2016

Implementation of a Nutrition Screening Tool in a Pediatric Oncology Clinic: A Practice Improvement Project

Terri L. Boyce

Implementation of a Nutrition Screening Tool in a Pediatric Oncology Clinic:

A Practice Improvement Project

Terri L. Boyce

Abstract

Malnutrition in children with cancer should not be accepted at any stage of the disease or tolerated as an inevitable process. To prevent malnutrition and its complications during cancer treatment, early identification is essential. SCAN is a simple, quick, and valid screening tool which can be utilized to identify children with cancer who are at risk of malnutrition. Utilizing the Iowa Model, implementation of SCAN incorporating customized EHR prompts for documentation was piloted for 8 weeks in an outpatient pediatric oncology clinic at an academic-affiliated hospital in Texas. Effectiveness of the implementation process was evaluated by percentage of opened forms (90%), percentage of completed forms (49%), percentage of completed screens forwarded to provider (90.5%), percentage of identified at risk patients billed as at risk by the providers, (50%), and the results of a staff questionnaire. Staff found value in utilization of SCAN to potentially improve patient care, but the current process needed minor modifications for long-term sustainability.

Keywords: nutrition, risk assessment, pediatric, oncology, supportive care

Implementation of a Nutrition Screening Tool in a Pediatric Oncology Clinic: A Practice Improvement Project

Introduction

The literature suggests that approximately 50% of children, adolescents, and young adults with cancer experience malnutrition due to numerous tumor and treatment-related factors (Bauer, Jürgen's, Fruhwald, 2011; Montgomery, et al, 2013). Nutritional strategies should be considered and integrated as a fundamental feature of pediatric oncology with the same diligence as one does for other supportive care measures to prevent chronic illness and adverse late effects caused by malnutrition in this population. Ensuring proper nutrition during anticancer treatment is challenging because of the side effects of chemotherapy and radiation, including taste changes, nausea, vomiting, diarrhea, constipation, anorexia, mucositis, and typhilitis (Mosby, Barr, & Pencharz, 2009; Mustapha, 2013).

Many studies have found that malnutrition in children with cancer is a negative prognostic factor (Co-Reyes, Li, Huh, & Chandra, 2012; Bauer, Jürgens, Fruhwald, 2011). According to these same studies, malnutrition is also associated with decreased treatment tolerance, unfavorable response to chemotherapy, treatment delays, increased risk of infection, and diminished quality of life. Poor nutritional status is linked to adverse outcomes both during treatment of childhood cancer and throughout survivorship (Brinksma et al., 2015).

Children with cancer, especially those with large abdominal masses, may present with normal weight despite severe malnutrition. Nutritional depletion in children with cancer may further be masked by marked by weight gain from treatment with corticosteroids,and hyper hydration with treatment modalities,. In overweight children, lean body mass loss may be concealed as fat decreases or remained unchanged while skeletal muscle wasting with

malnutrition. Thus, body weight is not a sufficiently and adequately sensitive marker for the detection of nutritional distresses in children with cancer (Bauer, Jürgens, & Fruhwald, 2011).

Despite acknowledging its unreliability as a single indication of nutrition, most Children's Oncology Group (COG) institutions surveyed reported that weight is the primary determinant in assessing nutrition status. These same facilities reported the use of laboratory indices, such as albumin, pre-albumin, electrolytes, and liver function tests, despite their clinical limitations because there is not an agreed upon "gold standard" in determining nutrition status (Ladas, Sacks, Brophy, & Rogers, 2006; Co-Reyes, Li, Huh, & Chandra, 2012).

The primary goal for nutrition in children with cancer is to maintain and promote normal growth and development throughout treatment (Montgomery et al., 2013). Malnutrition in children with cancer should not be accepted at any stage of the disease or tolerated as an inevitable process. To prevent malnutrition and its complications during cancer treatment, early identification is essential. Detailed nutrition assessment can be time consuming, expensive and impractical to complete on all children with cancer in what is often a resource poor setting. Additionally, amongst the multitude of testing undertaken on patients, nutrition assessment is often overlooked (Murphy, White, Viani, & Mosby, 2015).

