INTERVENTIONS TO PROMOTE PHYSICAL ACTIVITY FOR PEOPLE LIVING WITH AND BEYOND CANCER

EVIDENCE-BASED GUIDANCE

WE ARE MACMILLAN. CANCER SUPPORT

Acknowledgements
This document was written by Dr Anna Campbell, University of Dundee; Jo Foster, Macmillan Cancer Support; Dr Clare Stevinson, Loughborough University and Dr Nick Cavill (Cavill Associates Ltd).

Contents

Executive summary

This review provides commissioners and health professionals with an overview of the evidence for interventions to promote physical activity among people living with and beyond cancer, and guidance on integrating physical activity into the cancer care pathway.

The review should be read alongside its sister document *The importance of physical activity for people living with and beyond cancer*. This summarises the evidence for the role of physical activity during and after cancer treatment[1].

This review demonstrates that good evidence exists to *support* the promotion of physical activity throughout the cancer care pathway. The evidence supports approaches including oncologist-recommended exercise programmes; motivational interviewing and other types of behavioural counselling; referral to supervised gym-based exercise; and walking (including pedometer programmes). These programmes have been shown to be effective in increasing physical activity among cancer patients.

There are a number of key opportunities for intervening with cancer survivors*, to increase uptake of physical activity, before, during and after treatment. By integrating physical activity promotion into the cancer care pathway, health professionals can help to maximise the potential for physical activity to improve health and quality of life for people living with and beyond cancer.

Delivering a planned and integrated service will require a number of changes to current practice, including training in behaviour change techniques; training in physical activity assessment and intervention; and increased collaboration between many groups including clinicians; nursing staff; patient groups, physiotherapists; local authority physical activity staff and others.

*For the purpose of this report we are using the term 'cancer survivor' to refer to people both living with and beyond cancer.

The potential role of physical activity

There are over two million people living with or beyond cancer in the UK. If current trends continue, Macmillan estimates that four million people will be living with or beyond cancer by 2030.[1] Many cancer survivors experience long-lasting adverse effects of their disease and treatments.

It is already well established that physical activity can help in the prevention of cancer[2]. Evidence is now growing to support the role of physical activity during and after cancer treatment. This is summarised in the accompanying Macmillan evidence review *The importance of physical activity for people living with and beyond cancer* that examines the evidence for the role of physical activity during and after cancer treatment[1].

This review showed that physical activity is important for cancer patients at all stages of the cancer care pathway. There is evidence to support the role of physical activity for the following stages of the cancer care pathway:

1 During cancer treatment – physical activity improves, or prevents the decline of physical function without increasing fatigue

2 After cancer treatment – physical activity helps recover physical function

3 During and after cancer treatment – physical activity can reduce the risk of cancer recurrence and mortality for some cancers and can reduce the risk of developing other long-term conditions

4 Advanced cancer – physical activity can help maintain independence and wellbeing

Promoting physical activity at all stages of the cancer care pathway has the potential to improve the health and quality of life of cancer survivors as well as reduce NHS expenditure.

The importance of NHS-led interventions to promote physical activity

Despite the evidence outlined above, it appears that promotion of physical activity is not currently an integrated part of routine care for cancer patients. Most cancer centres do not offer exercise advice as a standard part of patient care, and a UK survey found that around half of oncologists and surgeons do not routinely discuss physical activity with their patients[3]. This may be due to scarce resources or expertise, or a lack of awareness of the strength of the evidence for the benefits of physical activity.

There are some clear reasons to support the integration of physical activity into the cancer care pathway:

Physical activity has multiple benefits

As outlined above, and in the accompanying Macmillan review[1] there is evidence that physical activity is important for cancer patients at all stages of the cancer care pathway, particularly in improving or preventing the decline of physical function without increasing fatigue. Instead of recommending only rest, the advice to "avoid inactivity," even in cancer patients with existing disease or undergoing difficult treatments, is likely to be beneficial.[4]

A cancer diagnosis provides a 'teachable moment'

NICE guidance on behaviour change[5] outlines the importance of significant events or transition points in people's lives that present an opportunity for intervening, as people may be more likely to review their own behaviour and seek support for change.

Cancer patients, have been shown to demonstrate an enhanced motivation to change lifestyle behaviours, especially within the year after diagnosis[6]. This means that the diagnosis of cancer provides a "teachable moment", in which discussions about diet and physical activity (and other issues such as smoking cessation) are likely to be well received by the patient.[6] However, these teachable moments do not happen on their own; they need to be deliberately created as part of the patient consultation. This could be as part of a discussion about preventing or managing side effects or consequences of treatment, especially fatigue[4] as part of an assessment and care plan.

Cancer survivors want professional support in becoming more active

There is evidence that most cancer survivors are keen to receive information or advice about exercise at some point during the cancer experience[7,8]. It is important that this counselling is delivered by a qualified health professional, and is individually tailored to each patient. Many patients would prefer to meet in person to receive exercise counselling, with information ideally provided by an exercise specialist associated with a cancer centre, indicating a strong desire for trustworthy and professional information[9].

Physical activity interventions for people with cancer – the evidence

Evidence from studies among people with cancer

There is a growing evidence base for the effectiveness of interventions to increase physical activity among people with cancer. Research has tended to focus on exploring the link between physical activity and health outcomes, and is now moving on to explore how physical activity can be effectively promoted to cancer survivors as part of their care pathway.

