**RESEARCH ARTICLE**

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# Impact of health talks on knowledge, attitudes and perception of breast cancer screening and treatment amongst healthcare staff by a breast surgical unit in a public healthcare institution: a cross-sectional study

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## Abstract

**Background:** In October 2019, surgeons from Changi General Hospital (CGH) Breast Centre delivered a series of health talk for its employees to assess the knowledge and perception of breast cancer screening and to improve the level of related knowledge amongst the institution's healthcare workers. This was to enable CGH, a healthcare provider to not only care for our patients, but also to look after its staff.

**Methods:** 141 hospital staff attended a 40-min talk followed by an open question and answer forum. Pre and post talk surveys were conducted to gauge knowledge, attitudes, beliefs and misconceptions towards breast cancer screening and treatment. Question domains were divided into (1) breast cancer knowledge, (2) breast cancer screening guidelines and (3) attitudes and perception of breast cancer screening and treatment. Univariate and multivariate logistic regression analysis were used to examine the relationship between demographics and performance in question domains.

**Results:** The overall response rate was 131 out of a total of 141 attendees (92.9%). The median age was 44 years old (range, 22–67), with nursing staff making up 40% of the cohort. Analysis showed statistically significant improvement in median score across all 3 domains. ($p < 0.05$) after the forum. We found that respondents who were women ≥ 40 years (eligible age for screening), had higher income, lived in larger housing types, had attended previous talks, had served > 10 years in healthcare and had personal encounter with breast cancer patients performed better. Surprisingly, being a nurse or having a university degree did not translate to a better score. 99% of respondents found the forum beneficial and would recommend it to others. Several knowledge gaps about breast cancer screening and misconceptions were identified. Future campaigns should focus on raising awareness of the national screening program BreastScreen Singapore. We aim to reinforce its recommendations, promote on the affordability and ready accessibility.

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**Conclusions:** A simple Breast Cancer Awareness Month campaign targeted at healthcare workers was found to be effective at educating hospital staff on breast cancer, screening practices and improving perception of screening and treatment practices. This may empower them to not only care for themselves but also to serve patients better.

**Keywords:** Breast cancer awareness, Screening, Knowledge, Perception

## Background

Breast cancer is the most common and lethal cancer amongst women in Singapore, accounting for 17.3% or 2105 deaths of all cancer in women in Singapore from 2011 to 2015 [1]. Moreover, the age standardised incidence rate[1] of breast cancer had jumped more than 2.5 times over the last four decades from 24.6 to 65.3 per 100,000 population per year [1]. After the Singapore Breast Screening Project concluded in 1994, the national breast cancer screening programme- BreastScreen Singapore (BSS) was launched in 2002. Despite considerable efforts made to encourage women to go for screening, uptake rates remained low [2, 3]. Regular campaign activities such as talks conducted during the Breast Cancer Awareness Month (BCAM) in October were targeted to promote awareness, so as to increase screening uptake.

Healthcare workers served as a direct source of medical information to the public and patients. Due to their frequent contact with patients and public, they were often looked upon to provide accurate health related information. It was therefore essential, that they conveyed accurate facts when promoting health awareness amongst the population. There were reports on observations whereby healthcare staff including nurses, radiographers or physiotherapists or patient service associates may not necessarily have the basic knowledge of these relevant topics [2, 4].

In October 2019, breast surgeons at Changi General Hospital (CGH), a public healthcare institution in the Eastern part of Singapore, delivered a series of talks on breast cancer and mammographic screening to its employees. We took the opportunity to assess the participants' knowledge, perception and practice with regards to breast cancer screening before and after the talk. The aim of this study was to determine the effectiveness of the breast cancer awareness talks at identifying areas of deficient knowledge amongst healthcare workers, clarifying common misconceptions on breast screening and improving perception towards breast cancer treatment.

## Methods

This cross-sectional study involved a convenient sampling of a target population attending the annual Breast cancer awareness campaign conducted hospital-wide. In October 2019, three health talks were conducted by CGH breast surgeons for staff members. Invitations were extended to all staff via email, intranet announcement and posters within the hospital premise. The content covered included epidemiology, signs and symptoms, risk factors of breast cancer, breast cancer screening guidelines, costs and accessibility to screening services. Common myths and misconceptions regarding breast cancer, screening and treatment were also addressed. All three talks had the same content but were conducted on different days in order to allow more staff to attend.

A self-administered questionnaire in English was conducted before and after the talk (Appendix 1). This questionnaire was adapted from a previous study looking at knowledge and perception of breast screening in Singapore [4]. A validity test was not performed on the questionnaire. The questionnaire was designed to assess three domains—knowledge of breast cancer, knowledge of breast cancer screening in Singapore and attitudes and perception towards breast cancer screening and treatment. The questions and answers were listed in Appendices 1 and 2. The list of accepted answers was not exhaustive and answers with similar implied meaning were accepted. Feedback with regards to the talk (duration, usefulness and content) was also obtained.

