesthetic cancer care actual. Oncoplastic surgery combines cancer treatment task with cosmetic approach. In review were discussed procedures of oncoplastic surgery and main approaches applicable to oncoplastic breast surgery.	International
19	Köppen J, et al.: 2018	Managers need to know the motivational factors of their employees and enabling versus hindering factors within their organizations to govern change effectively. The motivation was highest for nurses in countries with major skill-mix reforms (England, Scotland, and Netherlands). career opportunities is the second most motivating factor for them. Professional support (by colleagues) was mainly reported as facilitator. Support by hospital managers were considered important from both, the nurses' and physicians' perspectives.	Europe
20	Kowalski, C. et al.: 2016	Psycho-oncology care analysis among cancer centers of Germany is represented. Were compared cancer centers of different structure and specialized in different cancer types. Psycho-oncology care provided in hospitals has a great diversity. Breast cancer centers have the most developed psycho-oncology services. Ownership has no effect on the frequency of psycho-oncology support provision.	Germany, Austria, Switzerland, Italy

21	Krishnan, M. et al.: 2019	Review is dedicated to the management of breast cancer metastasizes to brain. Were discussed cancer subtypes and treatment approaches.	USA
22	Lang-Rollin, I. & Berberich, G.: 2018	In article was overviewed current knowledge of body-mind interaction and psycho-oncology role in treatment of various issues.	International
23	Leclerc, A.-F. et al.: 2017	Evaluation of breast cancer multidisciplinary rehabilitation programs impact to patient's outcome and quality of life was made. Rehabilitation interventions were physical training (cardiovascular training, muscular endurance training), psycho-educational session (psychological aspects, stress management, sexuality). Biometric, medical, professional and physical activity level was better in the experimental group with application of multidisciplinary rehabilitation.	Belgium
24	Markopoulos, C.: 2019	Affords, progress and demands of breast cancer care in Europe are discussed. Breast cancer care harmonization across Europe by unification of education and training programs, breast cancer units foundation, implementation of obligatory certification are expected to improve breast cancer care across Europe. .	Greece
25	Möller, O. et al. (2020)	Individualized rehabilitation breast cancer service has significant gaps in Sweden. Varying attitudes towards rehabilitation, incongruence in approaches of identifying and coping with rehabilitation needs and suboptimal collaboration during cancer treatment are detected as main reasons of this gap.	Sweden
26	Morrone, D. et al.:2017	Breast cancer patient's follow-up care is insufficient in Italy. Low implication of physicians, radiologist in multiprofessional team discussion and low mammogra-	Italy

		phy screening extent prevent from efficient follow-up care provision.	
27	Neamtiu, L. et al.: 2016	Psycho-oncology service is required in breast cancer units. Twenty-five national and four regional cancer plans/strategies were identified among the 32 countries investigated. European regulation of psycho-oncology service is insufficient. Detailed requirements and indicators for psycho-oncology support are highly desired in Europe.	Europe
28	Nyholm, N. et al.: 2018	Investigation is dedicated to organization of rehabilitation services during breast cancer treatment. Organizational aspects like fast-track surgery left less time to nurse-patient contact and rehabilitation needs estimation. Task distribution changes create challenges for interprofessional collaboration. Vulnerable patient's need can be not fully satisfied by nurses or other professionals because of lack of time. In this case family, close social and ethnic environment can be recourses for additional support during rehabilitation process.	Denmark
29	Rawal, N.: 2016	Multimodal analgesic techniques were described. Postoperative pain management strategies and its role in postoperative rehabilitation are discussed.	USA and Europe
30	Rutgers, E., et al.: 2019	Manifesto declares the importance of genetic testing in breast cancer and basics of regulation in this field. Provision of testing availability should be accompanied by its qualified interpretation.	Europe
31	Sena, B. & Liani, S.: 2019	Implementation of interprofessional teams is impeded with relational barriers; professional silos and perception of collaboration practices. Previous interpro-	Italy

