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Presently, NZ Health Professionals are frequently asked about Breast Thermography and its place in the assessment of breast diseases. The summary below explains the differences between Mammography and Breast Thermography.

Mammography	Breast Thermography
Purpose	
<ul style="list-style-type: none"> Detection of unsuspected early breast cancer (screening mammography) and diagnosis of breast abnormalities (diagnostic mammography)^{1,2,3} 	<ul style="list-style-type: none"> Promoted as a tool for breast assessment and breast cancer risk evaluation^{4,5}
Type of Imaging Procedure	
<p><i>Anatomical:</i></p> <ul style="list-style-type: none"> Low dose x-rays detect structural changes in <i>entire</i> breast tissue, e.g. tumour mass, architectural distortion, microcalcifications⁶ 	<p><i>Physiological:</i></p> <ul style="list-style-type: none"> Heat sensing camera detects differences in breast skin surface temperature Comparative 'heat maps' produced of left and right breast skin surfaces Based on concept that skin overlying a breast cancer can be warmer than surrounding skin areas (increased tumour growth/increased blood flow = increased temperature)^{4,5,6}
Evidence-based Breast Screening and Diagnostic Tool - reliable/useful	
<ul style="list-style-type: none"> Yes – since late 1970s^{6,7,7a,8} Proven method worldwide for early detection of breast cancer^{7,7a,8,9} Multiple large scale, prospective, high quality, randomised controlled trials (RCTs) support use^{6,7,7a,8,13,14,15} Proven to save lives (16% to 29% in women aged 40-74 years)^{6,7,7a,8} Approved by the NZ Public Health Service as a population breast screening tool and diagnostic tool for breast cancer¹ 	<ul style="list-style-type: none"> No - introduced 1956⁶ In the late 1970s, largely abandoned due to a number of trials showing it was unable to detect early breast cancer^{6,10} No satisfactory large scale, prospective, high quality, randomised controlled trial (RCT) to support use^{6,10,11,12} Not proven to save lives⁶ Not approved by the NZ Public Health Service as a population breast screening tool and diagnostic tool for breast cancer
Availability	
<ul style="list-style-type: none"> Available through NZ's Public Health Service and NZ private radiology practices Diagnostic mammograms (for women with symptoms) free publicly with doctor's referral Private screening and diagnostic mammograms: \$90-\$180¹⁶ 	<ul style="list-style-type: none"> Not available through NZ's Public Health Service and NZ private radiology practices Available through NZ private breast thermography clinics: approximately \$199⁵
NZ Quality Assurance Standards and Regulations	
<ul style="list-style-type: none"> Yes⁶ Stringent standards and regulations <i>exist</i> in NZ as to mammography use and quality parameters, e.g. equipment and image standards/protocols, who is able to buy and use equipment, professional governing bodies for the relevant health practitioners (radiologists, physicists, mammographers)^{6,17} 	<ul style="list-style-type: none"> No^{4,6} Currently, there are <i>no</i> standards and regulations in NZ as to breast thermography use and quality parameters, e.g. equipment and image standards/protocols, who is able to buy and use equipment, professional governing bodies for the relevant health practitioners (thermographers and personnel who read the infrared images)^{4,6}
Imaging Sensitivity and Specificity	
<ul style="list-style-type: none"> Sensitivity: <ul style="list-style-type: none"> - <u>High</u>, up to 90%^{1,6,12,15,18} - Proven to detect early, potentially curable, breast cancer² Specificity: <ul style="list-style-type: none"> - <u>High, up to 95%</u> - Ability to differentiate between abnormal and normal tissue/benign lesions (yes/no breast cancer)^{2,12,15,18} 	<ul style="list-style-type: none"> Sensitivity: <ul style="list-style-type: none"> - <u>Low</u>, unproven to detect early, potentially curable, breast cancer^{10,19,20} - Morbid obesity, large breast size and pendulous breasts can frequently prevent accurate heat recordings of inferior aspect of breasts⁶ - Heat recordings could vary with infection, inflammation, trauma, intense physical exercise, hormonal changes in young women (influences blood flow in normal tissue)^{6,19} Specificity: <ul style="list-style-type: none"> - <u>Low</u>, unsatisfactory record of diagnosing breast abnormalities, e.g. microcalcifications^{11,19,20,21,26} - <u>Low</u>, not proven to differentiate between abnormal and normal tissue (yes/no breast cancer)^{19,20,21}