Participation of the questionnaires was strictly voluntary and anonymous. An immediate response was requested, and the questionnaires were collected upon completion. Participants were encouraged not to discuss the answers with each other. Entries were checked by study assistants to ensure completeness of response to maintain a high fidelity and response rate. The study protocol has been reviewed and approved by the Singhealth Centralised Institutional Review Board (CIRB Ref no. 2019/ 2829).

The data including, total correct responses percentages before and after the health talk, was analysed with Chi-square test. We calculated pre and post questionnaire median scores and chose a 75th percentile as cut off score to analyse the group of better performing respondents according to their demographic characteristics. We determined the correlation of variables to predict for

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[1] Age-standardised incidence (ASIR) is the rate that would be observed if the general population had the age structure of an external world standard population. Age standardisation facilitates the comparison of rates across time and also across countries.

better scores. Multivariate analysis was performed on the statistically significant variables, using logistic regression analysis, with the Statistical Package for the Social Sciences (SPSS) version 18.0 (SPSS Inc, Chicago, IL, USA). A *P* value of < 0.05 was taken to be statistically significant.

## Results

### Demographics

The overall response rate was 92.9% (131 out of a total of 141 attendees). The median age of the respondents was 44 years old (range: 22–67). Chinese participants formed 50.4% of our respondents. The majority (97.9%) of respondents were female, nurses (40.4%) and were diploma/degree holders (85.1%) (Table 1).

### Working experience and exposure to family, friends and/ or patients with breast cancer

Slightly more than half (53.2%) had been working in healthcare for 10 years or less with two-thirds (68.8%) not having attended similar talks. Most did not have a family history of breast cancer (80.1%) and had not been involved in the care of breast cancer patients (63.8%) (Table 1).

### Domain 1: knowledge of breast cancer

The improvement in knowledge scores pre- and post-talk was statistically significant in 16 out of 27 questions as detailed in Table 2 (*P* < 0.05). The main areas of pre-talk knowledge deficit (which was defined as having less than 50% of the cohort having the correct responses) were: signs and symptoms of breast cancer, risk factors, and the stages of breast cancer. These were indicated with asterisks in Table 2.

After the talk, there was significant improvement in scores of more than 50% absolute increase in correct respondents in 3 questions, namely risk factors of breast cancer, stages of breast cancer, and the costs of screening mammograms for Singaporeans. 41.2% more respondents were aware of BSS and 42.0% more respondents knew the correct interval of screening mammograms after the talk.

However, post-talk, 24.4% of the respondents still believed that traditional medicine was part of treatment for breast cancer.

### Domain 2: knowledge of breast cancer screening

Generally, there was poor knowledge of breast screening amongst the respondents. Prior to the talk, almost half (44.3%) have not heard of BSS. Most (62.6%) were unaware that screening mammogram was to be done when there are no breast symptoms or problems and 85.5% were unable to correctly name two locations for screening mammograms. Almost two-thirds (64.1%) did not

**Table 1** Respondents' demographics, working experience and exposure to family, friends and/or patients with breast cancer (n = 141)

| Demographics | Respondents (%) |
|---|---|
| *Age** | |
| < 40 | 88 (62.4) |
| 40–49 | 27 (19.1) |
| ≥ 50 | 26 (18.4) |
| *Ethnic group* | |
| Chinese | 71 (50.4) |
| Malay | 35 (24.8) |
| Indian | 9 (6.4) |
| Eurasian | 2 (1.4) |
| Others | 24 (17.0) |
| *Sex* | |
| Male | 3 (2.1) |
| Female | 138 (97.9) |
| *Highest education completed* | |
| Primary or below | 0 (0.0) |
| Secondary | 13 (9.2) |
| Diploma (Polytechnic, A level, ITE) | 28 (19.9) |
| University degree holder | 92 (65.2) |
| Missing | 8 (5.7) |
| *Healthcare profession* | |
| Doctor | 0 (0.0) |
| Nurse | 57 (40.4) |
| Allied health | 36 (25.5) |
| Administrative staff/others | 48 (34) |
| *Gross personal monthly income (SGD)* | |
| < $2000 | 9 (6.4) |
| $2000—$3999 | 64 (45.4) |
| $4000—$5999 | 49 (34.8) |
| $6000 and above | 13 (9.2) |
| *Housing* | |
| Rental/1–2 room apartment | 11 (7.8) |
| 3 Room apartment | 16 (11.3) |
| 4–5 Room/executive apartment | 92 (65.2) |
| Executive condominium | 11 (7/8 |
| Landed property | 2 (1.4) |
| Missing | 9 (6.4) |
| *Family history of breast cancer* | |
| Yes | 16 (11.3) |
| No | 113 (80.1) |
| Don't know | 4 (2.8) |
| Missing | 8 (5.7) |
| *Know of relative who have breast cancer* | |
| Yes | 52 (36.9) |
| No | 70 (49.6) |
| Don't know | 11 (7.8) |
| Missing | 8 (5.7) |
| *Know of friends who have breast cancer* | |
| Yes | 63 (44.7) |