		fessional contacts and collaboration have a great influence to composition of decision-making team. Professionals who are involved in special cases (like palliative specialists) are not involved in decision-making team every time. Team members involved in decision-making and contacting with patient are not always match (for instance radiographer technician contacts with the patient but radiologist decides on further treatment strategy). Psychologist who has direct contact with patient also is invited if needed but is not permanent team member. Nurses are requested to attend cancer unit meetings to get prescriptions and make a schedule. Bariers: palliative care physicians are rarely included in chemotherapy decision-making because of cultural barriers. Conflict between breast surgeon and reconstructive surgeon is initiated because of different treatment perspective perception. Clear duties' delineation helps to overcome misunderstanding and gaps.	
32	Smith. J. et al.: 2017	Education pathway of medical scientist, their obligations, involvement in treatment process and communication with other healthcare professionals.	Denmark
33	Sollami, A et al.: 2015	interprofessional education interventions were able to reduce the difference in interprofessional collaboration between nurses and physicians	Italy
34	Tan, M.P. et al.: 2017	An operative approach that integrates present understanding of the lobar anatomy of the breast, the sick lobe theory of disease and its depiction on imaging, allows a planned resection pattern with defect repair to achieve clear margins	Singapore, France , Sweden

		with acceptable cosmetic effect. This paves the way for a reductionist surgical approach to breast cancer treatment.	
35	Trabjerg, T.B. et al.: 2019	Video-based consultation may facilitate a sense of partnership that is powerful enough to improve the patient's perception of intersectional cooperation, continuity of cancer care health-related quality of life	Denmark
36	Vandezande, L. et al.: 2020	Nurses training program implication induce some surgeon's function replacement in breast cancer treatment after surgery.	Belgium
37	Vegesna, A. et al.: 2016	Interprofessional collaboration between physicians and nurses in chronic-care units in Toscana region is the focus of investigation. Different perception of professionals roles were identified amongst physicians and nurses. Nurses reported significantly higher attitudes towards collaboration than practitioners. Gaps were identified not only in work activity but also during education. Teamwork needs to be developed.	Italy
38	Verhaegh, K.J. et al.: 2017	it is important for professionals to consider how team members and patients are involved in the decision-making process during the clinical round. Nurses and physicians are the main participants of decision-making process and have different view to the treatment strategy. Health professionals have diverse prospective concerning the need of patient's implication in decision-making process.	Netherlands
39	Watanabe, A.T. et al.:2019	This study shows how AI-based software can provide clinical benefit to radiologists in interpretation of screening mammograms.	USA

40	Watson, M. & Dunn. J.: 2016	The need of more precise statistical control of psycho-oncology interventions was identified. Psycho-oncology services are important in cancer prevention and rehabilitation, but education in psycho-oncology field and integration of trained specialists in clinical practice stay challenging task.	International
41	Willcocks, S.G.: 2018	Shared leadership is applicable in collaborative models of care. Shared leadership is an important aspect of organization and delivery of cancer care services.	UK
42	Young, J. & Snowden, A.: 2020	Analysis of social support services in cancer centers was performed. It was established that colocation of non-health professionals in clinical practice had positive effect to both patient experience and interprofessional communication.	Scotland, UK
43	Zagar, T.M. et al. 2016	Brain metastasis' biology and treatment approaches are reviewed. Multidisciplinary treatment is discussed. Practical recommendations concerning multidisciplinary clinic coordination are formulated.	USA

Appendix 3. Critical assessment of the reporting of the studies.

