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Review

Breast cancer: Multidisciplinary care and clinical outcomes

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ABSTRACT

A multidisciplinary approach to the management of breast cancer is the standard of care in developed health systems. We performed a systematic review to assess the extent and quality of evidence on whether multidisciplinary care (MDC), or related aspects of care, contribute to clinical outcomes in breast cancer, and in particular whether these influence survival. Only two primary studies have looked at MDC and neither of these studies considered long-term outcomes. The studies of MDC (case series) provide weak evidence that MDC may alter treatment patterns. Several population-based cohort studies showed that related aspects of team work, specialist (surgeon) and hospital workload and specialisation, are associated with improved survival. This group of studies used better quality design with more clearly defined outcome measures, and most of the studies have allowed for possible confounding variables. Evidence of a survival benefit was most consistent for specialist (surgeon) effect. However, the reasons behind the improved survival reported in these studies are unclear, and it is unlikely that this is entirely attributable to treatment patterns. We conclude that although intrinsically multidisciplinary care should be associated with better survival there remains a paucity of evidence to support this. Studies of the long-term clinical effects of MDC in breast cancer should be a priority for future evaluation.

1. Introduction

Breast cancer care has become increasingly specialised over the last 3 decades with interdisciplinary working from detection to all aspects of management. Concentrating expertise in breast cancer care using a process that brings all relevant disciplines together to discuss and agree on optimal care is intuitively attractive and would be expected to confer benefits. In many countries multidisciplinary care (MDC) for breast cancer has become the standard recommended in guidelines and by professional colleges, cancer organisations, consumer advocacy groups, and health care agencies.[1–3] Evidence of MDC is often sought for re-validation or accreditation in some health care systems.

A multidisciplinary (MD) approach to breast cancer care has been discussed and defined[4–9] but is essentially a model of care that encompasses specialist team care and access to all potential treatment options suitable for the individual patient. It involves collaboration between team members and treatment planning, and is more likely to be patient-centred and to

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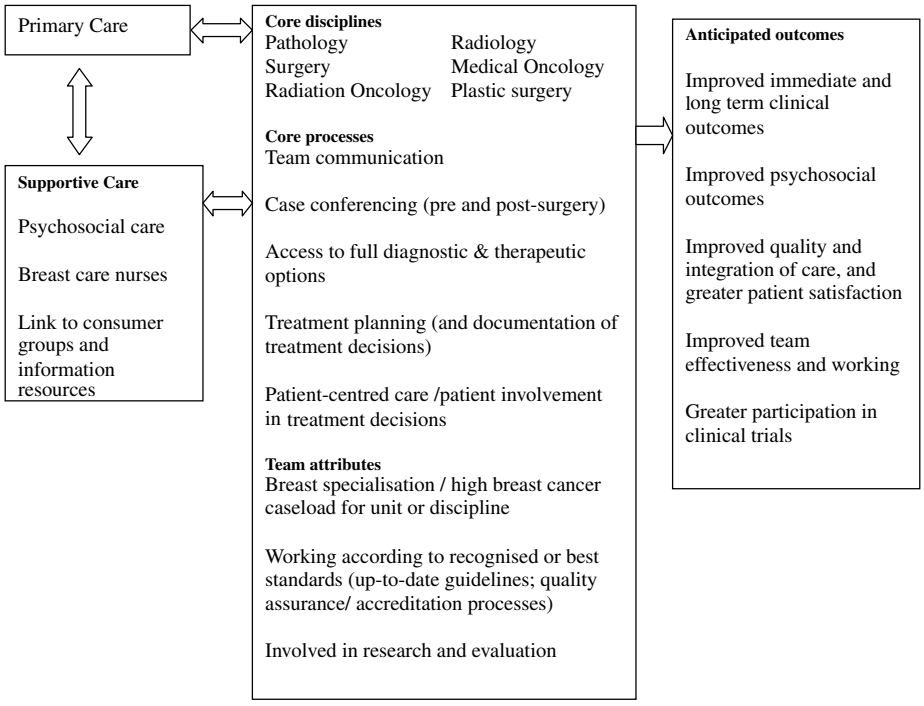

Fig. 1 – Schematic representation of multidisciplinary care in breast cancer.

provide psychosocial support and access to clinical trials.[4–6,8] Fig. 1 is a schematic representation of MDC in breast cancer.