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**Table 1** (continued)

| Demographics | Respondents (%) |
|---|---|
| No | 64 (45.4) |
| Don't know | 6 (4.3) |
| Missing | 8 (5.7) |
| *Had previously and/or currently been involved in the care of breast cancer patients* | |
| Yes | 42 (29.8) |
| No | 90 (63.8) |
| Missing | 9 (6.4) |
| *Attended previous similar health talk* | |
| No | 97 (68.8) |
| Yes | 43 (30.5) |
| Missing | 1 (0.7) |
| *Duration in healthcare* | |
| ≤ 10 years | 75 (53.2) |
| > 10 years | 64 (45.4) |
| Missing | 2 (1.4) |

* Age group categorised according to BreastScreen Singapore guidelines[5]

< 40: Not recommended for screening mammograms

40–49: To consider annual mammograms

≥ 50: Recommended for biennial screening mammograms

know the recommended interval for routine screening mammograms. Majority (72.8%) did not know the costs of a screening mammogram, with more than 50% (n = 74) believed that it cost more than SGD\$100, when in fact, it cost SGD\$50 when done at the BSS screening centres.

After the talk, the respondents displayed a significant improvement ($p < 0.05$) in most areas. Although there was improvement in their understanding of what was considered to be screening mammogram (37.4–45.0%) and the knowledge that Medisave (a national compulsory saving scheme) could be used to subsidise the screening mammograms (58.8–66.4%), it did not reach statistical significance [6].

Despite a significant improvement, 47.3% of the respondents were still unable to accurately name two locations to perform screening mammogram and 22.1% were unaware of the correct interval for screening mammogram.

## Domain 3: attitudes and perception of breast cancer screening and treatment

Most of the respondents (> 80%) provided correct answers to the questions in this domain, except for the question on the effect of breast cancer surgery on the ipsilateral arm. Fortunately, there was significant improvement after the talk, from 65.6 to 84.7% ($p < 0.05$).

In terms of personal practice, only 31.5% (34/108) of eligible respondents had gone for screening mammogram. After the talk, 82% of the respondents reported

that they would go for screening mammogram and most (99%) would recommend their family and friends to go for screening too.

## Scores

The total score for all three domains was 27. The mean total score pre-talk was 19 (range: 9–26). There was a significant improvement of the post-talk mean score to 24 (range: 15–27) ($p < 0.05$) (Fig. 1). Using the 75th percentile as cut-off, a high score on knowledge was arbitrarily defined as those with a score of > 21 (22/27 = 81.5%) and a low score was defined as those with a score of ≤ 21. There was a significant improvement in the percentage of overall good performers and a consistent improvement in mean scores across all 3 domains (Table 3). Of the three domains, respondents fared worst in the knowledge of breast cancer screening.

The scores were analysed against the demographic, working experience and exposure to family, friends and/or patients with breast cancer of the respondents. We found that respondents who were women ≥ 40 years (eligible age for screening), had higher income, lived in larger housing types, had attended previous talks, had served > 10 years in healthcare and had personal encounter with breast cancer patients performed better. Surprisingly, being a nurse or having a university degree did not translate to better score (Table 4). Having a non-nursing background and longer duration of service were the two statistically significant variables that predicted for better scores in the pre-talk analysis.

We further analysed the nurses' performance in the 3 domains and found that the mean score for knowledge on breast cancer and attitude and perception about breast cancer screening and treatment were higher than average at 11.1/13 (85.3%) and 5.2/6 (86.7%) respectively, but lower than average for knowledge on breast cancer screening at 4.7/8 (58.7%) (Table 3).

## Feedback

In general, the talks were well received, with 99% of respondents finding the talk beneficial and would recommend to others to attend. 89.4% identified health talks as their preferred source of information on breast cancer (Table 5).