Systematic reviews and research synthesis

Publication	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Blackwood, O. & Deb, R.: 2020	**	X	X	**	X	X	X	*	*	**	**
Bortesi, M et al.: 2018	**	**	**	**	X	**	*	**	*	**	*
Cardinale, D.et al.: 2018	**	*	**	X	X	*	X	**	*	**	**
Curigliano, G. et al.: 2012	**	X	**	*	X	X	X	*	X	**	**
Decadt, I. et. al.:2020	*	X	X	*	*	X	X	**	X	**	**
Kaufman, C.S.: 2019	**	*	*	**	*	-	X	**	*	**	*
Krishnan, M. et al.: 2019	**	*	**	**	*	X	X	**	X	**	*
Neamtiu, L. et al.: 2016	**	**	**	**	**	*	*	**	X	**	**
Rawal, N.: 2016	**	X	X	**	X	-	X	*	*	**	**
Smith, J. et al.: 2017	**	X	X	*	X	*	X	**	X	**	**
Willcocks, S.G.: 2018	**	X	X	**	X	-	X	**	*	**	**
Zagar, T.M. et al.: 2016	**	X	X	**	*	X	X	*	*	**	*

1. Is the review question clearly and explicitly stated?
2. Were the inclusion criteria appropriate for the review question?
3. Was the search strategy appropriate?
4. Were the sources and resources used to search for studies adequate?
5. Were the criteria for appraising studies appropriate?
6. Was critical appraisal conducted by two or more reviewers independently?
7. Were there methods to minimize errors in data extraction?
8. Were the methods used to combine studies appropriate?
9. Was the likelihood of publication bias assessed?
10. Were recommendations for policy and/or practice supported by the reported data?
11. Were the specific directives for new research appropriate?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply

Qualitative research

Publication	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Balasubramaniam, R. et al: 2015	**	**	**	**	**	-	-	*	X	**
Cruickshank, S. et al., 2020	**	X	**	**	*	-	-	**	*	**
De Bont, A. et al.: 2016	*	**	**	**	**	*	-	*	**	**
Dionigi, F. et al.: 2018	**	*	**	*	**	*	-	**	*	*
Ernstmann, N. et al.: 2020	**	**	**	**	**	**	-	**	**	**
Ferreira, F.S. et al.: 2016	*	**	*	**	**	*	-	*	**	*
Hequet, D. et al.: 2017	**	**	**	*	**	-	-	*	**	*
Huhlweg, P. et al.: 2017	*	*	*	-	*	-	-	-	**	**
Köppen J, et al. 2018	**	**	-	*	*	*	*	-	**	**
Möller, O. et al.: 2020	*	**	**	**	**	*	-	*	**	**
Nyholm, N. et al.: 2018	**	**	**	**	*	-	-	*	**	*
Sena, B. & Liani, S.: 2019	**	**	**	**	**	**	-	**	**	**
Sollami, A. et al.: 2015	**	**	**	**	**	*	-	**	**	**
Steven, B. et al.: 2019	**	**	**	**	**	**	-	**	**	**
Vandezande, L. et al.: 2020	**	*	*	*	*	-	X	*	X	*
Vegesna, A. et al.: 2016	**	**	**	**	**	*	-	*	X	**
Verhaegh, K.J. et al.: 2017	**	**	**	**	**	-	-	X	**	*
Young, J. & Snowden, A.: 2020	**	*	*	**	*	-	-	-	**	*

1. Is there congruity between the stated philosophical perspective and the research methodology?
2. Is there congruity between the research methodology and the research question or objectives?
3. Is there congruity between the research methodology and the methods used to collect data?
4. Is there congruity between the research methodology and the representation and analysis of data?
5. Is there congruity between the research methodology and the interpretation of results?
6. Is there a statement locating the researcher culturally or theoretically?
7. Is the influence of the researcher on the research, and vice- versa, addressed?
8. Are participants, and their voices, adequately represented?