In the 2003 COG nutrition survey, 52% of responding institutions reported having criteria for nutritional intervention, and only 56% reported utilizing a screening tool that triggers a nutrition consult. Institutions reported the limited availability of the registered dietician (RD) as one of the primary obstacles in proving optimal nutritional care. Institutions also reported that limited finances precluded the delivery of optimal nutrition care, which suggests that the provision of nutrition services requires modifications at an administrative level (Ladas, Sacks, Brophy, & Rogers, 2006). A standardized nutritional assessment and algorithm of nutritional

intervention will decrease the variability of nutritional practice that may well affect the outcome of therapeutic clinical trials (Rogers et al., 2008).

Screening for malnutrition risk to ensure prompt identification and intervention may provide one part of a solution to the high prevalence of malnutrition evident in children with cancer. Therefore, it is vital that there is a nutrition screening tool available that can be performed by any staff, at any stage of cancer treatment and in any setting that can triage the children that need to be referred for further detailed nutrition assessment (Murphy, White, Viani, & Mosby, 2015). Nutrition screening and assessment should be done early to allow for the correction of any pre-existing nutritional deficits. Nutrition status should be monitored throughout treatment (DeLoid, Peabody, Edelstein, 2010). At present, there are no agreed-upon parameters regarding the criteria for, timing of, and duration of nutritional interventions in pediatric oncology patients (Co-Reyes, Li, Huh, & Chandra, 2012). The development of The International Committee on Nutrition & Health for Children with Cancer has been established to help close this gap in education and clinical care. This committee aims to develop medical nutrition guidelines, screening, and education tools during and after cancer therapy (Ladas et al, 2012).

A thorough literature search utilizing CINAHL, PubMed, and Medline revealed several nutrition screening tools for children used in both the hospital and ambulatory setting, and several to screen nutritional status in adults with cancer. However, only one tool was found specifically aimed at nutritional screening of children with cancer. This recently published nutrition screening tool for children with cancer called “SCAN” was selected as the tool to be utilized for the practice improvement project. Despite its recent creation and implementation at only a single institution, there is still external validity, as the applicability of study findings to the

patient population of this clinic are more appropriate than any of the other nutrition screening tools or clinical guidelines found in the literature. This tool was developed by a team of internationally renowned experts in pediatric oncology nutrition after an extensive review of the other currently available tools and published screening recommendations, consideration of pediatric oncology nutrition guidelines, piloting questions, and consultation with members of International Society of Pediatric Oncology (SIOP) International Committee on Nutrition & Health for Children with Cancer Group, which also includes experts from COG. Of important note, the authors of SCAN are themselves on the International Committee of Nutrition & Health for Children with Cancer and the International Pediatric Oncology Nutrition Group.

The first study utilizing the tool determined the accuracy and validity of SCAN against pediatric subjective global nutrition assessment (pediatric SGNA). In the second, larger study, subjects were classified as "at risk of malnutrition" and "not at risk of malnutrition" according to SCAN and measures of height, weight, body mass, and body composition were compared between the groups. The validation of SCAN against pediatric SGNA showed SCAN had excellent accuracy (0.90, 95% CI 0.78-1.00; $p < 0.001$), 100% sensitivity, 39% specificity, 56% positive predictive value, and 100% negative predictive value. When subjects in the second study were classified into "at risk of malnutrition" and "not at risk of malnutrition" according to SCAN, the "at risk of malnutrition" group had significantly lower values for weight Z score ($p = 0.001$), BMI Z score ($p = 0.001$) and fat mass index ($p = 0.04$), than the "not at risk of malnutrition" group. Thus, this second study shows that SCAN is a simple, quick, and valid screening tool which can be utilized to identify children with cancer who are at risk of malnutrition (Murphy, White, Viani, & Mosby, 2015). The International Pediatric Oncology

Nutrition Group is currently conducting a third study on the SCAN tool, in an international multicenter trial in order to improve external validity and generalizability.