## Discussion
### Scores

Our study showed statistically significant improvement of knowledge scores before and after the BCAM talks in all three domains of questions (Fig. 1; Tables 2 and 3). The weakest performing domain was the domain on breast cancer screening. Fortunately, the post-talk questionnaire showed the improvement in knowledge of

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**Table 2** Number (%) of respondents achieving the correct answer pre and post talk (n = 131)

|  | Pre (%) | Post (%) | % Increase | *P* value |
|---|---|---|---|---|
| *Knowledge of breast cancer* | | | | |
| 1. What is the most common cancer in Singapore women | 105 (80.2) | 128 (97.7) | 27.5 | < 0.001 |
| 2. Is breast cancer a common cancer among Singapore women | 124 (94.7) | 130 (99.2) | 4.5 | 0.031 |
| 3. Name two risk factors for breast cancer* | 28 (21.4) | 96 (73.3) | 51.9 | < 0.001 |
| 4. Name two symptoms of breast cancer* | 59 (45.0) | 82 (62.6) | 17.6 | 0.001 |
| *Breast cancer has different stages as follows* | | | | |
| 1. Stage 0* | 44 (33.6) | 122 (93.1) | 59.5 | 0.001 |
| 2. Stage 1 | 123 (93.9) | 129 (98.5) | 4.6 | 0.109 |
| 3. Stage 2 | 127 (96.9) | 128 (97.7) | 0.8 | 1.000 |
| 4. Stage 3 | 123 (93.9) | 127 (96.9) | 3.0 | 0.388 |
| 5. Stage 4 | 117 (89.3) | 126 (96.2) | 6.9 | 0.035 |
| *Treatment of breast cancer may involve* | | | | |
| 1. Traditional medicine | 92 (70.2) | 99 (75.6) | 5.4 | 0.265 |
| 2. Surgery | 128 (97.7) | 131(100.0) | 2.3 | NA |
| 3. Chemotherapy | 128 (97.7) | 130 (99.2) | 1.5 | 0.625 |
| 4. Radiotherapy | 115 (87.8) | 129 (98.5) | 10.7 | 0.001 |
| *Knowledge of breast cancer screening in Singapore* | | | | |
| 1. Have you heard of the BreastScreen Singapore program | 73 (55.7) | 127 (96.9) | 41.2 | < 0.001 |
| 2. Correctly identify what is considered to be "Breast Cancer Screening"* | 49 (37.4) | 59 (45.0) | 7.6 | 0.132 |
| 3. Correctly identify age at which women are to start going for breast screening | 92 (70.2) | 122 (93.1) | 22.9 | < 0.001 |
| 4. Correctly identify the interval for breast screening * | 47 (35.9) | 102 (77.9) | 42.0 | < 0.001 |
| 5. Correctly name 2 places that screening mammograms are available (specific) * | 19 (14.5) | 69 (52.7) | 38.2 | < 0.001 |
| 6. Correctly identify how much a screening mammogram costs at the BSS screening centre for Singaporeans? * | 35 (26.7) | 115 (87.8) | 61.1 | < 0.001 |
| 7. Can Medisave+ be used to pay for screening mammogram for women ≥ 50 years old? | 77 (58.8) | 87 (66.4) | 7.6 | 0.174 |
| 8. How often women should do breast self-examination (BSE)? | 85 (64.9) | 115 (87.8) | 22.9 | < 0.001 |
| *Attitudes and perceptions of Breast cancer screening and treatment* | | | | |
| 1. Women should only go for a mammogram when they have a breast problem eg lump | 112 (85.5) | 116 (88.5) | 3.0 | 0.535 |
| 2. I think that regular screening mammogram will not affect the shape of the breasts | 114 (87.0) | 127 (96.9) | 9.9 | 0.004 |
| 3. If there is an abnormality in the breast, the 1st thing I would do or advise others to do is to see a doctor | 121 (92.4) | 130 (99.2) | 6.8 | 0.004 |
| 4. Will there be a higher chance of cure if breast cancer is detected early? | 127 (96.9) | 130 (99.2) | 2.3 | 0.375 |
| 5. Surgery for breast cancer always needs the whole breast to be removed | 105 (80.2) | 115 (87.8) | 7.6 | 0.052 |
| 6. Surgery for breast cancer will cause the affected arm to swell and be crippled | 86 (65.6) | 111 (84.7) | 19.1 | < 0.001 |

* Weaker areas defined as less than 50% of cohort scored correctly

+ MediSave is a compulsory national saving scheme in Singapore

breast screening to be the greatest. This may be due to the fact that healthcare staff who worked in a tertiary hospital that was not a screening centre, were therefore not familiar with screening practices. Thus, this would be an area that future talks to healthcare staff should place more emphasis on.