Macmillan commissioned a systematic review of randomised controlled trials to promote physical activity among cancer patients in 2010[10]. This (and additional searching of the literature) has shown the following evidence for specific categories of physical activity interventions:

- **Oncologist-recommended exercise programme**
  One RCT[11] investigated the effectiveness of an oncologist exercise recommendation, compared to the usual care of referral to an exercise specialist. This showed that the group receiving the oncologist recommendation reported significantly greater exercise participation than usual care at 5-weeks.

- **Motivational interviewing and other types of behavioural counselling**
  Three randomised controlled trials have demonstrated the effectiveness of approaches to promote physical activity using techniques such as motivational interviewing; behavioural counselling based on stages of change; and counselling and behavioural modification[12–14]. All of these trials demonstrated positive increases in physical activity measured either in terms of regular self-assessed exercise participation, or minutes of activity measured by accelerometer.

- **Referral to supervised gym-based exercise**
  One RCT[15] demonstrated the effectiveness of a supervised exercise group that participated in 150-minutes weekly supervised gym-based and home-based aerobic exercise for 6-months. On average, exercisers increased moderate intensity to vigorous intensity aerobic exercise by 129-minutes per week compared with 44-minutes per week among usual care participants.

- **Walking, including pedometer programmes**
  A recent review[16] highlighted five randomised controlled trials that promoted walking among cancer survivors[14,15,17–19]. These showed clearly that combined promotion of walking (mainly through counselling-based interventions) improves daily step activity in breast cancer survivors. Studies that define a step goal appear to be more effective than those that do not.

Evidence from studies among people with other long-term conditions

There is evidence from interventions among patients with other long-term conditions[10] that physical activity can be effectively promoted using a range of approaches, including:

- Motivational interviewing
- Behavioural counselling
- Tailored interventions based on stages of change/transtheoretical model
- Walking promotion including use of pedometers
- Supervised exercise training (often through referral to an exercise specialist).

Most of the effective interventions were based on behavioural theory,such as social-cognitive theory or the transtheoretical model, and offered physical activity that was closely tailored to the patient's needs and capabilities.

Example from the evidence[18]

Pedometers are a common aid to increasing physical activity through walking. One Randomised Controlled Trial used pedometers in a 12 week home based walking intervention for post treatment breast cancer survivors (n=23), delivered by two trained health counsellors, and compared outcomes with a control group receiving usual care (n-13).

The intervention was a single 30 minute face to face counselling session, followed by up to 5, 15 minutes telephone counselling sessions in weeks 1,2,4,7 and 10.

Patients were instructed to increase their walking frequency, duration and intensity gradually, over the course of the study.

Pedometers were provided to assist with self-monitoring of activity levels. Self report logs of daily activity/walking, pedometer steps, and ratings of perceived exertion during exercise were completed during each week of the intervention.

The trial was effective in increasing walking among the participants: the average intervention adherence over 12 weeks was 94%, with participants reporting a significantly greater increase in walking for exercise (+11 Metabolic Equivalent METs) over time than the usual care participants (+1.7 METs).

Evidence from studies among the general population

Cancer survivors are a unique population, with specific needs and health concerns[1]. However, findings from physical activity interventions among the general population can help to inform the planning of a cancer care pathway.

In 2006, NICE reviewed the evidence for the promotion of physical activity using brief interventions in primary care, and concluded that the approach is clinically effective and cost effective in the short and very long term (12 months or more)[20].

In primary care NICE have calculated the cost per Quality adjusted Life Year (QALY) of delivering a brief intervention in physical activity to the general population as being from £20 and £440 per QALY – making them highly cost effective (it is generally considered that interventions less than £30,000 per QALY are cost-effective[20].)