The critical appraisal of the of SCAN reveals psychometric properties that are reasonable and applicable to practice, despite the 56% positive predictive value that suggests that nearly half of all patients identified as "at risk" may not actually be. It is better to have false positives than false negatives, but we do run the risk of requesting nutrition consult on a substantial number of children who may not need one. This can be problematic from an insurance standpoint with increased cost to patient from co-pays, and can potentially saturate the system with "unneeded" referrals, thereby increasing the wait time for those truly at risk. However, this is the only pediatric oncology specific screening tool validated, and published to date, and therefore, is the best tool to utilize at this time. The lead author, Alexia Murphy, was contacted via email for permission to implement the SCAN tool into practice for this project.

Translating research evidence into routine clinical practice is notoriously challenging. Behavioral interventions are often utilized to change practice, although their success is variable and the characteristics of more successful interventions are unclear (Johnson & May, 2015). Systematic reviews, once thought of as simply helpful background reading, are becoming increasingly accepted as peer reviewed, rigorous publications required to establish if an intervention or activity is feasible, if it is appropriate (ethically or culturally) or if it relates to evidence of experiences, values, thoughts or beliefs of clients and their relatives (Hemingway & Brereton, 2009). Due to the high volume of publications related to utilization of EHR prompts in practice improvement projects, the project lead determined that evaluating systematic reviews instead of individual publications of primary research provided the most effective means to obtaining reliable information about the implementation intervention.

A systematic review by Shojania, et al. (2010) focusing only on the effects of point of care computer reminders on physician behavior revealed that computer reminders improved adherence to processes of care by a clinically insignificant median of only 4.2%. However, a trend toward larger improvements, 12.9%, was seen for reminders that required users to enter a response. This review demonstrates a much smaller than expected improvement from the implementation of computer reminders within an electronic medical record system.

A systematic review evaluating point-of-care decision support systems that confront the clinician during the prescribing process provides support for the continued development and use of computerized alerts and prompts for prescribing (Schedlbauer et al., 2009). Although this nutrition screening project does not include provider prescribing behaviors, there is value in the authors finding that there is support from clinicians for computerized alerts to be clear, precise, brief, and noticeable. This review concluded that most empiric studies evaluating the effects of computerized prompts and alerts on prescribing behavior show positive and often substantial, effects, but additional studies are required to determine the design features that are most strongly associated with improve impact on clinical outcomes (Schedlbauer et al., 2009).

A systematic review of 61 randomized controlled trials evaluating the effectiveness of clinician prompts about preventative care measures found that clinician reminders are a modestly successful approach for increasing the rates of delivering preventative care. Of important note, however, at the time of this publication, the authors reported only 23.9% of physicians in the United States using EHR and only 5% of hospitals using computerized provider order entry systems. Studies on the impact of computer generated prompts tended to decrease, while computerized reminders increased (Dexheimer, Talbot, Sanders, Rosenbloom, & Aronsky, 2008). The authors acknowledged this even in 2008, and newer systematic reviews still need to

be performed re-evaluating the effectiveness of prompts on preventative care now that these systems are the norm, not the exception.

A newer systematic review by Johnson and May (2015) aimed to establish the characteristics of successful behavior change interventions in healthcare. This 67-article review demonstrates that interventions based on action, such as audit with feedback and reminders, including those in an EHR, and various types of education tend to be more likely to successfully change professional behavior than those based on persuasion by local consensus processes and opinion leaders. Combining such interventions is most likely to change behavior.

The purpose of this practice change was to implement a validated nutrition-screening tool on all pediatric oncology patients currently receiving anti-cancer treatment in order to identify at risk patients. By doing so, a timely referral to the nutritionist may provide early intervention, thereby ultimately decreasing the morbidities associated with poor nutrition. The second goal of this project was to evaluate the effectiveness of electronic health record reminders on health care workers implementing practice change.

Method

Readiness of the staff to adopt guidelines into practice prior to implementation of the process is a critical factor in the subsequent change in practice. Initiating and maintaining change requires active buy-in from leadership, frequent interventions, and incentives (Bradley et al., 2006; Tran et al., 2009). It was important that the implementation of nutrition screening in the Children's Cancer and Blood Disorders Center was carefully planned, included ongoing staff input and support, and was fully evaluated soon after implementation in order to guide necessary enhancements or adjustments. Staff may lack confidence or remain uncommitted to changes that

are perceived as unnecessary, conflicting with worker values, or increased an already high workload (Thomas & Staiger, 2012).