The multivariate logistic regression revealed that working > 10 years in healthcare and non-nurses had better performance, suggesting that having a nursing background alone did not translate to better overall scores. Our subgroup analysis revealed that although nurses performed worst in the knowledge of breast

cancer screening, but they had above average scores in knowledge of breast cancer, attitudes and perceptions towards treatment. This was similar to previous studies that showed that nurses in a tertiary hospital lacked knowledge in screening even though they are aware of the symptoms, risk factors, treatment and natural history of the breast cancer [7, 8]. Chong et al. [9] also reported that nurses in hospital setting fared worse than their counterparts in primary health settings in terms of breast screening knowledge. Heena et al. [10] also reported that the knowledge attitudes and practices related to breast cancer screening among
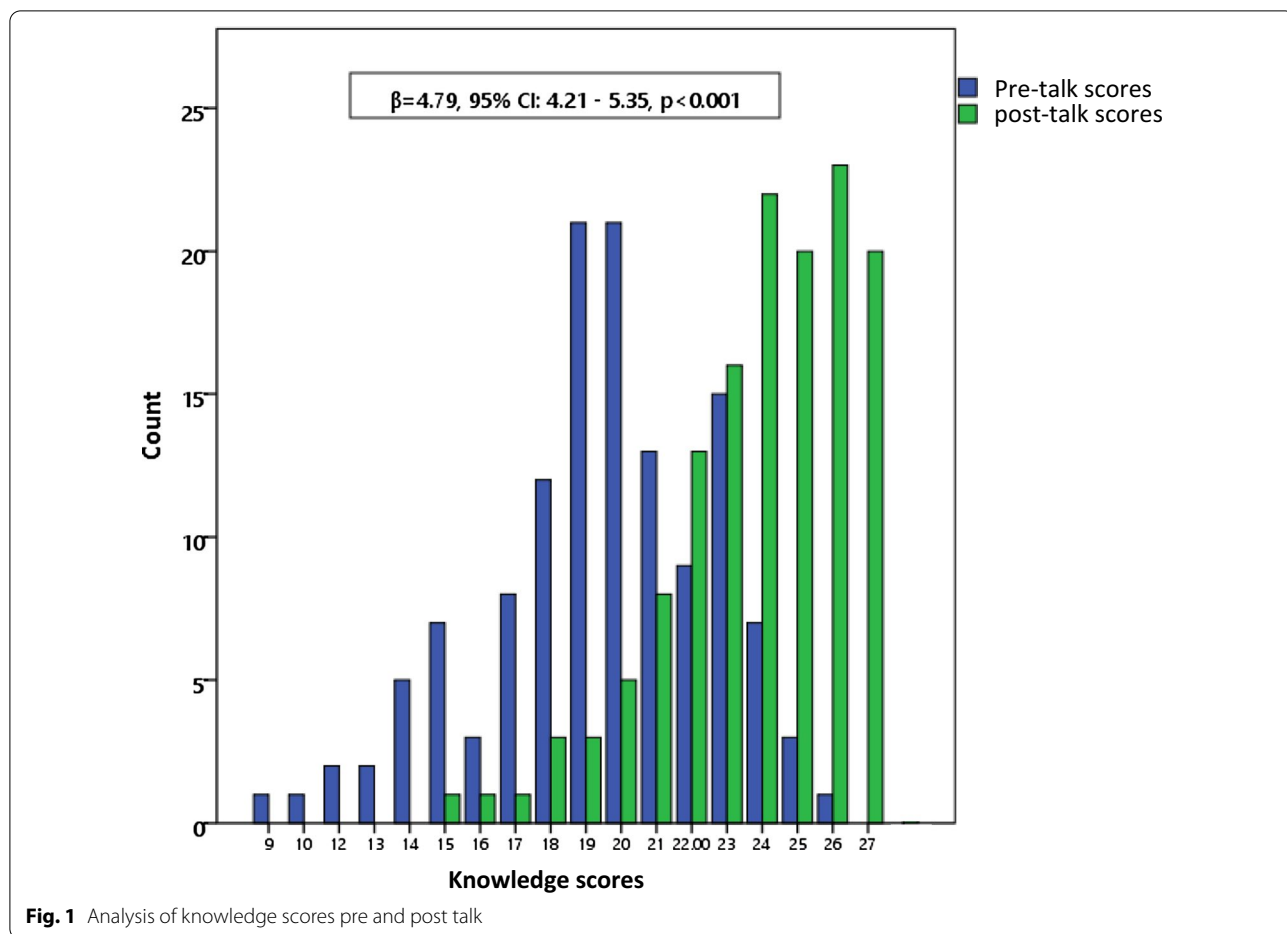
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**Fig. 1** Analysis of knowledge scores pre and post talk

**Table 3** Proportion (%) of poor and good performers, breakdown of mean scores in all 3 domains pre and post-talk

|  |  | Pre-talk (%) |  | Post-talk (%) |  |
| --- | --- | --- | --- | --- | --- |
| Poor performers (scoring ≤ 21/27) |  | n = 96 (73.3) |  | n = 22 (16.8) |  |
| Good performers (scoring > 21/27) |  | n = 35 (26.8) |  | n = 109 (83.2) |  |
| Average scores |  | 19 (range: 9–26) |  | 24 (range:15–27) |  |
| Domains | Total score | Average score among poor performers (%) | Average score among good performers (%) | Average score among poor performers (%) | Average score among good performers (%) |
| 1. Knowledge of breast cancer | 13 | 9.54 (73.4) | 11.34 (87.2) | 10.27 (79.0) | 12.12 (93.2) |
| 2. Knowledge of breast cancer screening | 8 | 3.72 (46.5) | 6.09 (76.1) | 4.41 (73.5) | 7.04 (88.0) |
| 3. Attitudes and perceptions of Breast cancer screening and treatment | 6 | 4.01 (66.8) | 4.80 (80.0) | 5.07 (84.5) | 5.56 (92.7) |

