Increasing the frequency of physical activity very brief advice by nurses to cancer patients. A mixed methods feasibility study of a training intervention.

Abstract

Objectives:

To examine the impact, acceptability, practicability and implementation of a training intervention, designed using the Behaviour Change Wheel, on the delivery of very brief advice on physical activity, by nurses to cancer patients.

Study design:

A mixed-methods feasibility study.

Method:

A purposeful sample of nurses (n=62) were recruited across two delivery arms, face-to-face (n=55) and online (n=7). Frequency of delivery of physical activity advice was collected at baseline with follow-up at 12 weeks. The 'capability, opportunity and motivation' of nurses to deliver very brief advice was measured via questionnaire. Semi-structured phone interviews (n=14) were completed and analysed thematically. A cost consequence analysis was undertaken.

Results:

The intervention improved the 'capability, opportunity and motivation' of nurses resulting in a change in knowledge, attitudes and beliefs towards physical activity. The intervention was both acceptable and practical.

Face-to-face was the preferred mode of delivery, however there was also value in the online option. The cost of delivery per participant was £33.87 for face-to-face delivery, and £103.83 for online delivery inflated due to low recruitment numbers. A significant improvement was seen in delivery of very brief advice at 12 weeks ($Z=-4.39$, $p \leq 0.01$).

Conclusion:

The intervention is acceptable, practical and improves very brief advice delivery in the short-term. Both face-to-face and online delivery should be considered.

Keywords

Behaviour change wheel

COM-B model

Very brief advice

Cancer

Physical activity

Introduction

The importance of physical activity to cancer patients

Being physically active has been shown to have multiple benefits for cancer patients. Evidence suggests physical activity improves common side-effects of cancer treatments such as cancer related fatigue, psychological disease, weight gain and loss of bone mineral density.[1-3]

Being physically active has been correlated with improved survival and reduced recurrence[1,4] with biological mechanisms thought to effect cell growth regulatory pathways, hormone levels, gene expression patterns and tumour immunity.[1]

Cancer patients are advised to avoid inactivity and return to normal daily activities, as soon as possible after surgery and during cancer treatments.[2,5] The standard age appropriate physical activity guidelines apply.[2,5,6]

Despite these benefits, only 23% of cancer patients in England are active to the Chief Medical Officer's recommended levels and 31% are completely inactive.[7] A dose response relationship has been reported[8] meaning that even small improvements in physical activity will have a positive impact.

Delivery of physical activity advice by health care professionals

A US survey[9] suggests 80% of cancer patients are interested in lifestyle advice. In the UK, Clinical Nurse Specialists and Practice Nurses are well placed to offer physical activity advice to cancer patients during their many interactions throughout treatment and observation.[10] These frontline nursing staff can provide advice at a time when a cancer patient may be motivated to make a lifestyle change.[11-13] This has been defined as a 'teachable moment'.[10,14-16]

A UK survey[17] shows that many nurses support the delivery of physical activity advice however provision is inconsistent. Just under a third of UK nurses (28%) think that discussing physical activity with cancer patients is not of critical importance and 41.5% are unaware of the recommended guidelines for physical activity.[17] Only 9% of UK nurses talk to all of their cancer patients about the benefits of physical activity.

[17] Nurses own levels of physical activity may impact upon their delivery of physical activity advice.[18]

Evidence suggests that practitioners consider time restrictions a barrier to delivering advice on physical activity. Where this is the case, delivery of very brief advice, which takes 30 seconds to two minutes following an 'ask, advise, assist (or act)' framework, is recommended.[19]

Very brief advice has been shown to be effective at encouraging smokers to access smoking cessation services.[20] The evidence of the effectiveness of very brief advice on physical activity is limited and identified by the National Institute of Health and Care Excellence (NICE) as a gap in the evidence.[21]

Training on the delivery of physical activity advice

Training on the delivery of very brief advice on physical activity to cancer patients currently does not exist. There is a need for the further education of nurses involved in cancer care about the importance of physical activity[22] although it is not clear what form this should take.[10]

Intervention design

The UK Medical Research Council guidance for the development and evaluation of complex interventions[23] states interventions should be evidenced based and systematically developed using an appropriate theory followed by phased testing.

