Self-guided technology to improve health related behaviour and quality of life in people with cancer

A commentary on:

Kiss N, Baguley BJ, Ball K, Daly RM, Fraser SF, Granger CL, Ugalde A. Technology-Supported Self-Guided Nutrition and Physical Activity Interventions for Adults With Cancer: Systematic Review. JMIR Mhealth Uhealth. 2019 Feb 12;7(2):e12281. doi: 10.2196/12281.

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Key points

- Self-guided technologies that encourage physical activity and healthy eating may improve short-term levels of activity, dietary behaviour and health related quality of life for people with cancer.
- The evidence base is limited by under-powered studies, recruitment of patients who do not require changes to health behaviour, variations in intervention type and lack of long-term outcomes.
- More research is needed to explore whether self-guided technologies can improve access to care, patient outcomes and pressure on health services.

Introduction

Cancer is the second leading cause of death in the world, and both the disease and its treatments result in reduced health-related quality of life (WHO 2020; Mishra et al. 2012). Cancer survivors are at increased risk of multiple chronic illnesses and the long-term effects of treatment such as fatigue, depression, weight loss/gain and pain (James et al. 2011). Health-related quality of life among people living with, or after, cancer can be improved through nutrition and exercise interventions, and these interventions may also improve survival (Albino de Queiroz et al. 2021; Mishra et al. 2012). There is emerging evidence that these interventions may also help to counter cancer related bone and muscle loss (Kiss et al. 2020). Delivering these interventions in traditional face-to-face methods may not be feasible when meeting the increasing incidence of cancer patients globally (Duan et al. 2021). There is therefore a need to consider alternative models of delivering interventions to achieve increased access and reduce healthcare system burden. Kiss et al. (2019) proposed that technology-supported interventions, such as those delivered over the internet, mobile phone or wearable devices, could offer self-guided support in nutrition and physical activity to more of the world's 32 million people currently living with cancer. Their systematic review aimed to describe and appraise the efficacy of such interventions for people with cancer.

Methods

A comprehensive literature search was undertaken using multiple databases (Medline Complete, Scopus, CINAHL, EMBASE, Cochrane Library, and SPORTDiscus) from 1973 to July 2018. Reference lists from appropriate articles were also searched manually for additional studies. Randomised and non-randomised trials were included if the intervention: focussed on nutrition or physical activity, was self-guided, technology-supported, for adults diagnosed with any cancer type and at any stage in treatment or recovery. Self-guided was defined by no or minimal facilitation by a clinician. Studies were required to have a comparator group such as usual care, waiting list control or no treatment. Studies identified were screened both for eligibility and for risk of bias (using the Cochrane Risk of Bias Tool) by two reviewers independently, and discussion was used to resolve any disagreements. Outcomes were behavioural (changes to dietary intake and physical activity level), clinical (weight and body composition), health-related (quality of life and fatigue), health service resource use and cost. Meta-analysis of the data was deemed not appropriate due to heterogeneity of studies and outcome.

Results

Description of included studies

After screening 3354 papers, 16 randomised controlled trials (RCTs) published between 2007 and 2018 were identified. Trials included 2,684 cancer survivors of any type with a majority of breast or prostate cancer survivors. Nine of the included studies were web-based interventions with content covering healthy eating and exercise but also including elements such as problem identification, goal setting and stress or fatigue management. Three studies delivered a tailored exercise programme with the use of a wearable device. A further three studies used mobile applications to provide training and advice to increase physical activity levels. One study used a digital video disk containing nutrition and exercise advice. Nine of the studies focussed on physical activity, one nutrition and six a combination of both. Five studies were self-guided only, with the remaining 11 including minimal facilitation (training, updates on content, reminders of completed activity and contact with facilitators). Comparator groups consisted of six waitlist controls, five active controls, four usual care controls and one no treatment. Follow-up periods ranged from 10 weeks to 12 months with only five studies reporting ≥6months. Participation rates varied from 25% to 89% (median=53%) with most studies (12/16) retaining >80% of participants upon enrollment. Risk of bias levels varied across studies and the majority did not include blinding of the outcome assessment. Incomplete outcome data and selective reporting of outcomes were also an issue for a small number of studies.

Behaviour change outcomes

Five studies investigated changes to dietary behaviours of which one RCT comparing a web-based intervention versus active control and one RCT comparing a web-based intervention versus usual care both observed statistically significant improvement in diet quality and vegetable intake at 12 weeks and six months. The remaining three studies were either underpowered to detect effect or recruited participants who already had above average quality diets.

Of the 14 studies that encouraged a change in physical activity behaviour, eight RCTs reported a statistically significant improvement in; physical activity levels at 12 weeks and six months (three RCTs, web-based interventions vs usual care, active control or control), moderate-to-vigorous intensity activity at 12 weeks (one RCT, wearable device with access to exercise guidelines vs control), total

minutes of physical activity at 6 weeks (one RCT, mobile app vs active control) and abdominal strength at two months (one RCT, web-based vs waiting list control), number of steps per day (one RCT, wearable device with instructions to exercise vs control) and brisk walking (one RCT, wearable device with access to exercise guidelines vs control). Studies that did not report positive outcomes included study populations without poor physical activity behaviour, underpowered studies and similarities between intervention and control groups.