**Table 4** Multivariate logistics regression on pre-talk knowledge scores

| | Knowledge | | Univariate | | Multivariate | |
|---|---|---|---|---|---|---|
| | Poor (%) | Good (%) | OR (95%CI) | *P* value | OR (95%CI) | *P* value |
| *Age* | | | | | | |
| < 40 | 67 (80.7) | 16 (19.3) | REF | | REF | |
| ≥ 40 | 29 (60.4) | 19 (39.6) | 2.74 (1.24, 6.08) | 0.013 | 1.67 (0.55, 5.08) | 0.364 |
| *Education* | | | | | | |
| Non-university | 25 (67.6) | 12 (32.4) | REF | | REF | |
| University | 66 (75.9) | 21 (24.1) | 0.66 (0.29, 1.54) | 0.341 | 1.73 (0.51, 5.91) | 0.380 |
| *Occupation* | | | | | | |
| Non-nurse | 54 (56.8) | 22 (62.9) | REF | | REF | |
| Nurse | 41 (75.9) | 13 (24.1) | 0.78 (0.35, 1.73) | 0.538 | 0.18 (0.05, 0.64) | 0.008 |
| *Personal income* | | | | | | |
| < $4000 | 30 (83.3) | 6 (16.7) | REF | | REF | |
| ≥ 4000 | 52 (66.7) | 26 (33.3) | 2.50 (0.92, 6.76) | 0.071 | 1.45 (0.39, 5.42) | 0.578 |
| *Housing type* | | | | | | |
| 3 Room and smaller/rented | 21 (84.0) | 4 (16.0) | REF | | REF | |
| 4–5 Rooms | 64 (73.6) | 23 (26.4) | 1.89 (0.59, 6.08) | 0.288 | 0.74 (0.16, 3.29) | 0.687 |
| EC/private | 6 (54.5) | 5 (45.5) | 4.38 (0.89, 21.61) | 0.070 | 3.18 (0.36, 28.21) | 0.298 |
| *Know someone with breast cancer* | | | | | | |
| No | 26 (28.6) | 5 (15.2) | REF | | REF | |
| Yes | 65 (71.4) | 28 (84.8) | 2.24 (0.78, 6.43) | 0.134 | 1.81 (0.50, 6.56) | 0.368 |
| *Attended talk previously* | | | | | | |
| No | 69 (77.5) | 20 (22.5) | REF | | REF | |
| Yes | 26 (63.4) | 15 (36.6) | 1.99 (0.89, 4.46) | 0.095 | 1.65 (0.56, 4.88) | 0.366 |
| *Working in healthcare* | | | | | | |
| ≥ 10 years | 59 (85.5) | 10 (14.5) | REF | | REF | |
| > 10 years | 35 (58.3) | 25 (41.7) | 4.21 (1.81, 9.80) | 0.001 | 4.76 (1.36, 16.62) | 0.014 |

* Multivariate analysis included age, education level, occupation, personal income, housing type, family history, relative and/or friends with breast cancer, attended previous talk, duration of working in healthcare

**Table 5** Respondents' preferred medium for future health awareness campaigns (%)

| | |
|---|---|
| Health talks/public forums | 126 (89.4) |
| TV | 96 (68.1) |
| Printed materials such as posters, brochures | 91 (64.5) |
| Internet | 77 (54.6) |
| Family doctors | 50 (35.5) |
| Email | 21 (14.9) |
| SMS | 15 (10.6) |
| Health App | 74 (52.5) |

healthcare professionals were found to be lower than expected.

The authors postulated that as CGH was a tertiary referral centre, nurses were more accustomed to managing more advanced breast conditions and hence lacked experience in promoting breast cancer screening practices. Another possible explanation could be that the nurses who attended the talk were a bias group. As a large number of nurses work shift duties, some may not be able to attend the talks. Hence those who attended may not be representative of the entire nursing population in the hospital. However, the authors took comfort in that, despite their initial poorer knowledge, their scores improved significantly after the talk.

## Knowledge gap
### Domain 1: knowledge on breast cancer
Despite a significant improvement in knowledge of risk factors and symptoms of breast cancer post-talk, 26.7% and 37.4% of the respondents respectively were still unable to provide correct answers for these after the talk. This suggested that the talk was effective in improving knowledge, but perhaps in future talks, more emphasis could be placed in these specific areas.