Selection of a theory for intervention design should be logical, supported by past research and used in similar programmes.[24] It is theorised that 'capability, opportunity and motivation' interact to influence behaviour, also known as the COM-B model of behaviour.[25] The COM-B model offers a logical approach, is recommended by NICE[19] and has been used previously to inform interventions to change health care practice. [26-28]

Based upon previous literature[17,18,21,22,29] it was possible to breakdown the behaviour of nurses delivering physical activity advice using the COM-B model. Details are provided in Table 1.

A training intervention was designed using the Behaviour Change Wheel,[30] an intervention development framework which has the COM-B model at its centre. Full details of intervention development are available in the preceding paper.[31] Delivered in either a face-to-face or an online setting within 60 minutes, the intervention aims to influence the 'capabilities, opportunities and motivations' identified in Table 1. The intervention includes eight behaviour change techniques (BCTs) selected from the 'behaviour change technique taxonomy version 1' (BCTTv1)[32]. Details of the selected BCTs, their definitions and BCTTv1 code are presented in Table 2. Full details of the training intervention content are presented in supplementary file: S1.

A phased approached was used in the development and testing of this intervention as outlined in Figure 1. This paper presents phase 2, a mixed methods feasibility study of the training intervention designed to change the behaviour of nurses towards improved delivery of very brief advice on physical activity to cancer patients.

Study aims and objectives

This feasibility study aims to assist intervention development by answering the following questions:

1. Does the training intervention improve the 'capability, opportunity and motivation' of nurses to deliver very brief advice on physical activity?
2. Is it acceptable and practicable?
3. How should it be implemented?
4. What is its efficacy on the frequency of delivery of very brief advice?

These form the primary objectives of the study. The secondary objectives are to understand:-

- Associations between the physical activity levels of nurses and the frequency of delivery of physical activity advice to cancer patients;

- The impact of the intervention on the physical activity levels of the nurse participants themselves.

Methodology

Study design

This feasibility study uses a mixed methods approach drawing on the strengths of qualitative and quantitative methodologies selected to provide a greater understanding of the efficacy, acceptability, practicability, implementation and costs of the intervention.[33]

Participants and delivery setting

Nurses (n=62) were recruited from a purposeful sample into either face-to-face or online delivery cohorts.

Face-to-face

Participants involved in the face-to-face delivery arm were recruited at two Practice Nurse (n=18) and three Clinical Nurse Specialist (CNS) training days (n=47) organised by the local Cancer Learning and Development Manager and lead Clinical Nurse Specialist respectively. All participants were informed of the study prior to attending and consent forms were signed on the day of delivery.

Participants were able to take part in the intervention but were given the option to decline further involvement in the study. Ten nurses declined further involvement. In total, 55 nurse participants were involved in the face-to-face delivery arm.

Online

Recruitment for the online delivery arm was completed in two phases. The first at a conference for health care professionals with consent gained on the day (n=42). A follow-up email invitation was sent (n=42) to attend one of three possible online training sessions. Despite providing consent only two responded to this invitation. Consequently, a second phase of recruitment took place with an email invitation published in the Macmillan Cancer Support ‘Mac Update’ e-newsletter, inviting nurses to attend one of six possible sessions. This was delivered to 7,810 cancer care professionals. The same invitation was placed on the Nursing Times website, which has an estimated reach of 6,000 nurses. Forty-seven registered an interest with 23 attending an online session of which only five were from the nursing

profession. Across both phases of recruitment, seven nurses were involved in the online delivery arm.

Resources

The resources used to support intervention delivery are outlined in supplementary file: S2.