Clinical outcomes

Two out of four RCTs showed a statistically significant improvement in BMI and metabolic syndrome biomarkers at six months (one RCT, web and mobile based plus wearable device vs waiting list control) and nutritional status at 12 weeks (one RCT, combined web-based nutrition and physical activity intervention vs waiting list control). Three RCTs reported non-significant improvements in weight change, lean body mass, fat mass, BMI, arm circumference and handgrip strength.

Health related quality of life outcomes

Nine studies assessed health related quality of life, of which six studies showed a statistically significant improvement in either global quality of life at 12 weeks and six months (two RCTs, web-based intervention vs waiting list control) or a subscale of quality of life at 12 weeks and six months (four RCTs web-based intervention vs waiting list control or active control). The most beneficial outcomes were from web-based interventions, involving a physical activity, using waiting list controls, and reporting very high adherence.

Of the six RCTs that reported fatigue related outcomes, four showed statistically significant improvements in fatigue levels following the intervention at 12 weeks and six months (four RCTs, web-based intervention vs waiting list control or active control). One RCT observed a statistically significant decrease in anxiety at 12 weeks (web-based intervention vs waiting-list control) but not depression. Of the four other studies that measured depression, anxiety or changes to mood or distress, there were no significant differences. There were statistically significant improvements in insomnia (one RCT, web-based intervention vs waiting list control) and pain severity at six months (one RCT, web-based intervention vs waiting list control).

Commentary:

Applying the AMSTAR2 appraisal tool found that the systematic review is of high quality, with the authors following a robust search and appraisal strategy. Though further detail could have been provided on the rationale for certain inclusion or exclusion choices and a list of excluded studies. The authors acknowledge key limitations in the review caused by the risk of bias within some of the included studies, as well as heterogeneity between interventions such as sample size, outcome measures and intervention type/duration which limited comparability, prevented meta-analysis and the identification of effective components. Therefore, due to these limiting factors these findings should be viewed with some caution.

The systematic review described and appraised the evidence for interventions that target physical activity and nutrition via self-guided technology. They identified a small number of studies that reported benefits on dietary behaviour and BMI in the short-term. Over half of the studies that measured physical activity, health related quality of life and fatigue demonstrated improvements. Long-term benefits beyond six months remain unclear for all outcomes. Health care resource usage and cost-effectiveness were not reported by any studies.

The evidence for technology supported interventions and self-guided care for people with cancer is still developing and remains inconsistent. Comparing the current findings to previous reviews in this area, a similar review of web or mobile based interventions demonstrated a similar benefit on short-term fatigue in people with cancer and small to moderate effects on HrQoL (Seiler et al. 2017). However, contrary to the current review, they identified a positive effect of the intervention on depression. A possible rationale for this discrepancy may have been identified as the need for facilitation within these types of intervention (Ugalde et al. 2017). In their review of self-guided interventions for people with cancer, Ulgalde et al. found limited evidence for reducing psychological distress and also identified that nearly all of the interventions required some level of facilitation for the purpose of orientation, monitoring or encouraging adherence and providing support.

Within other health populations, there is a similar lack of consistency and reporting of long-term outcomes. Web-based interventions for dietary behaviour in adults with type 2 diabetes demonstrated effectiveness in dietary behaviour change up to 12 months but evidence was based on a small number of studies with considerable heterogeneity (Dening et al. 2020). Similarly, a review of web-based interventions for obese and overweight adults, led to greater weight loss than offline interventions but the benefit was not maintained in the long-term (Sorgente et al. 2017). Possible explanations for heterogeneity and lack of long-term benefit may be due to factors that have been found to influence the effectiveness of web-based interventions such as the age of participants, design and duration of studies (Jahangiry et al. 2017).

The evidence suggests that self-guided technology may be beneficial for people with cancer, but the evidence base is limited by considerable heterogeneity in terms of intervention components and outcomes. Due to the COVID-19 pandemic, there is a further rationale for researching interventions which can be delivered remotely to reduce infection risk, particularly for cancer patients who may be classed as 'high-risk' or advised to shield by healthcare professionals (Fiona et al. 2021). Future research should address questions of the interventions relating to the best timing (prior to, during or after cancer treatment), duration, frequency, facilitation and whether there are any moderating factors such as participants with pre-adjusted health behaviours, gender, socio-economic status, ethnicity or age. In addition to addressing these questions, further research should be sufficiently powered, use long-term outcomes and include clear reporting of participation, acceptability and adherence as it is unclear if they influence poorer outcomes.

CPD Reflective Questions

- What are the main findings of this review and remaining gaps in knowledge?
- Do all people with cancer have access to technology based, self-guided interventions?
- What advice should be given to colleagues or patients considering such interventions?

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