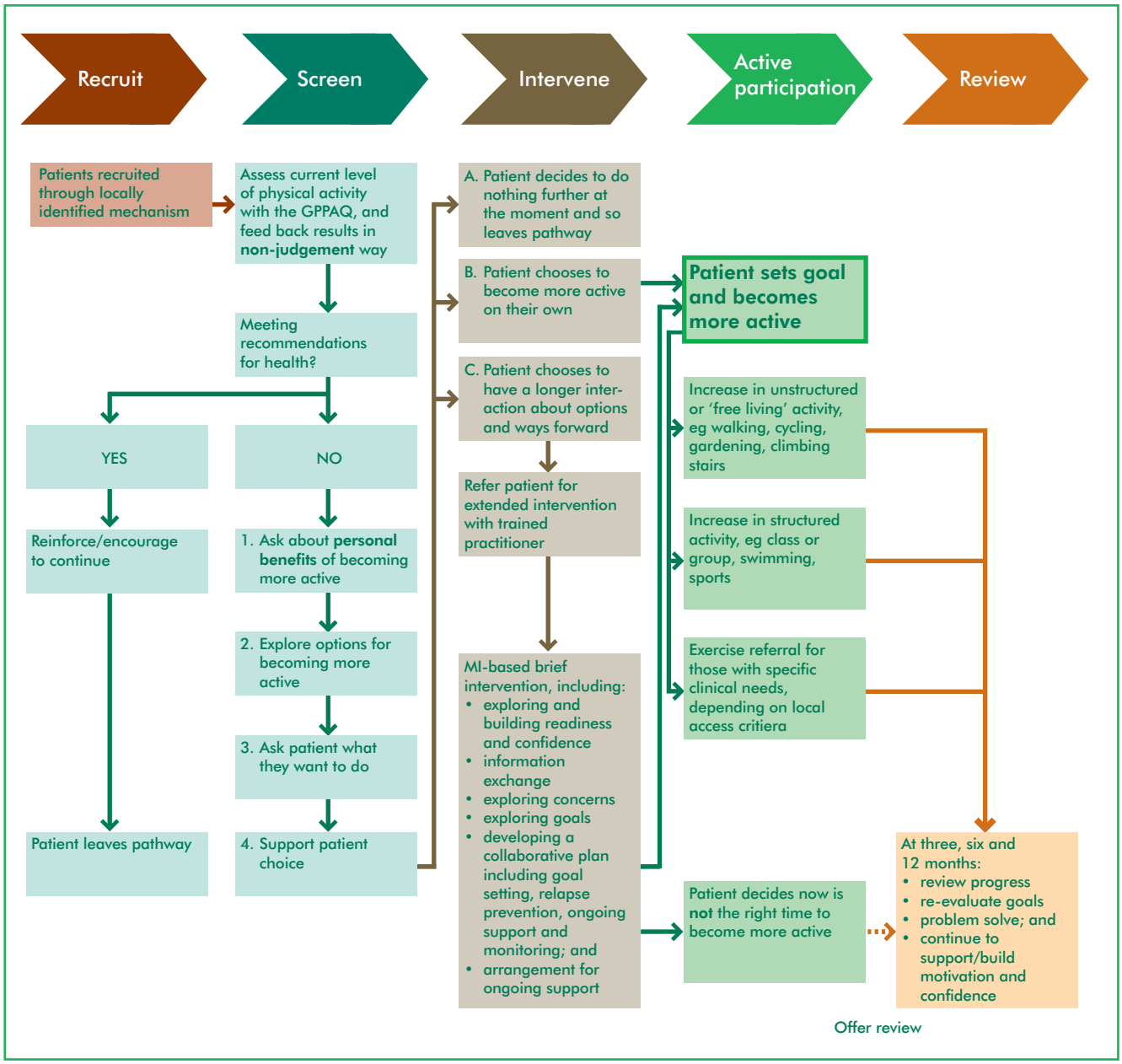
Let's Get Moving – a physical activity care pathway for the NHS

Based on these NICE ecommendations, the Department of Health has produced a physical activity care pathway for the NHS[21]. *Let's Get Moving* provides a framework for a systematic approach to identifying patients who would benefit from becoming more active and enabling them to do so and can be integrated into both prevention and clinical care pathways. It sets out the approach from recruiting patients; screening them for activity levels; offering appropriate tailored interventions; and active participation and review. The key principles are that the intervention is tailored to the patient's needs and readiness to change, based on the principles of motivational interviewing. The stages are set out overleaf:

NICE Guidance on physical activity brief interventions[20]

Primary care practitioners should take the opportunity, whenever possible, to identify inactive adults and advise them to aim for 30 minutes of moderate activity on five days of the week (or more). They should use their judgement to determine when this would be inappropriate (for example, because of medical conditions or personal circumstances). They should use a validated tool, such as the Department of Health's general practitioner physical activity questionnaire (GPPAQ), to identify inactive individuals. When providing physical activity advice, primary care practitioners should take into account the individual's needs, preferences and circumstances. They should agree goals with them. They should also provide written information about the benefits of activity and the local opportunities to be active. They should follow them up at appropriate intervals over a three to six month period.

Figure 1
Let's Get Moving – A Physical Activity Care Pathway



Integrating physical activity into the cancer care pathway

Let's Get Moving can be utilised by the NHS throughout the UK to enable health professionals to integrate the evidence-based promotion of physical activity appropriately into patient care at a number of points along the cancer care pathway. A variety of professionals can help enable patients to become more active, at a number of 'key moments' in the cancer care pathway when it is most appropriate to initiate a discussion about physical activity:

At diagnosis
As mentioned above, diagnosis of cancer can provide a "teachable moment", in which discussions about diet and physical activity are likely to be well received by the patient[6]. Clearly, such discussions have to be handled sensitively by someone with communication skills training, as the patient will have many overriding concerns.

Prior to surgery
Physical activity can be seen as one aspect of preparing for surgery; ensuring the patient is as fit as possible and improving their recovery from surgery. It is thought that fitter patients are less likely to have anaesthetic or surgical complications[21].

