The Most Significant Actions To Improve Cancer Survival

Breast cancer (BC) is when cells in the breast begin to grow uncontrollably and build§ up to form a tumor. As cancer grows, cells can spread to other parts of the body which can potentially be life-threatening.

Within the UK, BC remains the most commonly diagnosed cancer in women (55,200 cases in 2016) and is the second most frequent cause of death from cancer in women (11,400 deaths in 2017). BC incidence rates are currently on the rise. One of the biggest risk factors of BC is strongly related to age, with the highest mortality rates (47%) being in those aged 75 and over during 2015-2017.

Detecting cancer, before the disease spreads is one of the most significant actions to improve cancer survival, this can be done by screening asymptomatic individuals (Wilson and Jugner 1969). Forrest 1986 made recommendations to begin the NHS BSP, as they concluded that screening via mammography led to prolongation of life for women aged 50 and over. As a result, the NHS BSP was implemented in 1988 targeting women offering routine mammographic screening by assessing whether early signs of cancer are present when changes in the breast are often too small to feel or identifying abnormal cells which may develop into cancers. The aim is to lower incidence and improve early diagnosis and treatment outcomes for women which will be more effective if begun earlier within the disease process. The BSP is currently one of three successful screening programs running alongside cervical, bowel cancer.

The BSP has been a subject of debate with respect to the recommended age group to start and stop screening. Current guidelines invite asymptomatic women aged 50–70 to attend routine mammographic screening every 3 years, in accordance with age-specific incidence rates of BC which peak around the age of 50-59.

However, statistics show that one in five BC’s is diagnosed in women aged under 50, whilst studies report a survival benefit advocating regular screening within this age group. One of the difficulties screening women in their 40’s is that they are usually premenopausal and likely to have a greater breast density of active tissue which can obscure lesions making mammograms difficult to interpret and prone to misdiagnosis postmenopausal. Although White et al, 1998 argue that scheduling a mammogram during the first 2 weeks of the menstrual cycle in premenopausal women can improve the accuracy of mammography, however, this is not yet clinically significant.

For women aged over 70 statistics show that one in three women are diagnosed with BC, alongside a significantly higher mortality rate, yet screening stops at the age of 70 although women can self-refer if they wish to continue. Recent studies suggest that screening this age group is unlikely to find cancer that would change their life expectancy and they are more likely to die from causes other than BC. Screening carries more risks in those aged over 70 since the detection of BC usually means getting treated, which could impact their quality of life, as these women are more prone to health issues and are vulnerable to the potential side effects of treatment options such as radiation and chemotherapy, therefore decisions regarding continued screening should include life expectancy and health status.

Public Health England has currently been phasing a trial from 2009 till 2026, increasing the screening age range between 47 and 73 years, allowing two additional screening rounds for women randomly selected. This trial will measure the impact of whether an extra screen at both younger and older groups is of benefit.? argues that the advantages and the disadvantages of continuing triennial screening after age 70 would be seen more clearly in a trial of 2 or 3 additional invitations (covering ages 71-76 or 71-79) as opposed to a trial of one.

NHS BSP currently employs a 3-year-round length interval between each screening, clinical evidence states this is an effective period to help achieve the mortality reduction, detecting cancers early before they become symptomatic and minimizing interval cancers. This is supported by a study showing the effectiveness of the BSP as BC mortality was 35% lower amongst attendees compared with non-attenders. However, this study was conducted in ?? and questions whether the intervention of early detection is still necessary when prognosis and treatment have improved for BC of all stages, in which these results do not reflect upon.

Mammography currently remains the best and most cost-effective approach for BC screening, with 88.4% and 93.5% sensitivity and specificity for BC. However, it is far from a perfect screening test, as some BC's are missed especially in women with dense breast, where the sensitivity and specify is reduced further to around 76.5% and 87% leading to higher false-negative and false-positive findings. Ultrasound is an alternative modality that could be used for BC however its use in screening is limited, most notably due to its poor specificity (34%) and failure to detect early signs of cancer, additionally the time to perform bilateral breast the US is problematic, making it challenging to implement in practice due to current time restraints.

Using mammography as a screening tool exposes patients to low-dose ionizing radiation, which may be harmful to the patient due to an increase in radiation-induced cancers. According to Drukteinis et al, (2013) the dose received constitutes a small component of lifetime-accumulated dose from background radiation. Whilst the expected benefit of reduction in mortality by routine screening in terms of either life saved greatly exceeds this risk.