Post-talk, 24.4% still held the belief in treatment for breast cancer may involve traditional medicine. These

were areas that might have to be emphasized in future talks. This may be due to the deep-rooted cultural beliefs in traditional remedies in the predominantly Asian population in Singapore. A local study found that there was a wide discrepancy between the understanding and its uptake rate. The understanding of complementary and alternative medicine (CAM) may be poor among the population, but almost half of the surveyed population continued to use CAM concurrently with conventional medicine and up to 70% would not consult a doctor or pharmacist when using CAM [11]. Future talks should highlight the lack of scientific evidence on CAM in breast cancer treatment.

### Domain 2: knowledge on breast cancer screening
This was the weakest performing domain before and after the talk. Despite significant post-talk improvement, 22.1% and 47.3% of the respondents were still unaware of the correct interval for screening mammogram and unable to accurately name two screening centres respectively. More than half (55.0%) had poor understanding of what was considered to be screening mammogram and a third (33.6%) did not know that Medisave could be used to pay for the screening mammogram.

This was alarming since BSS started in 2002 and the use of Medisave for screening practices was permitted in 2011. Medisave was a national saving scheme that could subsidise screening practices [12, 13] Poor screening attendance may in part be due to some of these knowledge gaps. This reinforced the need for continual efforts to educate and spread awareness of the national screening program to healthcare staff who could then help to educate the population. [14].

### Domain 3: attitudes and perception of breast screening and cancer treatment
The respondents' knowledge in this area was high except for the effect of breast cancer surgery on the ipsilateral arm. A higher proportion of respondents associated breast surgery with debilitating side effects. This misconception may be due to a higher probability of healthcare staff in a tertiary hospital encountering patients with more advanced stages of lymphoedema undergoing surveillance or rehabilitative processes.

### Feedback
Majority of respondents' feedback that their preferred way of obtaining health information was via health talks. The authors suggested that for future talks, emphasis could be placed in areas that were poor pre-talk (stage of breast cancer, BSS programme and breast cancer screening) with extra emphasis in areas that remained poor

post-talk (risk factors, symptoms of breast cancer, traditional medicine, breast cancer screening). Future talks could also be tailored to the staff according to their area of work within the healthcare. For example, talks given to nurses, could have more prominence on information relating to breast cancer screening.

### Limitations
We recognised that this study had a small sample size. In-person attendances suffered the constraint of venue capacity, hence limiting the number of attendees. To address this, more sessions and/or incorporating the talks into staff's protected learning time could be arranged. Future talks may also be conducted online, thus allowing for even greater attendants. The study results were derived by convenient sampling. The instrument used to assess knowledge and perception in this case, although not validated, had been previously used in other studies to allow for convenient comparison [2, 4, 7]. This study was not designed to demonstrate that post-talk improvement in knowledge score would lead to an increase in screening practice.

Nonetheless, this study was able to highlight the knowledge gaps in breast cancer screening and treatment in healthcare staff. Majority of these areas showed significant improvement simply after attending the talk. This was a simple and effective way to vastly improve health knowledge amongst healthcare staff. As healthcare personnel are ambassadors of the healthcare system, their knowledge would aid in providing accurate information to patients and public, enabling them to make wise healthcare choices.

## Conclusions
This study had achieved its primary aim to identify certain knowledge gaps and perception towards breast cancer screening and treatment amongst healthcare staff. It also showed a significant post-talk improvement in knowledge scores, hence highlighting the effectiveness of such health talks. The authors endeavour to improve on future campaigns with targeted and relevant content.

## Appendix 1: Questionnaire
Thank you for taking time to do this survey. We would like to obtain your feedback on the Breast Cancer Awareness Talk 2019. Please tick your answers in the boxes provided &/or fill in the blanks. Thank you!

This survey is anonymous and your personal details will not be disclosed

.

**PERSONAL INFORMATION AND PERCEPTION TO BREAST SCREENING**

**Please tick the boxes &/or fill in the blanks**

1. Ethnic Group:

- ☐ Chinese
- ☐ Malay
- ☐ Indian
- ☐ Eurasian
- ☐ Others, please specify _____

2. Age: _____ years

3. Gender:

- ☐ Male
- ☐ Female

4. Occupational groups

- Medical staff
    - ☐ Doctor
    - ☐ Nurse
    - ☐ Allied health (please specify): _____
    - ☐ Others (please specify): _____
- Administrative staff
    - ☐ Interact with Patients – eg PSA, Ops, others
    - ☐ Back end (no direct patient contact)
    - ☐ Others (please specify) _____
- Others (please specify): _____