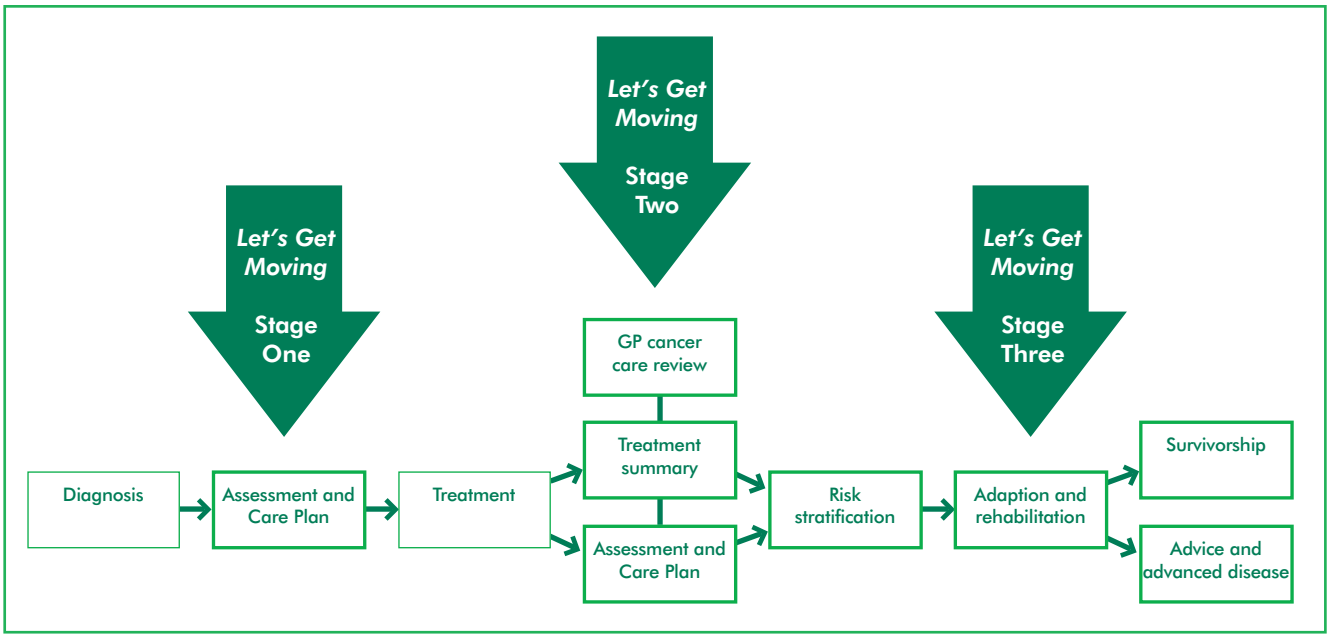
During treatment (as part of a holistic assessment and care plan)
Physical activity can help to improve physical function – or at least reduce the rate of decline of physical function – during treatment. For some patients, physical activity can provide a pleasant diversion while undergoing treatment, and can help with self-esteem and quality of life[1].

Following treatment (and at follow up cancer care review – six month follow up appointment in primary care)
Following the completion of cancer therapy, many patients continue to experience adverse effects of treatments. Physical activity can help recover physical function (including building muscle strength and improving cardiovascular fitness), manage fatigue, improve quality of life and mental health, and control body weight[1].

These discussions should be integrated into the patient's care pathway in a planned and systematic manner. The diagram below shows a cancer care pathway that is being developed by the National Cancer Survivorship Initiative, with the support of Macmillan Cancer Support[22]. This sets out a systematic approach to cancer care from diagnosis through to survivorship or end of life.

Physical activity can be integrated into this model by applying the principles of *Let's Get Moving* at appropriate stages:

Figure 2
Integrated care pathway for cancer survivors, including physical activity (based on National Cancer Survivorship mode [22]



Stage one
After diagnosis

Following diagnosis of cancer, patients are assessed and offered a care plan including the treatment they will be offered. At this stage, the principles of *Let's Get Moving* can be used to assess the patient's level of physical activity and motivation to change, and discuss appropriate types of activity. This brief intervention:

- highlights the health benefits of physical activity (perhaps using Macmillan Cancer Support patient resource *Move More*)
- works through key behaviour change stages
- concludes with a clear physical activity goal set by the patient, identifying local activity opportunities, including specialist services such as exercise on referral, physiotherapy, sports and exercise medicine consultant services.

It is extremely important to tailor the level and type of activity to the needs and capabilities of the patient, depending on their current symptoms and stage of cancer progression. Questionnaires are available to provide health professionals with evidence based physical activity recommendations, tailored to:

- whether people are in or out of treatment,
- the tumour type that they have and
- whether they have any co-morbidities.

These can be used to support health professionals collaboratively work with patients to identify if specialist services are appropriate[23].

Stages two and three
Assessment and care plan following treatment

Following treatment, the GP cancer care review will set out a longer-term assessment and care plan, based on the results of the treatment and the current health of the patient. A critical stage is risk stratification, currently being tested as part of the National Cancer Survivorship Initiative, where patients are assessed on whether they will be supported to self-manage; in shared care; or in complex care situations. Any physical activity assessment will need to be carefully coordinated with this. The PARQ+ and PARMEDX+ tools may be helpful to stratify patients by their ability to be active, as may specialist physiotherapy or sport and exercise medicine services. However, it is important to note that the evidence shows that advising and supporting cancer survivors to gradually build up to the health-related guidelines for the general population are appropriate for otherwise healthy cancer survivors[1].

Patients should then be followed up at regular intervals, over a three to six month period, with any activity recommendations carefully tailored to the patient's needs[4].

Table 1
General safety considerations regarding exercise during or after treatment[1]

Potential adverse event	Precautions
Exacerbation of symptoms (eg pain, fatigue, nausea, dyspnea)	Avoid high-intensity exercise; monitor symptoms; modify exercise type based on site of treatment (eg avoid exercise bike after prostate/rectal surgery).
Immunosuppression	If patient has low white blood cell counts, avoid high intensity/volume of exercise (keep to light – moderate intensity).
Falls	If patient has dizziness, frailty, peripheral sensory neuropathy, incorporate balance and co-ordination exercises (eg tai chi) and avoid activities needing considerable balance/ coordination (eg treadmill).
Bone fracture	If patient has bone metastases/osteoporosis risk avoid high impact or contact activities[24].
Lymphoedema	To prevent lymphoedema, progress resistance exercises in small and gradual increments. To avoid exacerbation of lymphoedema, avoid strenuous repetitive exercise with affected limb; wear compression garment.[25]

Referral to specialist services

When signposting or referring to specialist services health professionals should always consider patient needs and choice. This might mean signposting to a local community opportunity such as a walking group or referring into a specialist services such as physiotherapy, sport and exercise medicine, exercise on referral or falls prevention.