The project lead conducted multiple informal conversations with nurses and providers for months leading up to the time of the project. Their input regarding the importance of nutrition evaluation, the use of the EHR, and implementing clinic wide changes was sought and noted in the early planning stages. Several nurses, physicians, a nurse practitioner, the clinical psychologist, the front desk clerk, and the nurse informaticist were all involved in the brainstorming phases of planning, in order to create a process that would allow us to create the changes and collect the data with minimal interruption to workflow.

The next step in the implementation process involved formal education of the staff. The first meeting occurred approximately one month prior to starting the data collection so that staff was aware that of the process and again just prior to activating the EHR template. The project lead provided clinic staff and providers with SCAN nutrition screening tool for children with cancer and a written explanation of the project in a 20-minute in-service. The goal of the meeting was to educate staff about tool and answer questions. SCAN, written instructions, and expectations of the project was also emailed to all clinic staff/providers for future reference.

With permission from the chief nursing officer to include EHR changes in the pilot project that required assistance from the IT department, the project lead provided the nursing informaticist with SCAN tool and desired mandatory Y/N radio-button triggers and documentation formatting request. The following process was built into the customized clinic encounter template in the EHR based on the project lead's recommendations and the nurse informaticist's ability to customize documentation within the EHR.

At patient check in to front desk, the office clerk asked parent/patient the following 3 questions and recorded the answers utilizing radio-button triggers on the EHR: (1) are you 18 or under Y/N; (2) are you receiving anti-cancer treatment Y/N; and (3) is this your first visit to clinic this week Y/N? The EHR required all three questions to be answered before staff could proceed to the next phase of check-in process in the EHR. If the answer to all three questions was yes, the front desk clerk opened the customized note in the EHR entitled "SCAN Nutrition Tool" which served as the notification to the staff assigned to that patient to complete the screening tool on that visit. If any of these questions were answered "no," the nutrition note was not opened and the EHR allowed the clerk to proceed with other documentation. The front desk clerk kept a tally of the number of nutrition notes opened each day utilizing an excel spreadsheet created by the project lead and emailed this chart weekly.

If the SCAN note was opened by the front desk for a particular patient, the nurse or medical assistant assigned to the patient that day knew that the creation of the note means that they are to complete the SCAN screening tool in the EHR based on their initial intake with the patient and their parent. The SCAN nutrition tool note was saved to the patients' medical record forwarded by the staff member completing the screening tool to the project lead and the provider seeing the patient that day using the "save and forward" feature so that the project lead could track the number of completed SCAN nutrition assessments in the EHR. Physicians and nurse practitioners received the completed SCAN document in the EHR, reviewed the results documented by the nurse or MA, and incorporated results into their provider recommendations and plan of care by documenting ICD-10 code Z91.89 "At risk or high risk for malnutrition" if the patient scores ≥ 3 on the screening tool.