Our review examines the evidence on whether a multidisciplinary approach and related aspects of care contribute to clinically relevant outcomes in breast cancer, and specifically whether these influence survival. We do not question the role of MDC in the management of breast cancer – we present a systematic evaluation of the extent and quality of the evidence on its clinical effectiveness. While we acknowledge the potential benefits of a MD approach to psychosocial outcomes, we considered this aspect to be outside the scope of the present review.

2. Methods

We systematically reviewed the literature on MDC or team care in breast cancer using data sources and the search strategy described in Appendix 1. We included studies of MDC, team care (or defined components thereof) which examined survival or other clinically significant outcomes. We did not include published work which was primarily concerned with describing or demonstrating MD models of care and which did not consider clinical outcomes.

The quality of evidence from relevant studies was assessed using criteria that evaluate external and internal validity. For external validity (generalisability), we considered study design, study population (was it well-defined in time and place, was case-mix described), and definition or description of MDC or team care (or components of MDC). For internal validity we considered whether the study included an appropriate or meaningful comparator (or comparison for) model of care, and whether it adjusted for confounding or significant variables. Our quality appraisal criteria included (under adjustment for significant variables) whether the study provided information on adjustment for risk (severity or stage of disease) and processes of care (treatment given).[10] Quality appraisal for each eligible study was done prior to extraction of data on clinical outcomes.

3. Results

Most papers identified in searches of the literature dealt with describing or defining MDC, describing methods of implementing MD meetings, covered institutional models of MDC, outlined the role of specific crafts within MD teams, or expressed personal views on MDC. Fourteen papers[11–24] and one abstract[25] examined MDC, or related aspects of team care, and provided data on clinical outcomes. These included studies which specifically examined specialist (surgeon), team or hospital breast cancer caseload (volume), or specialisation, and survival. We excluded a paper by Haward and colleagues[26] which provided important information on team composition and working (including workload) in relation to team effectiveness, but since breast teams were the study population in this paper we considered it to be outside the scope of the review.

Table 1 summarises the findings of our review – the evidence table includes the quality appraisal and reported clinical outcomes for each study. There were no randomised controlled trials of MDC in breast cancer. All relevant studies

Table 1 – Quality appraisal and clinical outcomes in breast cancer for studies of multidisciplinary care (MDC), team care, or specific components of team care

Author (s) (year)	Study design and population 1. Study design, 2. Is population well defined? 3. Is case-mix described? 4. Sample size (*N*)	Is descriptive information or definition of MDC or team care (or specific components thereof) provided?	Does study design include a comparator model of care or a valid comparison for component of care being evaluated?	Adjustment for confounding or significant variables	Clinical outcomes
Ingram et al.[11]	1. Population-based cohort (conducted over 3 time intervals) 2. Yes 3. Limited descriptive data given (age, mode of detection, tumour size) 4. N = 2203 (some analyses were limited to 1727 subjects due to missing data items)	Surgeon workload only	Yes, compared caseload stratified into 2 categories	Adjusted for age, tumour size, lymph node status, study year, and whether tumour screen-detected	Survival: 4-year survival better for women treated by high caseload surgeons (20 + cases pa) versus low caseload surgeons (<20 cases pa) (HR 0.71, $p = 0.03$) 86% versus 82% (1989) 89% versus 84% (1994) 90% versus 79% (1999) Treatment: patients managed by higher workload surgeons were more likely to have • breast conservation (53.3% versus 36.7%, $p < 0.001$) • adjuvant radiotherapy (50% versus 30.6%, $p < 0.001$) No significant difference for chemotherapy (29.2% versus 20.9%, $p = 0.28$)
Stefoski et al.[12]	1. Population-based cohort (follow-up of cohort from previous study by Sainsbury et al.)[21] 2. Yes 3. Yes, patients' age and SES, cancer stage (disease extent and tumour grade) 4. N = 11,329	Surgeon workload and hospital workload	Yes, compared workload stratified into categories based on mean annual number of new breast cancer cases (per surgeon and per hospital)	Adjusted for all variables described in case-mix Including cancer stage; adjusted for treatment	*Surgeon workload* Overall survival: 5-year survival 60% for lowest workload category *versus* 68% for highest workload category RR (breast cancer death) = 1.15 (1.03–1.28) (increased by 15%) for very low workload category (<10 cases pa) relative to highest workload category (>50 cases pa) RR (breast cancer death) = 1.10 (1.02–1.18) (increased by 10%) for low workload category (10–29 cases pa) relative to highest workload category (>50 cases pa)