The evidence shows that patient choice and collaborative consultations are critical to behaviour change success[13]. This section highlights the wide variety of physical activity services appropriate for commissioning for cancer survivors.

Rehabilitation Services: Physiotherapy and Occupational Therapy

NICE Guidance on Improving Supportive and Palliative Care for Adults with Cancer, recommends a comprehensive rehabilitation service if offered to cancer survivors when they need it.

Allied Health Professionals within rehabilitation services also have a role to play in supporting long- term sustainable lifestyle behaviour change, This could include delivering a brief intervention and referral on to other services such as exercise on referral or community opportunities[20].

'Patients coming to the end of treatment should continue to have access to rehabilitative therapies for an indefinite period, and should know how to initiate such access.'

'Within each care setting, a model for assessing and meeting rehabilitation needs should be developed and implemented. This should include the use of a Cancer Network-wide assessment tool and criteria for referral and treatment, and should be integrated with other assessment processes. Patients should be assessed at key points in the patient pathway, such as at the end of treatment and towards the end of life, and when circumstances change.'

NICE Guidance on Improving Supportive and Palliative Care for Adults with Cancer[26]

Exercise referral schemes

Many areas have exercise referral programmes – often partnerships between the NHS and local authorities. An exercise referral scheme directs someone to a service offering an assessment, development of a tailored physical activity programme, monitoring of progress and follow-up. They involve participation by a number of professionals and may require the individual to go to an exercise facility such as a leisure centre. They will state which conditions are accepted onto the scheme and who can refer to the scheme. In order to lead an exercise scheme, professionals must be trained to level 3 on the Register of Exercise Professionals. A new level 4 qualification is now available for exercise professionals. This equips them to deliver schemes similar to cardiac rehabilitation phase 4 for cancer survivors during and after treatment in the community.

While the evidence on the effectiveness of these schemes is mixed[20,27], they have been recommended by the Department of Health for people with long term conditions[28].

Other specialist services

Cancer survivors may qualify for other specialist services depending on their individual needs such as falls prevention (which is important for frail patients and those at risk of falling) or cardiac rehabilitation. Some exercise on referral schemes may not accept cancer as the main reason for referral. However another risk factor such as obesity, type 2 diabetes, or hypertension may mean that they can still be referred. This will need to be discussed with public health colleagues.

Community opportunities

There are a wide variety of physical activity opportunities, including sports clubs, exercise classes, and active travel. In many areas there are community walking schemes, many run under the banner of Walking for Health*. Walking for health evaluation shows that around one third of participants in the scheme have a diagnosed medical condition when they register[29]. The American College of Sports Medicine recommends walking as one of a range of types of physical activity suitable for cancer survivors.[4]

* England: Walking for Health **www.wfh.naturalengland.org.uk**
Northern Ireland: Walking for Health **www.promotingwellbeing.info/walking**
Scotland: Paths for all **www.pathsforall.org.uk**
Wales: Let's walk Cymru **www.lets-walk-cymru.org.uk**

Case Study – Active after Breast Cancer (ABC) Glasgow

What is the project?
Active After Breast Cancer is a community based exercise programme in the city of Glasgow. All women attending clinics for breast cancer are offered 24 free exercise classes in leisure centres throughout the city.

The classes consist of a group circuit based exercise session followed by an educational component which provides lifestyle advice and helps the women move on to become independent exercisers.

The classes are led by highly qualified instructors, who have all undergone extensive training in exercise prescription for cancer survivors. Following current guidelines for screening, testing and providing exercise programmes to cancer survivors, the instructors can confidently prescribe safe and effective exercise for the women in the classes. The instructors are very professional in their approach to teaching the classes and also possess excellent communication skills and a friendly manner which has proven essential to the retention and attendance of the ABC participants.

The programme has been running since October 2009 and has had 126 participants. 50% of the women join during adjuvant treatment. The age of the participants varies from 31 to 85, with most women in their 50's.

What impact has it had?
- More than two thirds (68%) of participants were inactive prior to attending the Active ABC programme
- Currently more than half (52%) of all participants are now exercising in addition to the ABC programme with women attending classes such as Vitality, Zumba, Active Living, Swimming, body balance and many more.

Some participants commented:

'I really looked forward to it! You were meeting people that were the same as yourself. And you could get on with your exercise and have a laugh at the same time'

'For me it was a light at the end of a very long dark tunnel'

Case Study – Bournemouth

What is the project?
This project is run through a partnership between Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust and Bournemouth Borough Council Littledown Centre (now a not for profit trust organisation). Patients are identified by Clinicians and Clinical Nurse Specialists, as part of the assessment and care planning process. Patients can also self- refer to the programme.

On referral patients attend two one-to-one appointments with an exercise therapist at the leisure centre. **Appointment 1** includes:
- A thorough introduction to the programme and information pack
- Review of personal health history, and goals and motivation
- Physical measurements including fitness and treatment-related concerns (eg shoulder function, lymphoedema, wound tenderness etc.)