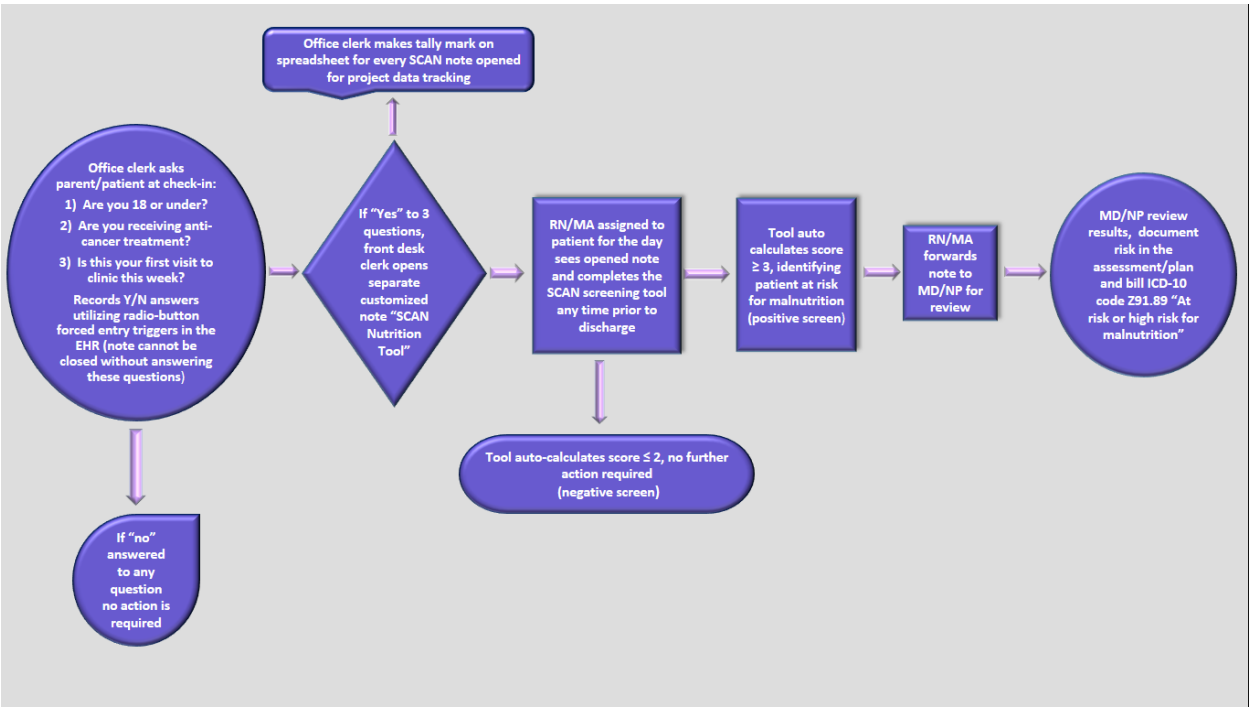

Figure 1 Workflow diagram

Results

Of the 142 eligible patient encounters during the 8-week pilot, 128 patients (90%) had SCAN note opened in the HER by the front desk clerk upon patient check-in. The RN/MA completed 63 of these 128 opened notes for a 49% completion rate. Of the 63 completed notes, 57 (90.5%) were appropriately forwarded to the provider. An at-risk score of ≥ 3 was auto-calculated on 12 of 63 encounters indicating that 19% of the screened patients were at nutritional risk. Providers documented and billed for y 6 (50%) of these 12 at-risk screens.

Three SCAN notes were incorrectly opened (two patients not on treatment, and one over the age of 18 years) but recognized by the RN as inappropriate for inclusion and closed prior to completion and therefore not included in the statistical analysis.

Eighteen staff members (8 MDs, 5 RNs, 2 NPs, 2 Mas, 1 front desk clerk) were given the participation questionnaires, but only 10 (56%) completed forms were received by the project lead. 70% of questionnaire responders indicated the process of SCAN screening was sustainable for future use. Another 20% were undecided and 10% disagreed but provided suggestions for modifications. 80% of survey responders indicated that they would like to continue to use SCAN in clinic and 20% were undecided.

Free text comments from staff members on the questionnaires were generally positive regarding design of project, ease of use, value to patient care, and need for nutritional screen and discussion with patients and families. Constructive criticism from one respondent expressed some concern for accuracy of responses to the trigger questions at the front desk making assumptions about treatment instead of asking the patient or family after several patients receiving only radiation treatment at an outside facility were documented as "not receiving anticancer therapy" and therefore not opening at SCAN note for that encounter.