					Treatment: patients managed by higher workload surgeons were more likely to receive • chemotherapy • combined radiotherapy and other adjuvant therapy *Hospital workload* RR (breast cancer death) did not significantly differ between workload categories
Skinner et al.[13]	1. Population-based cohort 2. Yes (however, data missing in about 19% of defined cohort) 3. Yes, patients' age, race and SES, cancer stage (disease extent, tumour size, node status) 4. N = 29,666 (from initial 43,411)	Surgeon workload and specialisation; criteria for specialisation defined and related to membership of Society for Surgical Oncology. Hospital workload and whether specialty centre (according to whether NCI-designated cancer centre)	Yes, compared workload stratified into categories based on mean annual number of breast cancer cases (per surgeon and per hospital) Comparison of specialist surgeon or specialty centre status based on clearly defined criteria	Adjusted for all variables described in case-mix including cancer stage; adjusted for specialisation for estimate of volume effect; adjusted for volume for estimate of specialist effect	*Specialist effect* Overall survival: surgeon specialisation and surgeon case volume both significantly (and independently) associated with better 5-year survival RR (breast cancer death) = 0.77 (0.67–0.88) (decreased by 23%) for women treated by surgical oncologists relative to those treated by non-specialist surgeons ($p < 0.0001$) RR (breast cancer death) progressively decreased with increasing surgeon case volume ($p = 0.001$); consistent with a dose-response effect across volume categories. RR = 0.84 (0.77–0.92) (decreased by 16%) for high caseload surgeons (>15 cases pa) relative to lowest caseload surgeons ($\leqslant$5 cases pa) Treatment: specialist surgeons performed more BCS than non-specialists ($p = 0.0001$) *Hospital effect* RR (breast cancer death) progressively decreased with increasing hospital case volume ($p < 0.0001$); consistent with a dose-response effect across volume categories. RR = 0.77 (0.70-0.84) (decreased by 23%) in high volume

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Table 1 – *continued*

Author (s) (year)	Study design and population 1. Study design, 2. Is population well defined? 3. Is case-mix described? 4. Sample size (*N*)	Is descriptive information or definition of MDC or team care (or specific components thereof) provided?	Does study design include a comparator model of care or a valid comparison for component of care being evaluated?	Adjustment for confounding or significant variables	Clinical outcomes
					hospitals (>125 cases pa) relative to low volume hospitals (⩽35 cases pa) Hospital specialty status had no impact on survival
Harcourt and Hicks[14]	1. Population-based cohort (conducted over 3 time intervals) 2. Unclear – insufficient information on whether all cases from region were included 3. Limited aggregate data only (median age, mean stage) 4. N = 2409	Hospital annual case volume only	Compared hospital volume stratified into 5 categories of average number of breast cancer cases – but volume per hospital generally low (most less than 25 cases pa)	No	No significant correlation between hospital annual new case volume and 5-year survival
Chang et al.[15]	1. Case series 2. Unclear – likely to be highly selected (self-referral or second opinion to breast MDT in major cancer centre) 3. Yes (patient demographics, clinical stage) 4. N = 75	Yes, MDC with team consensus recommendations; team composition described	Unclear – compared panel recommendation with that of 'outside physician'	No	Change in treatment recommendations for 43% (32 subjects) after MD review The most common 'discordant recommendations' (for the 43%) were: further work-up before final treatment decisions (31%), change to BCS + radiotherapy (17%) instead of mastectomy
Chaudhry et al.[16]	1. Random sample from population cancer registry (sample from cohort) 2. Yes, however restricted to node-negative cases 3. Yes, patients' age and SES, tumour variables (tumour size and grade, ER status, whether extensive DCIS or multifocal) 4. N = 938	Hospital teaching status only – defined according to membership of the Association of Canadian Teaching Hospitals	Compared teaching status of initial treating hospital: teaching versus non-teaching (community) hospital	Adjusted for variables described in case-mix including tumour variables; adjusted for treatment	5-year survival (multivariate model in analysis showed interaction between tumour size and hospital status): RR (breast cancer death) = 0.47 (0.23–0.96) (decreased by 53%) for patients treated in a teaching hospital relative to those treated in a non-teaching (community) hospital for tumours ⩽20 mm Estimate and interaction did not vary substantially with adjustment for therapy; no