Appointment 2 is 5–7 days later and includes:
- An exercise tolerance test
- Advice on appropriate activity, based on a review of the patient's goals
- Information on educational talks/ workshops

The patient then receives a **three week supportive phone call** and a **six week review** to:
- Review their physical activity and conduct a 're-motivational' interview
- Discuss and jointly resolve any problems or concerns, and modify the activity programme as appropriate or necessary

Finally the patient receives a **12 week review** to:
- Repeat tests and measurements and note improvements/changes
- Conduct another re-motivational interview, and discuss and plan activity options
- Providing patients with ongoing information, news, offers and opportunities, including registering with the 'Living Life Active and Well Community'

A final **six month phone call** is made to check if the patient is still active and to offer support and advice to either remain active or to restart activities

What impact has it had?
From the 200 breast, colorectal and melanoma patients included in the evaluation the following outcomes were demonstrated:
- 93% patients increased cardiovascular fitness
- 94% self reported reduction in fatigue in carrying out everyday functions
- 66% self reported improved lymphoedema
- 100% self reported improved self image
- 97% self reported improvements in flexibility
- 100% increased physical activity levels and planned to continue doing so

www.ncsi.org.uk/wp-content/uploads/Bournemouth-Adult-Test-Community.pdf

Implications for practice

Delivering a planned and integrated service as outlined above will require a number of changes to current practice:

Training in behaviour change techniques
There is a need for high quality standardised training in effective behaviour change strategies including motivational interviewing.

Training in physical activity assessment and intervention
Health professionals will benefit from training in the use of the General Practice Physical Activity Questionnaire[30] for assessment of level of physical activity and degree of motivation to change behaviour. They also need to know about local opportunities for exercise referral and the appropriate referral methods.

Collaborative working
Effectively counselling and recommending physical activity to cancer survivors will require collaboration between many professional groups including clinicians; nursing staff; physiotherapists; local authority physical activity staff and others. These services should be commissioned as part of an integrated approach to a cancer care pathway.

Conclusions

This review demonstrates that good evidence exists to support the promotion of physical activity throughout the cancer care pathway. The evidence supports approaches including oncologist-recommended exercise programmes; motivational interviewing and other types of behavioural counselling; referral to supervised gym-based exercise; and walking (including pedometer programmes). These can all be included in an integrated approach, following the NHS physical activity care pathway *Let's Get Moving*.

There are a number of key opportunities for intervening with cancer survivors, to increase uptake of physical activity, before, during and after treatment. By integrating physical activity promotion into the cancer care pathway, health professionals can help to maximise the potential for physical activity to health improve quality of life for people living with and beyond cancer.

Resources

The following resources provide additional helpful information.

- Advising cancer survivors about lifestyle: a selective review of the evidence. 2010. Macmillan, London. **www.ncsi.org.uk/what-we-are-doing/physical-activity**

- Start active, stay active: a report on physical activity from the four home countries' Chief Medical Officers. 2011. Department of Health. **www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_128209**

- American College of Sports Medicine round table consensus statement on exercise guidelines for cancer survivors. 2010. ACSM. **http://journals.lww.com/acsm-msse/Fulltext/2010/07000/American_College_of_Sports_Medicine_Roundtable_on.23.aspx**

- The BASES Expert Statement on Exercise and Cancer Survivorship. 2011. BASES. **www.bases.org.uk/Exercise-and-Cancer**

- Let's Get Moving commissioning guidance **www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_105945**

- Swedish Professional Associations for Physical Activity. Physical activity in the prevention and treatment of disease. 2011. **www.fhi.se/PageFiles/10682/Physical-Activity-Prevention-Treatment-Disease-webb.pdf**

- Evidence-based risk assessment and recommendations for physical activity clearance: Cancer Lee W. Jones Appl. Physiol. Nutr. Metab.

- Macmillan Cancer Support (2001) Move more report **www.macmillan.org.uk/Documents/AboutUs/Commissioners/Movemorereport.pdf**

Annex

Authors	Design	Sample and approach	Outcome
Bennett et al. (2007)	An RCT to evaluate the effect of a motivational interviewing on increasing physical activity in cancer survivors. A secondary purpose was to evaluate whether the effect of motivational interviewing on physical activities depended on self-efficacy. The physical activity counsellor received 8-hours of group training and 6-hours of individual training by an experienced motivational interviewing trainer. The intervention consisted of one 30-minute in-person counselling session followed by 20-minute motivational interviewing telephone calls over 6-months. The aim was to encourage all participants to move towards the goal of 30-minutes of moderate intensity physical activity on most days a week. Control participants received two telephone calls without motivational interviewing content.	Cancer survivors (n= 56) who were approximately 42-months post-treatment and primarily comprised breast cancer survivors. Motivational interviewing	At 6-months, group differences in regular physical activities were found, controlling for time since treatment. Furthermore, individuals with high self-efficacy exercise at baseline increase their physical activity more than those with low self-esteem; this was also statistically significant.
Street et al. (2009)	RCT to examine the effect of a tailored education coaching intervention designed to help cancer patients communicate their experience of pain more effectively with clinicians. The intervention comprised brief behavioural counselling, on the basis of the stage of change model, carried out by practice nurses to reduce smoking and dietary fat intake and to increase regular physical activity.	Cancer patients (n=265) Motivational interviewing/ Behavioural Counselling	Favourable differences were recorded in the intervention group for dietary fat intake, regular exercise, and cigarettes smoked per day at 4 and 12-months. Systolic blood pressure was reduced to a greater extent in the intervention group at 4 but not at 12-months. No differences were found between groups in changes in total serum cholesterol concentration, weight, body mass index, diastolic pressure, or smoking cessation.