Data collection and analysis

Baseline data and 12-week follow-up

All participants recorded their gender, date of birth and occupation. The baseline survey included a question to determine the frequency of delivery of physical activity advice to cancer patients with immediate follow-up post intervention and again at 12-weeks. Since a validated measure was not available, a question was based on a previous study[18] and asked:-

'I raise physical activity with my cancer patients 0% to 25% of the time; 26% to 50% of the time; 51% to 75% of the time or 76% to 100% of the time?'

The physical activity levels of nurses were self-reported using the validated, single-item measure for physical activity.[34]

Intention to treat analysis was performed with missing data assumed to show no difference from baseline. Paired, before and after data used Wilcoxon Signed Ranks test, two-tailed, to an alpha of 0.05.

Spearman's rho correlation coefficient was used to identify associations between the frequency of physical activity advice and the physical activity levels of nurses at baseline.

The t- test for continuous variables and the Chi-square test for categorical variables were used to explore the homogeneity of baseline characteristics between the delivery modes.

Post training survey

The 'capability, opportunity and motivation' of nurses to deliver physical activity advice was measured via questionnaire using a Likert scale from 1 to 5, with 1 being strongly disagree and 5 strongly agree. The questionnaire was based upon the COM-B self-evaluation questionnaire[30] and instructed immediately post intervention. Participants also had the opportunity to add qualitative comments. This questionnaire is available as supplementary file: S3.

Interviews

All participants were invited to participate in a semi-structured telephone interview. Interviews were conduced by the principal researcher (JW) and digitally recorded with the participant's permission and transcribed verbatim.

Interviews were analysed using thematic analysis,[2,5,35] an inductive approach ensuring that themes were grounded in the original data and reducing influence from researcher preconceptions. Analysis was completed in four stages: (1) each researcher reviewed the transcripts in full before (2) reviewing again and directly coding the text to allow key points to be gathered. (3) Researchers met on four occasions to review the coding and group codes into themes. Data that did not fit into a theme were discussed with new themes created. (4) Researchers reviewed all the transcripts once more to ensure all themes were highlighted.

Fidelity of intervention delivery

Researcher JW delivered both the face-to-face and online intervention to ensure consistency and intervention fidelity.

One face-to-face and one online training session were digitally recorded and checked against the intervention content by researchers JW and KH to confirm intervention fidelity. Further checks were planned if intervention fidelity was deemed poor in these sessions.

Cost consequence analysis

A cost-benefit analysis was not possible as the full benefits of delivery of very brief advice on physical activity to cancer patients is not yet known. Therefore a cost

consequence analysis was completed, reporting all costs associated with intervention delivery separately from the intervention benefits.[36]

Data management

The principal researcher managed all data records with data held securely and managed as per the requirements of the Data Protection Act 1998.[37]

Results

Participant characteristics

Table 3 displays the characteristics of the participants involved in the study. No statistically significant differences were identified between the participants in each delivery arm.

Intervention fidelity

Analysis of the intervention recordings show that the intervention was delivered as planned across both delivery arms. Further checks were not deemed necessary.

Impact of the intervention

Frequency of delivery of physical activity advice

When comparing the baseline frequency of physical activity advice to the intention to discuss physical activity measured immediately post intervention, significant improvements were seen in the combined analysis ($Z=-5.91$, $p\leq0.01$) and in the face-to-face group ($Z=-5.58$, $p\leq0.01$). Significant improvements were seen in the frequency of very brief advice on physical activity at 12-weeks from baseline in the combined analysis ($Z=-4.39$, $p\leq0.01$) and in the face-to-face group ($Z=-3.97$, $p\leq0.01$). The sample size in the online delivery arm was not big enough to return a critical value so analysis was not possible.

In total 62 nurses were in receipt of the intervention irrespective of delivery arm. Twenty-seven reported an improvement in delivery of very brief advice, with 18 showing no change, one reporting a reduction at 12-weeks and 16 (25.81%) not responding to the follow-up survey. The full results are reported in Table 4.