					survival difference in women whose tumours were >20 mm. Treatment: patients treated in a teaching hospital were (significantly) more likely to receive: • BCS • Radiotherapy following BCS • Additional treatment to surgery • More (10+) nodes sampled
Golledge et al.[17]	1. Population-based cohort (conducted over 2 time intervals in a single district) 2. Yes 3. Yes (age, tumour stage and grade, node status, proportion screen-detected) 4. *N* = 784	Examined the effect of surgeon 'specialisation' but limited information on criteria (or process of care) in relation to introduction of sub-specialisation	Unclear – compared cohort in district before (1990–1992) and after (1993–1996) introduction of specialist surgeons (65–75 cases per year)	Adjusted for significant variables	1990–1992 (non-specialist surgeons) versus 1993–1996 (specialist surgeons): *Disease free survival (DFS)*: 87% versus 91% (DFS at 1 year) 70% versus 79% (DFS at 3 years); *P* = 0.009; HR (1990–1992) = 1.5 (1.2–2.0) *All recurrence rate (locoregional relapse and metastases)*: 22% versus 12% (at 3 years); *P* = 0.0004; HR (1990–1992) = 2.0 (1.2–3.5) Treatment: patients treated in time interval following introduction of specialist surgeons (93–96) were (significantly) more likely to have: • Axillary dissection • Radiotherapy to axilla • Tamoxifen • Chemotherapy
Morrow et al.[25] (abstract only)	1. Probably a population-based cohort since it included all patients registered with the National Cancer Database 2. ND 3. Data suggests age differences, but similar cancer stage and distribution in relation to volume categories 4. *N* = 173,401 (in 1238 hospitals)	Hospital annual case volume only	Yes, compared hospital volume stratified into 6 categories based on annual number of new breast cancer cases	Adjusted for age and tumour stage – allowed for treatment by stratifying analysis according to treatment pattern	5-year survival for all cases, all cases treated with surgery only, and all cases treated with surgery and systemic therapy Higher hospital volume was significantly associated with increased survival – the association persisted across all treatment combinations Consistent with a dose-response association across hospital volume categories