Authors	Design	Sample and approach	Outcome
Rogers et al. (2009)	RCT – participants were randomly assigned to receive the 12-week Better Exercise Adherence after Treatment for Cancer intervention or usual care. Counselling and behavioural modification.	Sedentary women with stage I, II, or IIIA breast cancer currently receiving hormonal therapy (n=41). Motivational interviewing/ Behavioural Counselling	Weekly minutes of greater than or equal to moderate intensity physical activity measured by accelerometer showed a significant group by time interaction ($F = 3.51$; $P = 0.035$; between group difference in the mean change from baseline to 3 months post-intervention, 100.1 minute, $P = 0.012$).
Irwin et al. (2008)	RCT – the Yale Exercise and Survivorship Study – to test the feasibility of recruiting post-menopausal breast cancer survivors into a physical activity intervention. The exercise group participated in 150-minutes weekly supervised gym-based and home-based aerobic exercise for 6-months. The usual-care group was instructed to maintain current physical activity level. The intervention comprised a combined supervised training program at a local health club and a home-based aerobic training program. Participants exercised in small groups of 2–5 at the health club three times per week, during designated sessions. They were also instructed to exercise 2-days per week on their own, either at the health club or at home. At the initial health club exercise meeting, an exercise physiologist outlined the program goals, instructed the participant on the use of heart rate monitors, and introduced participants to study materials (i.e. a binder containing educational worksheets and exercise logs). The worksheets included topics such as overcoming barriers and enlisting social support, injury prevention, choosing footwear for exercise, and a list of local parks and fitness areas. After reviewing the materials, the exercise physiologist and participants set initial goals for the first week of physical activity.	Post-menopausal breast cancer survivors (n=75) Supervised Gym-based Exercise	Rates of accrual were higher for women who self-referred into the study (19.8%) compared with women recruited via the cancer registry (7.6%). On average, exercisers increased moderate intensity to vigorous intensity aerobic exercise by 129-minutes per week compared with 44-minutes per week among usual care participants ($p < .001$). Women in the exercise intervention group also increased their average pedometer steps by 1,621 steps per day compared with a decrease of 60 steps per day among women in the usual care group ($p < .01$).

Authors	Design	Sample and approach	Outcome
Jones et al. (2005)	An RCT whereby participants were randomly assigned to receive oncologist exercise recommendation only, oncologist exercise recommendation plus referral to exercise specialist usual care at first treatment consultation.	Recently diagnosed breast cancer patients (n=405). Oncologist recommendation	The recommendations only group reported significantly greater exercise participation than usual care at 5-weeks. Perceived behavioural control had a direct effect on exercise and mediated the effect of the oncologist exercise recommendation intervention on physical activity. The direct effects of attitude, subjective norm, and perceived behavioural control on intention were also supported. No direct effects of intention on exercise were found.
Matthews et al. (2007)	RCT – a 12-week home-based walking intervention vs wait-list usual care.	36 breast cancer patients. walking	Intervention participants reported significantly greater increases in walking for exercise as compared to the control condition; objective accelerometer data also reflected significant group differences in favour of the intervention group. No significant changes in body weight or composition were observe.

Authors	Design	Sample and approach	Outcome
Vallance et al. (2007)[14]	RCT to determine the effects of breast cancer–specific print materials and step pedometers on physical activity (PA) and quality of life (QoL) in breast cancer survivors. Participants were randomised to receive one of the following: a standard public health recommendation for PA, previously developed breast cancer–specific PA print materials, a step pedometer, or a combination of breast cancer–specific print materials and step pedometers.	Breast cancer survivors (N = 377) Tailored advice Plus pedometers	Attrition was 10.3% (39 of 377). PA increased by 30 minutes/week in the standard recommendation group compared with 70 minutes/week in the print material group (mean difference, 39 minutes/week; 95% CI = –10 to 89; *d* = 0.25; *P* = .117), 89 minutes/week in the pedometer group (mean difference, 59 minutes/week; 95% CI, 11 to 108; *d* = 0.38; *P*= .017), and 87 minutes/week in the combined group (mean difference, 57 minutes/week; 95% CI, 8 to 106; d = 0.37; *P* = .022). For brisk walking minutes/week, all three intervention groups reported significantly greater increases than the standard recommendation group. The combined group also reported significantly improved QoL (mean difference, 5.8; 95% CI, 2.0 to 9.6; *d* = 0.33; *P* = .003) and reduced fatigue (mean difference, 2.3; 95% CI, 0.0 to 4.7; *d* = 0.25; *P* = .052) compared with the standard recommendation group.

References

1 Campbell A, Foster J, Stevinson C, Cavill N. The importance of physical activity for people living with and beyond cancer: A concise evidence review. London: Macmillan 2011.

2 World Cancer Research Fund. Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective. London, 2009.

3 Daley AJ, Bowden SJ, Rea DW, Billingham L, Carmicheal AR. What advice are oncologists and surgeons in the United Kingdom giving to breast cancer patients about physical activity? *The international journal of behavioral nutrition and physical activity* 2008;5:46.

4 Schmitz KH, Courneya KS, Matthews C, Demark-Wahnefried W, Galvao DA, Pinto BM, et al. American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Medicine and Science in Sports and Exercise* 2010;42(7):1409–26.

5 National Institute for Health and Clinical Excellence. Behaviour Change. London, 2007.

6 Demark-Wahnefried W, Aziz NM, Rowland JH, Pinto BM. Riding the crest of the teachable moment: promoting long-term health after the diagnosis of cancer. *Journal of clinical oncology: official journal of the American Society of Clinical Oncology* 2005;23(24):5814–30.

7 Karvinen KH, Courneya KS, Campbell KL, Pearcey RG, Dundas G, Capstick V, et al. Exercise preferences of endometrial cancer survivors: a population-based study. *Cancer Nurs* 2006;29(4):259–65.