5. How long have you been working in the healthcare industry?      _____year(s)

6. Have you attended talks on Breast cancer &/or Screening

- ☐ No
- ☐ Yes (Roughly how long ago was this?) _____

7. Gross personal monthly income

- ☐ Below $1000
- ☐ $1000-$1999
- ☐ $2000-$3999
- ☐ $4000-$5999
- ☐ $6000 and above
- ☐ Not applicable

8. Gross household monthly income

- ☐ Below $1000
- ☐ $1000-$1999
- ☐ $2000-$3999
- ☐ $4000-$5999
- ☐ $6000 and above
- ☐ Not applicable

9. Housing – do you live in a

- ☐ Rental flat
- ☐ 1-2 room HDB flat
- ☐ 3 room HDB flat
- ☐ 4-5 room HDB flat/Executive flats
- ☐ Executive Condominium
- ☐ Private Apartment / Condominium
- ☐ Landed property
- ☐ Others (specify) _____

10. Highest Education qualification

☐ No formal education
☐ Primary or below
☐ Secondary
☐ Post-Secondary (Polytechnic, A Level, ITE)
☐ University
☐ Postgraduate

11. Family History of breast cancer

☐ Yes, specify_____
☐ No
☐ Don't know

12. I know of relative(s) who have breast cancer

☐ No
☐ Yes
☐ I don't know

13. I know of friend(s) who have breast cancer

☐ No
☐ Yes
☐ I don't know

14. I have previously &/or currently been involved in the care of breast cancer patients

☐ No
☐ Yes

15. I get most of my information on breast cancer from **(choose only 2 answers)**

☐ Health talks at school/university/workplace / public forums
☐ Family and friends
☐ TV
☐ Posters, brochures
☐ Internet
☐ My regular family doctor
☐ Polyclinic
☐ Others (specify)_____

16. <u>For Lady Respondents only</u>: I have gone for screening mammograms before

☐ No
☐ Yes, how long ago was this? _____          years

17. Wound you encourage your family & friends to go for screening mammogram?

☐ No
☐ Yes

## Appendix 2: Accepted answers (bolded)

**KNOWLEDGE BEFORE AND AFTER THE TALK**

1. What is the <u>**most**</u> common cancer in Singapore women? <u>**(choose one)**</u> **Breast**

2. Is breast cancer a common cancer among Singapore women? **Yes**

3. Will there be a higher chance of cure if breast cancer is detected early? **Yes**

4. <u>**Which one of the following**</u> do you consider as "Breast cancer screening" <u>**(choose one)**</u>
   **Going for a mammogram when there are no breast problems / symptoms**

5. Women should only go for a mammogram when they have a breast problem eg lump. **No**

6. Have you heard of the BreastScreen Singapore programme? **Yes**

7. At what age should women start going for screening mammogram?       **40**

8. How often should an average risk woman ≥50years old go for screening mammogram?
   **Every 2 year**

9. Name 2 places that screening mammograms are available:
Accepted list of answers (non-exhaustive):
**Screening centres at polyclinics, Health Promotion Board, Assessment centres (hospitals), NHGD mammobus, Singapore Cancer Society**

10. How much does a screening mammogram at a polyclinic costs for Singaporean? **$50**

11. Can Medisave be used to pay for screening mammogram for women ≥50years old? **Yes**

12. I think that regular screening mammogram will affect the shape of the breasts. **No**

13. How often should women do breast self-examination (BSE)?      **Once a month**

14. If there is an abnormality in the breasts, the 1st thing I would do or advise others to do is
**See a doctor (own or polyclinic doctor) immediately**

15. Name two risk factors for breast cancer:
Accepted list of answers (non-exhaustive)**:**
**Smoking, obesity, family history, BRCA gene carrier, nulliparous, no breastfeeding, increased estrogen exposure from OCP/HRT/ early menarche, late menopause**

16. Name two symptoms of breast cancer:
Accepted list of answers (non-exhaustive)**: Asymptomatic, lump, pain, bloody nipple discharge, nipple changes, skin changes**
<u>**Please circle the correct answer**</u>

Stages of Breast cancer are:
17. Stage 0                    **True**
18. Stage 1                    **True**
19. Stage 2                    **True**
20. Stage 3                    **True**
21. Stage 4                    **True**

Treatment of Breast cancer may involve:
22. Traditional Medicine       **False**
23. Surgery                    **True**
24. Chemotherapy               **True**
25. Radiotherapy               **True**

26. Surgery for breast cancer always needs the whole breast to be surgically removed. **Disagree**

27. Surgery for breast cancer will cause the affected arm to swell and be crippled. **Disagree**

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## Declarations

### Ethics approval and consent to participate
The study protocol was reviewed and approved by the Singhealth Centralised Institutional Review Board (CIRB Ref no. 2019/ 2829). The need for consent has been waived by the Singhealth Institutional Review Board.

### Consent for publication
Not applicable.

### Competing interests
Nil.

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