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Table 1 – *continued*

Author (s) (year)	Study design and population 1. Study design, 2. Is population well defined? 3. Is case-mix described? 4. Sample size (*N*)	Is descriptive information or definition of MDC or team care (or specific components thereof) provided?	Does study design include a comparator model of care or a valid comparison for component of care being evaluated?	Adjustment for confounding or significant variables	Clinical outcomes
Roohan et al.[18]	1. Population-based cohort; all cases identified through state hospital discharge database and linked to cancer registry 2. Yes (however, data not linked or not available in about 30% of cohort) 3. Yes (patient demographics, cancer stage, comorbidity index, race and SES) 4. N = 47,890 cases from original cohort of 68,584 (in 266 hospitals)	Hospital annual case volume only	Yes, compared hospital volume stratified into 4 categories based on annual number of breast cancer cases	Adjusted for all variables described in case-mix including cancer stage; adjusted for type of surgery	Adjusted Risk Ratio for death at 5 years progressively decreased with increasing hospital case volume – consistent with a dose-response effect across volume categories: Volume – Risk Ratio Very low (⩽10 cases pa) – 1.60 (1.42–1.81) Low (11–50 cases pa) – 1.30 (1.22–1.37) Moderate (51–150 cases pa) – 1.19 (1.12–1.25) High (⩾151 cases pa) – 1.00
Gabel et al.[19]	1. Before-after series 2. Partly yes; represents hospital cases so likely to be selected; all cases treated in single institution over 2 defined time intervals 3. Yes (clinical stage) 4. N = 339	Yes, MDC described for team composition and process of care	Unclear – compared cases prior to introduction of MDC with cases after its introduction; MDC defined but comparator model of 'sequential consultation' not sufficiently described	No	MDC decreased time between diagnosis and commencing treatment (42.2 versus 29.6 days, $p < 0.0008$) MDC differed significantly in treatment pattern; increase in either neoadjuvant chemotherapy, or local excision alone ($p = 0.02$) (but unadjusted) (MDC also significantly increased patient satisfaction)
Gillis and Hole[20]	1. Population-based cohort 2. Yes 3. Yes (patient demographics, cancer stage) 4. N = 3786	Surgeon specialist status (defined as working in dedicated breast clinic, link to other disciplines and clinical trials, having separate records of cancer cases)	Probably yes, specialist status (as defined) versus non-specialist (other) surgeons	Adjusted for age, SES, tumour size and nodal status	Five and ten-year survival higher for women treated by specialist surgeons: 5-year survival 67% (specialist) versus 58% (non-specialist) 10-year survival 49% (specialist) versus 41% (non-specialist) Adjusted relative HR = 0.84 (0.75–0.94), significant 16% reduction in the risk of death in women treated by specialist surgeons

					Differences in survival persisted across age and deprivation categories Treatment: women treated by non-specialist surgeons were more likely to have fewer nodes sampled
Sainsbury et al.[21]	1. Population-based cohort 2. Yes 3. Yes (patient demographics, cancer stage) 4. N = 12,861	Surgeon workload (and treatment pattern)	Yes, compared workload stratified into categories (median annual number of new breast cancer consultations), and treatment categories	Yes, adjusted for age, SES, cancer stage, and treatment	Five-year survival: Volume Adjusted Risk Ratio <10 cases pa 1 10–29 cases pa 0.97 (0.90–1.06) 30–49 cases pa 0.85 (0.77–0.93) ⩾50 cases pa 0.86 (0.79–0.94) Treatment: showed differences in treatment in relation to caseload
Lee-Feldstein et al.[22]	1. Population-based cohort 2. Yes 3. Yes (patient demographics, cancer stage) 4. N = 5892	Hospital type only grouped in 4 categories: small or large community, HMO, or teaching; type not well-described	Unclear – insufficient information on how hospital type allocated, insufficient information on hospitals being compared	Yes, adjusted for age, cancer stage, and treatment; analysis stratified according to stage (localised, regional)	Survival by hospital type RR of death for: Localised breast cancer – Regional breast cancer Small community 1.00 – 1.00 Large community 0.74 (0.59–0.94)* – 0.74 (0.60–0.91)* HMO 1.63 (1.16–2.30)* – 0.94 (0.66–1.34) Teaching 0.96 (0.54–1.68) – 0.78 (0.52–1.16) (*$p < 0.05$) Treatment: patients (with localised disease) managed at teaching hospitals were more likely to receive BCS + radiotherapy (>50%) relative to non-teaching hospitals (⩽30%)
Basnett et al.[23]	1. Case series (attending 2 hospitals) from 1982 to 1986 2. Doubtful; hospital cases so likely to be selected; unclear whether series includes all cases for region; 2 years excluded from study interval due to incomplete information from teaching district 3. Yes (age, cancer stage) 4. N = 999	Hospital type only, classified as urban teaching hospital/ district or rural non-teaching hospital/ district (both with access to radiotherapy, chemotherapy)	Unclear, hospital type defined but insufficient information on hospitals being compared	Yes, adjusted for age, cancer stage	Adjusted odds of death for non-teaching district (relative to teaching district) = 1.74 (1.34–2.27) $p < 0.00001$ Treatment: women treated in teaching hospital were more likely to • have radiotherapy • have chemotherapy • have investigations (mammogram, ultrasound, bone or liver scan)