9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply

Randomized controlled trials

Publication	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
Berger-Höger B. et al.:2019	**	**	**	**	-	*	**	*	-	**	**	**	**
Trabjerg, T.B. et al.: 2019	**	*	**	**	**	*	**	**	*	**	*	**	**

1. Was true randomization used for assignment of participants to treatment groups?
2. Was allocation to treatment groups concealed?
3. Were treatment groups similar at the baseline?
4. Were participants blind to treatment assignment?
5. Were those delivering treatment blind to treatment assignment?
6. Were outcomes assessors blind to treatment assignment?
7. Were treatment groups treated identically other than the intervention of interest?
8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?
9. Were participants analyzed in the groups to which they were randomized?
10. Were outcomes measured in the same way for treatment groups?
11. Were outcomes measured in a reliable way?
12. Was appropriate statistical analysis used?
13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply

Text and opinion

Publication	1.	2.	3.	4.	5.	6.
Biganzoli, L. et al.: 2017	**	**	**	**	**	**
Lang-Rollin, I. & Berberich, G.: 2018	**	**	**	**	**	-
Markopoulos, C.: 2019	**	*	**	*	**	-
Morrone, D. et al.: 2017	**	**	**	**	**	*
Rutgers, E., et al.: 2019	**	**	**	**	**	**
Watson, M. & Dunn. J.: 2016	**	*	**	**	*	*

1. Is the source of the opinion clearly identified?
2. Does the source of opinion have standing in the field of expertise?
3. Are the interests of the relevant population the central focus of the opinion?
4. Is the stated position the result of an analytical process, and is there logic in the opinion expressed?
5. Is there reference to the extant literature
6. Is any incongruence with the literature/sources logically defended?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply

Cohort study

Publication	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Coolbrandt, A. et al.: 2018	**	**	**	-	-	**	**	**	**	**	*
Kowalski, C. et al.: 2016	**	**	**	**	-	**	*	*	-	-	**

1. Were the two groups similar and recruited from the same population?
2. Were the exposures measured similarly to assign people to both exposed and un-exposed groups?
3. Was the exposure measured in a valid and reliable way?
4. Were confounding factors identified?
5. Were strategies to deal with confounding factors stated?
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?
7. Were the outcomes measured in a valid and reliable way?
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?
10. Were strategies to address incomplete follow up utilized?
11. Was appropriate statistical analysis used?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply

Controlled non-randomized trial (quasi-experimental study)

Publication	1.	2.	3.	4.	5.	6.	7.	8.	9.
Leclerc, A.-F. et al.: 2017	*	**	-	**	*	**	**	**	**

1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?
2. Were the participants included in any comparisons similar?
3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?
4. Was there a control group?
5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?
7. Were the outcomes of participants included in any comparisons measured in the same way?
8. Were outcomes measured in a reliable way?
9. Was appropriate statistical analysis used?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply

Case Study

Publication	1.	2.	3.	4.	5.	6.	7.	8.
Tan, M.P. et al.: 2017	-	**	**	**	**	*	**	**

1. Were patient's demographic characteristics clearly described?
2. Was the patient's history clearly described and presented as a timeline?
3. Was the current clinical condition of the patient on presentation clearly described?
4. Were diagnostic tests or assessment methods and the results clearly described?
5. Was the intervention(s) or treatment procedure(s) clearly described?
6. Was the post-intervention clinical condition clearly described?
7. Were adverse events (harms) or unanticipated events identified and described?
8. Does the case report provide takeaway lessons?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply

Case series study

Publication	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Watanabe, A.T. et al.:2019	**	**	*	**	**	-	**	-	-	**

1. Were there clear criteria for inclusion in the case series?
2. Was the condition measured in a standard, reliable way for all participants included in the case series?
3. Were valid methods used for identification of the condition for all participants included in the case series?
4. Did the case series have consecutive inclusion of participants?
5. Did the case series have complete inclusion of participants?
6. Was there clear reporting of the demographics of the participants in the study?
7. Was there clear reporting of clinical information of the participants?
8. Were the outcomes or follow up results of cases clearly reported?
9. Was there clear reporting of the presenting site(s)/clinic(s) demographic information?
10. Was statistical analysis appropriate?

** assessment criteria are satisfied

* assessment criteria are partly satisfied

- assessment criteria are hardly or not all satisfied

X assessment criteria do not apply