Another key issue relating to screening is that of overdiagnosis of Ductal Carcinoma In-situ (DCIS), a non-invasive pre-malignant form of BC where the epithelial cells proliferate within the breast ducts, which is seen as scattered tiny specs of micro-calcifications on a mammogram. Mammography fails to find the extent of DCIS, in some women, DCIS will invade the surrounding breast tissue, or since the development rate of DCIS can be so slow that it never becomes life-threatening, but it's not possible to determine which cases of DCIS will become invasive or not so it's important to get treated, thus exposing women to the side effects of cancer treatment when not always required. This is supported by autopsy studies that found a significant prevalence of undetected DCIS in women who died of other causes even if left undetected.

Quality assurance is the underpinning principle of the BSP, guidelines state that women must receive their mammogram results within 2 weeks of their screening to help reduce anxiety awaiting results. Four out of every 100 women screened are also recalled attending an assessment clinic within 2 weeks of screening pending further investigation. These timeframes are embedded in the service and are vital to abide by to ensure the safety and effectiveness standards are maintained.

Overall, the NHS BSP is a cost-effective program and therefore congruent with the NICE

guidance. The main benefits to screening include the reduction in costs associated with BC treatment, for example, 15 months following diagnosis is around £12,595, yet treatment for individuals diagnosed earlier would be less invasive and thus less costly towards the NHS.

Many BC's are also detected by women themselves, and not just through screening. These women are referred by their GP into the symptomatic service and are offered the gold standard 'triple assessment, preferably in a single hospital visit in accordance with National Institute of Clinical Excellence standards (NICE 2016), however, this may not always be possible in practice. TA helps to confirm or dismiss the presence of malignancy and compromises of a series of clinical examinations, imaging (mammography and/or ultrasonography), and a histological assessment (biopsy) if indicated.

The first step in evaluating a breast lump is the clinical breast examination (CBE). Some clinicians can confidently make the diagnosis of benign or malignant lesions through CBE, but the possibility of mistake is always there even in very experienced hands.

The next stage is the imaging, where all women aged over 40 will require a mammogram. However, with mammography the summation of overlapping tissue-mimicking, or obscuring lesions is an issue, causing an increase in false positives and false negatives. However, advancements in technology have formed Digital Breast Tomosynthesis (DBT), proving higher sensitivity and specificity for BC (88.7%, 93.8%) than mammography alone. DBT produces a three-dimensional reconstruction of the breast tissue, allowing superior lesion visibility as its technology is able to suppress the influence tissue superimposition of overlying anatomical structures. Studies have also asserted a significant improvement in the delineation of radial distortions and speculated lesions.

DBT is currently only used in symptomatic and assessment services, whereas in other countries it's used as a routine screening tool in replace of mammography.

The increase in radiation dose of DBT is doubled when compared with mammography alone, however, this increase in dose is acceptable in favor of accurate lesion assessment. These concerns may be obviated as technology now allows the construction of a two-dimensional mammogram from the tomosynthesis data, eliminating the need for mammograms in addition to the DBT. However, it is unknown how this technology will perform in clinical practice, research and trials are still ongoing to understand the benefits, feasibility, and cost-effectiveness before this can be implemented in the UK.

Contrast-enhanced spectral mammography (CESM) is another emerging imaging tool providing superior sensitivity and specificity in diagnosing BC than mammography. CESM uses contrast alongside mammography to help identify tumor areas by an increased uptake of blood flow due to angiogenesis. The physiologic information which CESM provides is broadly similar to breast MRI, but without the added time or expense of breast MRI protocols. CESM can clearly show micro-calcifications lesions in the breasts, whereas MRI and DBT are less sensitive to it. CESM exposes individuals to iodinated contrast, thus inherent risks such as contrast-induced nephropathy from exposure are small but nevertheless, they may limit the use of CEM in those with reduced kidney functioning.

US is also used in TA, assessing all women under the age of 40, and is used as a complementary examination to mammography for women over the age of 40. The US is less

affected by breast density, unlike mammography. It has an 82.0%, and 99.3% sensitivity, and specificity. The US is able to determine whether a suspicious lump is a benign, fluid-filled cyst, or a solid cancerous mass and excels in distinguishing between features of benign and malignant masses. However, the US has a low capability in detecting micro-calcifications which indicates the possibility of malignancy and not all cancers show up on ultrasound. Nonetheless, when mammography and ultrasound are combined clinically, sensitivity is significantly improved to 94.6% in detecting breast lesions.

Breast MRI currently provides the highest sensitivity for the detection of malignancy than most modalities. However, its use is limited and only used in cases of discrepancies between TA or in women with BRCA mutations (Kotsiopoulos, 2018).