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Table 1 – *continued*

Author (s) (year)	Study design and population 1. Study design, 2. Is population well defined? 3. Is case-mix described? 4. Sample size (*N*)	Is descriptive information or definition of MDC or team care (or specific components thereof) provided?	Does study design include a comparator model of care or a valid comparison for component of care being evaluated?	Adjustment for confounding or significant variables	Clinical outcomes
					Women treated in non-teaching hospital were more likely to • have axillary surgery (sampling or clearance)
Bonett et al.[24]	1. Population-based cohort 2. Yes (invasive ductal cancer only) 3. Yes (patients' age and SES, tumour size and nodal status) 4. N = 2589 (adjusted RR in outcomes for 1073 of cohort)	Hospital type only grouped in 3 categories: large public, large private, and smaller hospitals	Probably yes, defined hospital type as well as total case volume; pooled small volume hospitals together for analysis	Yes, adjusted for age, tumour size and nodal status	No significant differences in survival by hospital type – RR of death: Smaller hospitals RR = 1.00 Large public hospital RR = 0.93 (0.68–1.27) Large private hospital RR = 1.28 (0.94–1.75)

ND (not described), BCS (breast conserving surgery), MDC (multidisciplinary care), DCIS (ductal carcinoma in situ), HR (hazard ratio), HMO (health maintenance organisation).

were observational, and can be broadly categorised into 2 groups. The first group consisted of 2 studies[15,19] that looked at MDC and dealt primarily with treatment patterns; neither of these studies examined survival as an outcome. Both studies consisted of case series, providing weak evidence that MDC affects or alters treatment recommendations, and the limitations of each of these studies are evident in the quality appraisal (Table 1).

The second category of studies examined the association between specialist and/or hospital breast cancer caseload (volume), and/or specialisation, and survival[11–14,16–18,20–25]. Several of these studies also looked at treatment patterns as an outcome.[11–13,16,17,21–23] This group of studies included 12 population-based cohort studies, which provide better quality (higher level) evidence, as well as one large case series.[23] Almost all these studies adjusted for variables that would be expected to influence survival, and only one study (which reported no association between hospital caseload and survival)[14] did not adjust for risk-related variables.

Four cohort studies[11–13,21] reported a significant association between high specialist (surgeon) caseload and improved survival, and none of the studies reported a lack of association between specialist caseload and survival. Three cohort studies[13,18,25] similarly reported a significant association between high hospital caseload and better survival, with two studies reporting a lack of association.[12,14] However, one of these studies[14] had several limitations relative to some of the larger cohort studies in that it had a less defined population, hospital case volume was generally low which provides a less valid comparison, and it did not adjust for risk-related variables.

Three cohort studies[13,17,20] showed a survival benefit for women treated by specialist breast surgeons (specialty status as defined in Table 1) although in one of these studies surgeon specialisation was not clearly defined.[17] There were no studies that reported a lack of association between surgeon specialisation and improved survival. Two cohort studies[16,22] and one case series[23] showed a survival benefit for women treated in hospitals that were designated specialty or teaching centres, although the definition of hospital type or status was not consistently clear for all studies of this topic (Table 1). One of these studies[16] showed the survival advantage in association with hospital type only in women with cancers $\leqslant$20 mm in size. Two studies[13,24] however did not find an association between hospital type and breast cancer survival.

4. Discussion

Our review shows that very few studies have formally evaluated MDC in relation to clinical outcomes, and no studies have been done to assess its impact on survival. There is weak evidence, from 2 small studies,[15,19] that MDC may alter treatment. It remains unclear from the findings of these studies whether this represents an appropriate change in treatment, and in any case the reported treatment changes (for example converting mastectomy to breast conservation and radiotherapy) would not be expected to confer a significant survival benefit. The study by Gable and colleagues[19] did however report a significant reduction in time between diagnosis and treatment, although it is unknown whether this was a result of MDC or other service factors relating to the different time intervals for the study duration. It is also unclear whether all patients (both pre- and post-surgery) were discussed at the MD meeting. It might be expected that the greatest change in survival would be seen if improved decisions on adjuvant therapy were demonstrated as an outcome of MD meetings.