Mammography	Breast Thermography
Frequency	
<ul style="list-style-type: none"> The NZBCF recommends screening mammograms: <ul style="list-style-type: none"> Every year: 40-49 years²² Every second year: 50-74 years^{22,23} 	<ul style="list-style-type: none"> If abnormal breast thermogram heat readings occur, further breast thermograms often advised 3 monthly^{4,5} If a breast thermogram normal, breast thermograms are advised yearly at all ages^{4,5}
High Risk for Breast Cancer	
<ul style="list-style-type: none"> Annual: Mammogram +/- Breast MRI (MRI may be useful for very high risk women)^{6,16,24,25,26,27} 	<ul style="list-style-type: none"> No evidence to support, unproven^{6,10,11,27}
Suitability	
<ul style="list-style-type: none"> If mammography is considered inappropriate, e.g. women 30-35 years or pregnant women, breast ultrasound is usually performed in the first instance^{6,16} Breast MRI (high sensitivity) may also be used as an adjunctive (supplementary) test in some specific cases (see above box)^{6,16,24,25} 	<ul style="list-style-type: none"> No evidence to support use for women of all ages^{6,10} No proven benefit for women with dense breasts, breast implants, small breasts, and fibrocystic breast conditions (non-cancerous). Likewise for pregnant/breastfeeding women and breast cancer survivors (recurrence concern)^{6,10} If a woman chooses to undergo a breast thermogram, it should be an adjunct (supplementary) to a screening and/or diagnostic mammogram⁶
Radiation and Technology	
<ul style="list-style-type: none"> Very low x-ray dose²⁸ Dose is approximately equivalent to the amount of 'natural' background radiation we each receive over 3 months²⁹ Lives saved outweigh any potential harmful effects of the x-rays, e.g. the extremely small hypothetical risk of a radiation induced breast cancer^{26,30} Recent technological advance with digital mammography – improved sensitivity and specificity (yes/no breast cancer)^{9,31} 	<ul style="list-style-type: none"> Camera detects radiation in the infrared range of the electromagnetic spectrum - longer wavelengths spanning 9-10 micro millimetre range³² Breast thermography has had a history of being open to error^{4,6} A number of recent technological advances have been made: <ul style="list-style-type: none"> Types of infrared cameras used Computerised software for image production, processing and analysis Standardised image interpretation protocols Environmental imaging room conditions^{10,32} <p>The above advances have not enhanced the basic information, only the way it is displayed¹⁹</p>
NZ Private Health Insurance Cover	
<ul style="list-style-type: none"> Southern Cross <i>does</i> cover full cost of a private screening/diagnostic mammogram (doctor's referral required)³³ Tower covers full cost of a diagnostic mammogram (doctor's referral required), but <i>not</i> a screening mammogram³⁴ 	<ul style="list-style-type: none"> Southern Cross and Tower <i>do not</i> cover cost of a breast thermogram (full or partial)^{33,34}
Breast Compression and Imaging Environment	
<ul style="list-style-type: none"> In a comfortable environment, the breast is placed between two perspex plates of the mammography machine Breast compression generally tolerated well by most women^{16,28} Why breast compression? <ul style="list-style-type: none"> Required to spread out breast tissue folds, providing clearer images for radiologists to read Keeps the breast still Allows decreased radiation dose by reducing breast tissue thickness^{16,28} 	<ul style="list-style-type: none"> No physical contact Infrared camera placed at a distance from breast Heat detected from upper 5 mm of skin⁴ Promoted as a 'more pleasant test', although environment of the imaging room is at a lower temperature as compared to a mammographic imaging room Lower temperature is required to reduce any error with heat recordings: <ul style="list-style-type: none"> Room requires constant temperature stability No drafts Pre-imaging acclimatisation⁵
NZBCF Recommendations	
<ul style="list-style-type: none"> The Foundation unequivocally recommends screening and diagnostic mammograms for the early detection and diagnosis of breast cancer¹¹. The role of breast thermography as an alternative breast imaging technique is unproven (due to findings remaining in question), and cannot be recommended without evidence-based data supported by large-scale, prospective, high quality, statistically valid, randomised controlled trials. Breast thermography should not be used as a substitute for mammograms. 	

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