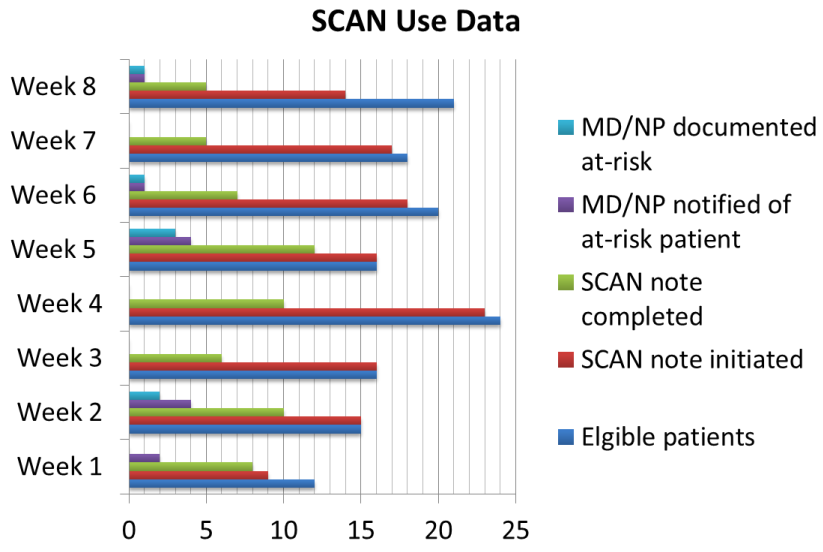

Figure 2 SCAN Use Data

Discussion

There are several factors that either influenced the process, the outcomes, or sustainability of the project. Nearly 1/3 of the on-therapy oncology patients in this clinic are >18 years of age, and therefore not included in the nutrition screening process because SCAN is validated only in children ≤ 18 years of age. Thus, there are likely more patients at-risk for malnutrition than the results of this project indicate.

Staff were notified in the informational meeting and in writing that participating in the pilot project was voluntary, and not mandated by the DNP student, nurse manager, clinical director, or any other administrator in position of authority. Participants may choose not to participate or quit participation at any time without penalty. Staff engagement might be influenced by their ability to opt-out of participating in student projects; completion of screening might be likely to increase if required by nurse manager and medical director and enforced by random chart check or audits. Additionally, frequent reminders may increase compliance until the process becomes habitual for staff.

Weekly screening brings attention to the topic of nutrition and factors that place a patient at risk, even in those not identified as at-risk. Without the screening, conversations may take place sporadically or not at all. Ideally, the existence of positive screening results would demonstrate the need for increased availability of dietitians in the outpatient clinic, and referrals can be made as deemed appropriate by the provider.

Recommendations for process change for sustainability include embedding the SCAN tool into the clinic note template with a forced entry field instead of a separate note in order to increase visibility during documentation. Secondly, consideration of provider completion of screening instead of RN/MA is needed in order to eliminate the notification step and ensure

provider documentation. Furthermore, the clinic could consider use in patients >18 years treated on pediatric protocols or incorporate separate screening tool validated for adults in order to include all on-therapy patients. Lastly, a quarterly evaluation of the process should occur for the first year, then annually thereafter.

Acknowledgements

Leanne Embry, PhD, Associate Professor, University of Texas Health Science Center San Antonio

Disclosure

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article

References

Bauer, J., Jürgens, H., & Fruhwald, M.C. (2011). Important aspects of nutrition in children with cancer. *Advances in Nutrition, 2*, 67-77.

Bradley, K., Williams, E., Achtmeyer, C., Volpp, B., Collins, B., & Kivlahan, D. (2006). Implementation of evidence-based alcohol screening in the Veterans Health Administration. American Journal of Managed Care, 12(10), 597-606

Brinksma, A., Roodbol P.F., Sulkers, E, Kamps ,W.A., de Bont, E.S., Boot , A.M., Burgerhof, J.G.,… Tissing, W.J. (2015). Changes in nutritional status in childhood cancer patients: A prospective cohort study. *Clinical Nutrition, 34*(1), 66-73.

Ciliska, D., DiCenso, A., Mazurek Melnyk, B., Fineout-Overhold, E., Stetler, C.B.,… & Dang, D. (2011). Models to Guide Implementation of Evidence-Based Practice. In B.M. Melnyk & E. Fineout-Overholt (Eds.), Evidence-Based Practice in Nursing & Healthcare (241-275). Philadelphia: Lippincott Williams & Wilkens.