Physical activity levels of nurses

No correlation was found at baseline between frequency of delivery of physical activity advice and the physical activity levels of nurse participants ($R=-0.129$, $p=0.319$). No association was seen between the intervention (combined analysis) and improvements in the physical activity levels of the nurse participants ($Z=-0.075$, $p=0.944$)

Impact on capability, opportunity and motivation

The intervention showed improvements in the capability (4.36 overall; 4.39 face-to-face and 4.18 online), opportunity (4.38 overall; 4.37 face-to-face and 4.24 online) and motivation (4.44 overall; 4.44 face-to-face and 4.48 online) of participants towards the delivery of very brief advice on physical activity. Low recruitment figures in the online group meant that statistical analysis between groups was not possible. Full details of the results from the COM-B survey are presented in Table 5.

Cost consequence analysis

The set up costs were £4,127.56 of which £614.00 was specific only to the online intervention. Only those costs associated with intervention delivery were included in the cost consequence analysis. Costs associated with intervention design and specific only to the feasibility study were not included.

The costs associated with face-to-face delivery were £1862.95. Fifty-five nurse participants completed the intervention, an amount of £33.87 per participant. As intervention delivery was part of an arranged training day room hire charges were not incurred.

The cost of delivery of the online intervention was £726.83. Seven nurses participants took part in the online intervention, which is £103.83 per participant.

Qualitative analysis

Fourteen participants (n=9 face-to-face; n=5 online) took part in a semi-structured phone interview lasting on average 12 minutes. Thirty-two comments were received on the post intervention survey (n=27 face-to-face; n=7 online). Five major themes and associated sub-themes emerged from the data. These are presented in Table 6.

Theme 1: Personal identity

All participants reported a sufficient *prior knowledge and awareness* of the general importance of physical activity however only those working in cancer survivorship roles reported an understanding of the importance in relation to cancer. Three of the five interviewed participants in the online delivery arm reported that they worked on

cancer survivorship programmes. The Practice Nurses interviewed suggested that a good prior knowledge was obtained from working across other long-term conditions, specifically diabetes.

> *"Well I suppose as a health care professional I'm always aware about the importance of promoting physical exercise"* (Occupational identity: Practice Nurse, face-to-face, participant 10)

> *"I do know quite a bit anyway, because I'm working in survivorship"* (Prior knowledge and awareness: CNS – online, participant 59)"

Most identified physical activity promotion as part of their role (*occupational identity*). The *perceived ability and motivations of patients* to be more active was an influential factor. Some nurses, those identified as working in an acute or palliative care setting, mentioned that physical activity was not appropriate for their patients and consequently these nurses did not identify physical activity as within their remit.

> *"[I] work as a palliative care nurse [and] see inpatients in hospital. A lot are terminal [so physical activity] would not be appropriate"* (Occupational identity; Perceived patient ability and motivations: CNS, face-to-face, participant 42, written comment)

Theme 2: Organisational culture and practice

Job demands and limited study leave (*structure and process)* were identified as a barrier to training attendance. It was suggested that this results in selection of only training courses of interest. Shift patterns also impacted negatively upon the accessibility of training with a recommendation made to offer the training intervention during the night for night-shift workers. Accessing protected training time was also recommended as an opportunity for diffusion of this intervention.

> *"You [have] a certain amount of study leave…if it's an interest I have I will go"* (Job demands; Structure and process: Practice Nurse, face-to-face, participant 22)

Availability of a cancer specific local physical activity programme (*local opportunities*) made the promotion of physical activity to cancer patients easier and helped improve knowledge (Theme 1). Conversely, not knowing where to signpost patients, or difficulty in referring to specific programmes reduced the capability to give physical activity advice. It was recommended that links be made to other long-term condition programmes to widen the availability of local opportunities.