8 Karvinen KH, Courneya KS, Venner P, North S. Exercise programming and counseling preferences in bladder cancer survivors: a population-based study. *J Cancer Surviv* 2007;1(1):27–34.

9 Mc Tiernan A. *Cancer Prevention and Management through exercise and weight control*. London: Taylor and Francis, 2006.

10 Davis NJ, Batehup L. Lifestyle-Related Health Behaviour Change: Physical Activity and Diet: Theory and Evidence on Developing Lifestyle-related Behaviour Change Training for Cancer Clinicians. London, 2010.

11 Jones LW, Sinclair RC, Courneya KS. The effects of source credibility and message framing on exercise intentions, behaviors, and attitudes: An integration of the Elaboration Likelihood Model and Prospect Theory. *Journal of Applied Social Psychology* 2003;33:179–96.

12 Bennett JA, Lyons KS, Winters-Stone K, Nail LM, Scherer J. Motivational interviewing to increase physical activity in long-term cancer survivors: a randomized controlled trial. *Nursing research* 2007;56(1):18–27.

13 Street RL, Jr., Makoul G, Arora NK, Epstein RM. How does communication heal? Pathways linking clinician-patient communication to health outcomes. *Patient education and counseling* 2009;74(3):295–301.

14 Rogers LQ, Hopkins-Price P, Vicari S, Markwell S, Pamenter R, Courneya KS, et al. Physical activity and health outcomes three months after completing a physical activity behavior change intervention: persistent and delayed effects. *Cancer epidemiology, biomarkers & prevention: a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology* 2009;18(5):1410–8.

15 Irwin ML, Cadmus L, Alvarez-Reeves M, O'Neil M, Mierzejewski E, Latka R, et al. Recruiting and retaining breast cancer survivors into a randomized controlled exercise trial: the Yale Exercise and Survivorship Study. *Cancer* 2008;112(11 Suppl):2593–606.

16 Knols RH, de Bruin ED, Shirato K, Uebelhart D, Aaronson NK. Physical activity interventions to improve daily walking activity in cancer survivors. BMC Cancer 2010;10:406.

17 Vallance JK, Courneya KS, Plotnikoff RC, Yasui Y, Mackey JR. Randomized controlled trial of the effects of print materials and step pedometers on physical activity and quality of life in breast cancer survivors. *Journal of clinical oncology: official journal of the American Society of Clinical Oncology* 2007;25(17):2352–9.

18 Matthews CE, Wilcox S, Hanby CL, Der Ananian C, Heiney SP, Gebretsadik T, et al. Evaluation of a 12-week home-based walking intervention for breast cancer survivors. *Supportive care in cancer: official journal of the Multinational Association of Supportive Care in Cancer* 2007;15(2):203–11.

19 Knols RH, de Bruin ED, Uebelhart D, Aufdemkampe G, Schanz U, Stenner-Liewen F, et al. Effects of an outpatient physical exercise program on hematopoietic stem-cell transplantation recipients: a randomized clinical trial. *Bone Marrow Transplantation* 2010.

20 National Institute of Health and Clinical Excellence. Four commonly used methods to increase physical activity: brief interventions in primary care, exercise referral schemes, pedometers and community-based exercise. London, 2006.

21 Department of Health. Let's Get Moving. Commissioning Guidance. London: Dept of Health, 2009.

22 Department of Health. National Cancer Survivorship Initiative Vision. London, 2010.

23 Jones LW. Evidence-based risk assessment and recommendations for physical activity clearance: cancer[11] This paper is one of a selection of papers published in this Special Issue, entitled Evidence-based risk assessment and recommendations for physical activity clearance, and has undergone the Journal,Äôs usual peer review process. *Applied Physiology, Nutrition, and Metabolism* 2011;36(S1):S101–S12.

24 Scottish Intercollegiate Guidelines Network. Management of Osteoporosis. Edinburgh, 2004.

25 Clinical Resource Efficiency Support Team. Guidelines for the Diagnosis Assessment and Management of Lymphoedema. Belfast, 2008.

26 National Institute for Health and Clinical Excellence. Improving supportive and palliative care for adults with cancer. LONDON, 2004.

27 Pavey TG, Taylor AH, Fox KR, Hillsdon M, Anokye N, Campbell JL, et al. Effect of exercise referral schemes in primary care on physical activity and improving health outcomes: systematic review and meta-analysis. *BMJ* 2011;343:d6462.

28 Department of Health. Statement on Exercise Referral. 2007.

29 Fitches T. Who took part in Walking for Health? Natural England Research Reports, Number NERR041., 2011.

30 Department of Health. The General Practice Physical Activity Questionnaire London: Dept of Health, 2006.

If you have any questions about cancer, ask Macmillan.
If you need support, ask Macmillan.
Or if you just want someone to talk to, ask Macmillan.

Our cancer support specialists are here for everyone affected by cancer, whatever you need.

Call free on **0808 808 00 00**,
Monday to Friday, 9am to 8pm

www.macmillan.org.uk

We have an interpretation service in over 200 languages.
Just state, in English, the language you wish to use when you call.

If you are deaf or hard of hearing, you can use our textphone service on **0808 808 0121**, or the Text Relay system.

WE ARE MACMILLAN. CANCER SUPPORT

Contact **Elaine McNish, Physical Activity Manager**
email **EMcNish@macmillan.org.uk**
or go to **website www.macmillan.org.uk**

Printed using sustainable material. Please recycle.

Macmillan Cancer Support, registered charity in England and Wales (261017), Scotland (SC039907) and the Isle of Man (604). June 2012. MAC13821