Pathological assessment is the gold standard for the diagnosis of all cancers. In the early days of breast screening, fine needle aspiration cytology (FNAC) was the procedure of choice to obtain a sample from solid or cystic breast lesions, however, NAC only collects very few cells and fragments for a cytology result which is prone to inconclusive findings. This is now superseded by needle core biopsy (NCB) for significant breast abnormalities, as current evidence suggests that NCB has greater sensitivity and specificity in evaluating micro-calcifications, symmetry, and archrental distortion than does FNAC, as well as aiding in benign diagnosis. Overall NCB is able to provide more reliable results to help base diagnosis and subsequent management options. Whilst, FNAC is reserved for breast lesions close to the chest wall or examining axillary lymph nodes.

NCB is conducted under local anesthesia alongside US image guidance, this allows real-time demonstration of the guide needle traversing the lesion ensuring accurate sampling in 80% case, however, it can be done under x-ray guidance. ?? reports 90.1% accuracy rate from the first sample collected by NCB and increases to 96.6% or higher with multiple sample collections.

For the suspicion of micro-calcifications Vacuum-Assisted Biopsy (VAB) should be used, as it allows a larger volume of tissue to be sampled via a single insertion resulting in a lower equivocal sample rate and increasing accuracy as its more sensitive than NCB in the detection of small invasive tumors associated with DCIS. It is important to take into account the likely underlying histological nature of the lesion from the imaging features when deciding on the sampling method to be used. However, is important to consider that VAB is more prone to hematoma than NCB, therefore after-care needs to be considered.

When all the three competent of TA are adequately performed and produce concordant results, they give an overall diagnostic accuracy is 99.6% and the missed cancer rate is 1.7 per 1000 women discharged (Britton et al. This data is seen as reassuring for both clinicians and patients that the TA breast clinics are able to provide high-quality diagnostic accuracy.

In cases where the clinical examination, mammography, US are all negative for malignancy, the patient/clients can be safely discharged, obviating the need for pathology. However, any patient with a biopsy taken needs to be discussed with the relevant clinical information in a multidisciplinary meeting (MDT) attended as recommended by NICE (National Institute for Clinical Excellence 2002) which forms part of the quality assurance framework. This ensures concordance between clinical, radiological, and pathological findings before options for the patient’s definitive management can be agreed upon with the patient. If there is discordance between the imaging and pathology outcomes then further management must be discussed,

such as a repeat biopsy. No more than two needle biopsy procedures carried out on a separate occasion should be normally be needed to achieve a diagnosis of abnormality.

MDT meetings are beneficial as it allows a variety of specialists to come together sharing their expertise and professional perspective in terms of breast cancers allowing concordance between the results. Studies have demonstrated that multidisciplinary care in cancer management has better patient outcomes as patients are getting a wider range of treatment options like the increased use of chemotherapy and optimized surgical management (Brown, 2012).

The current rise in BC incidences and increasing complex cases are said to put a strain on the MDT meetings affecting the quality of decision-making in the meetings due to current time restraints. Discussing all cases at MDM means that there is insufficient time allocated for the discussion of more complex cases. Whereas a selective review of cases could potentially improve the effectiveness and efficiency of the MDT meetings (Joinville et al., 2019). However, those who argue against this selective review feel that it is important that all patients are treated equally regardless of their case.

Decisions on patient management should be individualized and be based on the patients' preferences and risks (Taylor et al., 2010). Taylor et al., 2010 also argues that treatment recommendations made by multidisciplinary teams do not always consider the patients' preferences and their psychological and social needs, this is why a breast care nurse is also present as plays a crucial role in the MDT acting as an advocate on the patient's behalf. Some argue whether it's feasible to involve patients themselves in the MDT meetings. However, this would be hard to implement as MDT meetings are so fast-paced and it would be hard to discuss risks and prognosis without distressing the patients.

The primary objective of screening is cancer detection, identifying the presence of possible early malignancy, whereas, in triple assessment, the focus is shifted towards confirming or dismissing the presence of malignancy at the site of abnormality.

Employing DBT into screening in replace of mammography has been researched to identify cancers missed by mammography, spot cancers earlier leading to overall fewer false alarms, and in all likelihood increase the program's benefits. However, it's important to question how many clinically insignificant cancers might be detected by employing DBT, and whether the detection of these additional cancers will be of any net benefit or harm to the patient is a strongly debated issue.

Current research shows that a simple blood test could be set for the future helping clinicians detect autoantibodies that may arise before breast tumors develop. While these are early findings, this could be a cost-effective tool and an easier screening method to implement compared to current mammography.