Specialist and hospital caseload and/or specialisation have been shown to be associated with improved breast cancer survival in a number of the studies identified in this review.[11–13,16–18,20–23,25] Many of these studies have also demonstrated differences in treatment patterns in relation to caseload and specialisation.[11–13,16,17,21,22] The most consistent evidence of a survival benefit was for studies of specialist (surgeon) effect (both caseload and specialisation). It is likely that high specialist, or team, caseload is correlated with increasing specialisation, but it is unclear how either aspect of care relates to MD working. Although specialist or high caseload surgeons might be expected to work in an organised MD setting, this has generally not been described (or demonstrated) in the papers on this topic, with the exception of the study by Gillis and Hole.[20]

The reasons behind improved breast cancer outcomes in relation to high caseload and specialisation are not clearly explained by the work reported in the literature. It may be due to better surgical management (both selection and surgical technique), greater use of adjuvant therapy, or more appropriate use of a MD approach (hence appropriate selection of treatment options that are likely to confer clinical benefits). One of the consistently reported differences in treatment in this review is greater use of breast conservation – that is unlikely to have a significant effect on survival. Sainsbury and colleagues reported that surgeon caseload and the use of chemotherapy accounted for most of the survival differences in their cohort,[21] and also showed differences in treatment patterns in relation to caseload. A longer follow-up of this cohort by Stefoski[12] identified that high caseload surgeons were significantly more likely to treat with chemotherapy and combined radiotherapy with other adjuvant therapy. Similar differences in adjuvant therapy have been reported in some of the other studies;[11,17,23] Golledge also reported a significant decrease in all recurrences as an effect of the introduction of surgical specialisation.[17] Nevertheless, the observed differences in survival in several of the studies identified in our review are relatively high – a proportional improvement in survival (in relation to caseload or specialisation) of up to 30% (or up to 53% in selected groups[16]) cannot be attributed to treatment alone. An absolute survival benefit of 8% at 5 years[12] is difficult to explain on the basis of adjuvant therapy alone, as previously pointed out by others.[27] Our review has shown good evidence of an association between surgeon and hospital caseload or specialisation, and improved survival, but the magnitude of the effect cannot be entirely explained.

This review does not challenge the role of MDC in the management of breast cancer, nor its potential psychosocial benefits. We have focused on evaluating the evidence on MDC and survival – intrinsically MDC should be associated

with better breast cancer survival but there remains a paucity of quality evidence to support this. Health care systems that have not implemented MDC may be ideally placed to evaluate it in a randomised trial, comparing existing standard model of care (where specialist responsible for care decides additional consultation and therapy required for each case) with formalised MDC, and examining long-term survival. Such studies need to provide a clear description of MDC (both the process and model of care) and the process of existing standard care, and to adjust for risk-related variables and treatment.

Conflict of interest statement

None declared

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Appendix 1. Literature search, study selection and review strategy

Data sources consisted of MEDLINE (1966 to 28 August 2005), reference lists from primary studies and reviews, websites, and content experts. For the MEDLINE search we exploded the MeSH heading 'breast neoplasms' and searched for the terms 'multidisciplinary care' or 'multidisciplinary' or 'patient care team'. Initial searches suggested that 'patient care team' and 'team caseload' or 'workload' were related themes, and we extended our search by exploding these terms as subject headings and combining them with the exploded MeSH heading 'breast neoplasms'.

Study selection: Eligibility was determined according to whether the study examined MDC, team care, related or defined components of MDC or team care (such as specialist care) and examined survival or other clinically significant patient outcomes. Relevant abstracts were reviewed by one of the authors (NH), and full papers were reviewed only for studies that met eligibility criteria. All selected primary studies were reviewed independently by both authors, and information on defined quality criteria and outcome measures was extracted; disagreement between reviewers was resolved via discussion and consensus.

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