> *"…they're saying how do I go about that, I say I can put you In touch with my facilitator, and it's very straightforward. I don't have to know anything else really"* (Local opportunities: CNS, face-to-face, participant 13)

Whilst the nurses interviewed identified physical activity promotion as part of their role (Theme 1), the perception is that other health care professionals working in both primary and secondary care do not raise physical activity with their patients (*peer behaviour*). The intervention, whilst designed for nurses, was suggested to be relevant to GPs, health care assistants, community nurses, dieticians, speech and language therapists, physiotherapists and occupational therapists and could be adapted to support other long-term conditions.

> *"One of the things that we're very aware of is that the clinicians are not discussing physical activity"* (Peer behaviour: CNS, online, participant 62)

Practice Nurses working in a primary care setting did not have the chance to regularly follow-up with cancer patients because most interaction was with the GP. Lack of communication between primary and secondary care was identified as a barrier, with primary care Practice Nurses not knowing what, if any, physical activity advice had already been given to the patient during treatment and care (*structure and process).*

Theme 3: Intervention content

Specific *BCTs* emerged from the data. All interviewed participants highlighted the evidence to support the impact of physical activity in relation to cancer as memorable (Table 2: *BCT - Salience of consequences*). Delivery from a physical activity and

cancer specialist ensured that the message was delivered with authority with use of a cancer patient voice adding meaning (Table 2: *BCT - Credible source*).

The use of the 'ask, advise, act' framework provided '*instruction on how to perform the behaviour*', a '*demonstration of the behaviour*' and served as a reminder to deliver very brief advice on physical activity. The intervention increased awareness of the guidelines for physical activity and cancer, and the resources available to support people to become and stay active.

> *"…the key message was the three As, the ask, the advise and the act. That's really easy to take away."* (BCT – 'instruction on how to perform the behaviour', 'demonstration of the behaviour ': CNS, online, participant 59)

Some identified the use of '*goal setting'* although one nurse questioned its use due to the time taken. The follow-up process used to gather data within the study positively influenced behaviour acting as a tool to self-monitor delivery of very brief advice and as a feedback mechanism.

> *"…you're thinking, OK I've got all this work to do, have I got time to do this [goal setting], is it relevant… but I do think it is something that does stick in your mind. I still remember what I put."* (BCT – 'goal setting coupled with commitment'; Job demands (Theme 2): CNS, face-to-face, participant 16)

The *BCTs* of '*adding objects to the environment' and 'prompts/cues'* were the only *BCTs* not specifically mentioned by any participant.

Inclusion of information on the specific barriers and motivators of cancer patients toward physical activity was recommended as were more diverse patient videos both in terms of ethnicity and stages within the cancer journey (*content additions*).

> *"…different patient clips [would be useful], how different patients [and] where they are in their journeys…and how it's benefitted them"* (Additional content: CNS, face-to-face, participant 13)

Theme 4: Intervention delivery

Delivery in a face-to-face setting (*mode of delivery)* was the preferred choice of nearly all participants regardless of delivery arm, with social interaction and learning from others identified as important factors. Online delivery was not as favourable in this regard, however the use of online seminar technology allowed participants to ask questions to the presenter and the group which was viewed positively. Online delivery was also identified as saving participants time making the training more accessible. Those taking part in the online delivery reported that it might only appeal to those who already have an interest in the area. This coincides with the findings in Theme 1.

> *"…people can't afford the resource to get out of clinical areas to go to training, and we're hearing that repeatedly so, I think that [online training] would be excellent"* (Mode of delivery; Job demands (Theme 2); Structure and process (Theme 2): CNS, online, participant 59)

> *"I wonder about online training sometimes because unless you're really interested and you want to know about it I don't think a lot of people go looking for those things"* (Mode of delivery; Prior knowledge (Theme 1): CNS, face-to-face, participant 5)

Technical issues impacted upon the experience of the majority of interviewed online participants (n=3 of 5). Issues were identified with accessing the session and with sound quality.

> *"The background noise was very off putting"* (Technical issues: CNS, online, participant 24)

Participants were positive about the *structure and pitch* of the intervention with the varied use of delivery mediums seen as effective. The intervention delivery time of 60 minutes was rated favourably (*timing)*.

> *"…it was to our level, it wasn't too high tech or too low…it marked what we needed to know really. Not too long, not too short either, because sometimes*

it can drag…it was really, really good" (Structure and pitch; Timing: Practice Nurse, face-to-face, participant 6)

Theme 5: Impact of the intervention

The intervention improved *knowledge, attitudes and beliefs* towards physical activity very brief advice for most with the exception of those identified as working palliative care (as identified in Theme 1)

> *"it's definitely something that's there now and that I know I'd be confident in saying to patients"* (Individual knowledge, attitudes and beliefs: CNS, face-to-face, participant 18)

> *"It has been very well received by patients. It certainly seems to have made a difference to their own motivation to exercise more"* (Impact on practice; Perceived patient ability and motivations (Theme 1): Practice Nurse, face-to-face, participant 1)

Attitudes towards their own physical activity improved however the quantitative data suggests that this did not translate into changes in behaviour.

The intervention improved delivery of very brief advice on physical activity and the signposting to local services or self-help resources (*impact on practice)*. This is supported by the quantitative data. The intervention resulted in the influencing of other health care professionals by those nurses who had received the training (*influencing others)*.

> *"I was unaware of the Macmillan pack. I will definitely direct people to this"* (Impact on practice: CNS, face-to-face, participant 57)

> *"…in just ten days' time, we've got an oncology training event. So that's going to be featuring there"* (Influencing others: Practice Nurse, face-to-face, participant 1)

Discussion

A gap in the education of nurses with regards to physical activity and cancer has been identified in the literature.[11,22] To our knowledge, this is the first intervention that aims to change practice in regards to the delivery of very brief advice on physical activity.

It was anticipated during the design of the intervention that the physical activity levels of nurses would increase.[31] This was not the case despite an improvement in attitudes towards their own physical activity. No association is seen between baseline physical activity levels and the frequency of delivery of physical activity advice to cancer patients by nurses however, the sample size within this study is not based on a power calculation and therefore a type II error cannot be ruled out.

This intervention improved the capability, opportunity and motivation of nurses in the areas identified within the behavioural diagnosis, outlined in Table 1. The intention of nurses to deliver very brief advice was significantly higher following the intervention however this intention was not fully translated into practice at 12 weeks, although a statistically significant improvement was still reported. The themes identified in the qualitative analysis are interrelated and likely to impact upon each other as outlined in Figure 2.

Personal views and organisational culture

Pre-determined personal views (Theme 1) influence delivery of very brief advice. All nurses, except those working in palliative care, identify physical activity promotion as part of their role. However, baseline data suggests that most (n=27 of 62) discuss physical activity with their cancer patients less than 25% of the time, supporting the existing literature.[9,38] It may be that nurses are aware of the benefits of physical activity in general terms but not in relation to cancer. The presentation of the evidence on the importance of physical activity to cancer patients is identified as important and memorable to nurses. Gaining an understanding of the recommended guidelines is also highlighted as an important factor supporting the existing literature[17,18,21,22,29] and the behavioural diagnosis.

Those with a prior knowledge of the benefits of physical activity for cancer patients are more likely to seek out and sign up to a training session. This helps explain the low recruitment figures for the online delivery arm. Three of the five nurses interviewed in the online delivery arm report prior knowledge with regards to physical activity and cancer. However, this did not translate into a greater baseline frequency of delivery of physical activity advice suggesting that the other barriers identified within the behavioural diagnosis also need to be influenced before a change in practice is achieved. Organisational culture and practice influence nurses' ability to attend training. With limited study time available, only training courses of interest are selected, also explaining low recruitment figures within the online delivery arm and the prior physical activity and cancer knowledge of online participants.

Intervention delivery

The messenger, or change agent,[39] defined as BCT '*credible source*', is an important element of intervention delivery. Delivery by a trusted individual is useful to nurses[40] so an area specialist is likely to be effective. Implementation in a face-to-face setting is the preferred choice however job demands and lack of study leave means that there may be a need for an online seminar solution to save time. Online delivery offers greater reach and consistency, however face-to-face delivery could engage those unlikely to seek out a training intervention of this kind. Those attending a face-to-face delivery session did so as part of organised training; they did not actively seek out the training rather it was the choice of the training organiser. This is important and should be considered if rolling out the intervention.

A network of trainers will be required to achieve widespread face-to-face delivery. This brings an additional variable with trainer personalities and characteristics likely to impact upon intervention acceptability and efficacy. Web-based distance learning is consistent, flexible, convenient and an attractive platform for the education of nurses.[41] The biggest disadvantage is that online delivery limits social interaction however, online seminar technology aims to bring social interaction to a virtual environment. Whilst there may be a need for the online intervention, it is likely to only attract those with a prior knowledge of the importance of physical activity for cancer patients.

A variety of delivery times and dates should be offered when delivering online training to ensure accessibility to a wide range of nurses. It is recommended that this include times covering the night-shift however this might not be practical for an intervention deliverer. Social interaction is deemed important but it may be more practical to deliver the intervention using pre-recorded material in this instance. The technical issues faced by the participants need to be addressed to improve the acceptability of the training. Delivery in 60 minutes is both practical and acceptable.

Intervention cost

The cost consequence analysis suggests that face-to-face delivery is more cost effective in terms of participant attendance, with a cost of £33.87 per nurse participant compared to £103.83 for online delivery. The online delivery cost per participant is inflated because of the low recruitment figure. This cost would be reduced if more nurse participants took part in the online intervention; for example, if the same number of nurses participated as in the face-to-face arm (n=55) the cost per participant would have been £13.22.

The cost of resources for each participant is the same regardless of intervention arm. The online delivery is subject to greater postage costs however the face-to-face delivery is subject to the costs of travel (including time). There are no room hire charges included within the cost consequence analysis. Delivery was part of existing training days with room hire charges covered by the organising institution. Such charges may be incurred in future delivery. An understanding of the long-term impact of the intervention and the consequential impact on the physical activity levels of cancer patients is required before a more in-depth cost benefit analysis can be completed.

Intervention content

Practitioners need the knowledge of what to say, the skills on how to say it and the memory and attention to remember to give very brief advice. The use of the 'ask, advise' act' framework helps achieve this. The BCTs of '*adding objects to the environment'* and *'prompts/cues'* were not specifically identified within the qualitative

data however, it is argued that the script card (*adding objects to the environment*) and the coaster (*prompts/cues*) influence recall of the framework, facilitate and prompt delivery of very brief advice. Therefore, these should remain as part of the intervention. The use of *goal setting, coupled with commitment*, is effective but may not be practical to those with high job-demands. The BCTs of '*self-monitoring of behaviour'* and '*feedback on behaviour'*[32] were not part of the original intervention but used for study data collection. These BCTs were suggested to influence very brief advice delivery and as such should be included in future intervention development but may result in additional cost implications that will need to be considered.

This mixture of BCTs is practical and acceptable to nurses and their combination is suggested to bring about a change in practice in very brief advice delivery. However, this is not the case for those working in palliative care. The training intervention should be adapted to ensure that the evidence of the benefits of physical activity for those in palliative care is communicated effectively. The inclusion of additional patient videos highlighting the impact of physical activity across their cancer journey is recommended.

Impact of the intervention

The intervention improves the attitudes, knowledge and beliefs of nurses towards physical activity for cancer patients, which in-turn improves their confidence and delivery of very brief advice. This was an expected outcome of the intervention. What was not expected is that this would lead to the influencing of other health care professionals, which could in-turn influence organisational culture and practice. For example, more importance might be placed on physical activity within cancer care with health care professionals encouraged to attend training such as this. Further, it may change the personal views of other health care professionals and directly influence their practice, should they model the behaviour of those practicing very brief advice. This intervention is designed to influence the behaviour of individuals but it has the potential to influence a wider group. This may be achieved if a sizable group from one location receive the intervention, most likely from organised face-to-face delivery.

It is suggested that the intervention is relevant to other health care professionals across primary and secondary care. This is supported by the recruitment of a wide variety of health care professionals to the online intervention. In total 47 registered an interest in the intervention with 23 attending but only five being from the nursing profession. Other health care professionals involved in cancer care should therefore be included in future developments. For those working across multiple long-term conditions, a combined, cross condition, training intervention should be considered.

Strengths and limitations of the study

The efficacy of this intervention is not measured against a control group, participants are not randomised with self-reported measures used, that have not been validated, with the exception of the single-item measure for physical activity.[34] The study is not powered, follow-up is for a limited time and the sample in the online group is small, meaning a comparison between delivery modes is not possible, all impacting upon the study's internal validity. Highly controlled trials make it possible to draw inferences, but this can reduce external validity; it is important for the feasibility of complex behaviour change interventions to be tested in real world settings.[33] This study has high external validity as participants represent the nursing population and the intervention is delivered in a real world setting.

The qualitative approach met all of the criteria on the NICE qualitative appraisal tool[36] with the exception of getting participants to feedback on their interview transcripts. The interviews were however, short and completed over the telephone making it difficult to develop a rapport. The principle researcher (JW) delivered the intervention, conducted the interviews and instructed the follow-up survey resulting in a possible interviewer / interviewee bias where participants may be uncomfortable being completely honest.

The coding of the interviews and written feedback was repeated multiple times by multiple researchers ensuring that the findings were grounded in the data. This combined with the quantitative data gives an in-depth understanding of the research area. The primary aim was not to rigorously assess the effectiveness of the intervention but rather to undertake work to assist in intervention development and

future research decisions.

Conclusion

This feasibility study aimed to confirm if a theory based training intervention designed using the Behaviour Change Wheel could work at changing the practice of nurses in relation to the giving of very brief advice on physical activity. The intervention is both acceptable and practical and it has the potential to increase the frequency of discussion on physical activity to cancer patients. The training intervention influenced the personal views and identities of the nurses involved towards physical activity and consequently could influence the views of nurses working with them. This in-turn could influence the culture and practice of their organisations.

The barriers identified in the behavioural diagnosis were confirmed and overcome by this training intervention, with the exception of those working in palliative care. This training intervention is relevant to other health care professionals. For those working across long-term conditions, an intervention covering multiple conditions should be considered. Face-to-face deliver is preferred however, online delivery modes may be useful. This is the first training intervention of its kind and supports the *making every contact count* agenda,[42] a national policy to ensure that everyone at risk of an unhealthy lifestyle receives advice on health improvement. It also supports the importance of giving advice on physical activity to all cancer patients to reduce their risk of secondary cancer as highlighted in the cancer strategy for England.[43]

The intervention has the potential, should a pilot trial confirm its efficacy in changing the physical activity behaviour of cancer patients, to impact upon Public Health Outcome Framework indicators for physical activity, mortality rates from cancer and other comorbidities,[44] and domains one, two and three of the NHS Outcomes framework.[45] A pilot trial exploring the long-term impact of the training intervention on professional practice and physical activity in cancer patients should follow.

Author statements

Author contributions

The original concept and design for this work was conceived by JW. JW led the feasibility study, collected and analysed all data and drafted the article.

JW, JH and RF developed the approach towards qualitative assessment and JW, JH and KH interpreted the qualitative data. KH reviewed the fidelity of intervention delivery.

All authors have reviewed and approve the final manuscript.

Conflicts of interest

JW is a member of staff at Macmillan Cancer Support. RF and KH were interns at Macmillan Cancer support during this programme of work. No other conflicts of interests are declared.

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Ethical approval

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Appendices

Supplementary files have been submitted digitally in support of this paper. They are as follows:-

Supplementary file: S1	Intervention Content.
Supplementary file: S2	Resources used to support intervention delivery.
Supplementary file: S3	Post intervention questionnaire.