Co-Reyes, E., Li, R., Huh, W., & Chandra, J. (2012). Malnutrition and obesity in pediatric oncology patients: Causes, consequences, and interventions. *Pediatric Blood and Cancer, 59*, 1160-1167.

DeLoid, L.B., Peabody, A., & Edelstein, S. (2010). Incidence of nutritional assessment, intervention, and follow-up for pediatric patients with cancer. *Topics in Clinical Nutrition, 25(1)*, 3-8.

Dexheimer, J.W., Talbot, T.R., Sanders, D.L., Rosenbloom, S.T., & Aronsky, D. (2008). Prompting clinicians about preventative care measures: A systematic review of randomized controlled trials. *Journal of the American Medical Informatics Association, 15*(3), 311-320.

Eldridge, C.R. (2014). Nursing Science and Theory: Scientific Underpinnings for Practice. In M.E. Zaccagnini & K.W. White (Eds.), The Doctor of Nursing Practice Essentials (pp.3-36). Burlington: Jones & Bartlett Learning.

Elia, M. & Stratton, R. (2011). Considerations for screening tool selection and role of predictive and concurrent validity. *Current Opinion in Clinical Nutrition and Metabolic Care, 14*, 425-433.

Hemmingway, P. & Brereton, N. (2009). What is a systematic review? [PDF document]. Retrieved from http://www.medicine.ox.ac.uk/bandolier/painres/download/whatis/syst-review.pdf

Johnson, M.J., & May, C.R. (2015). Promoting professional behaviour change in healthcare: what interventions work, and why? A theory-led overview of systematic reviews. BMJ Open, 5, 1-14.

Ladas, E.J., Sacks, N., Brophy, P., & Rogers, P.C. (2006). Standards of nutritional care in pediatric oncology: Results from a nationwide survey on the standards of practice in pediatric oncology. A Children's Oncology Group Study. *Pediatric Blood and Cancer, 46*, 339-344.

Ladas, E.J., Mosby, T.T., Murphy, A.J., Cohen, J., Barr, R., & Rogers, P. (2012). Meeting report: Development of an international committee on nutrition & health for children with cancer, International Society of Pediatric Oncology (SIOP). Pediatric Blood and Cancer, 58, 1008-1009.

Montgomery, K., Belongia, M., Mulberry, M.H., Schulta, C., Phillips, S., Simpson, P.M., & Nugent, M.L. (2013). Perceptions of nutrition support in pediatric oncology patients and parents. *Journal of Pediatric Oncology Nursing, 30(2)*, 90-98.

Mosby, T.T, Barr, R.D., & Pencharz, P.B. (2009). Nutritional assessment of children with cancer. Journal of Pediatric Oncology Nursing, 26(4), 186-197.

Murphy, A.J., White, M., Viani, K., & Mosby, T.T. (2015). Evaluation of the nutrition screening tool for childhood cancer (SCAN). *Clinical Nutrition, 2(9),* 1-6.

Mustapha, M. (2013). Nutritional challenges in childhood cancer. *NHD, 87,* 18-19.

Rogers ,P.C., Melnick, S.J., Ladas, E.J., Halton, J., Baillargeon, J., & Sacks, N. (2008). Children's Oncology Group (COG) Nutrition Committee. *Pediatric Blood and Cancer, 50*, 447-450.

Schaffer, M.A., Sandau, K.E., & Diedrick, L. (2012). Evidence-based practice models for organizational change: overview and practical applications. *Journal of Advanced Nursing*, 1197-1209.

Schedlbauer, A., Prasad,V., Mulvane, C., Phansalkar, S., Stanton, W., Lib, D.,… Avery, A.J. (2009). What evidence supports the use of computerized alerts and prompts to improve clinician' prescribing behavior? *Journal of the American Medical Informatics Association, 16*(4), 531-538.

Shea *et al.* Assessing the methodological quality of systematic reviews: The development of AMSTAR. *BMC Medical Research Methodology* 2007 7:10 doi:10.1186/1471-2288-7 10

Shojania, K.G., Jennings, A., Mayhew, A., Ramsey, C., Eccles, M., & Grimshaw, J. (2010). Effect of point-of-of-care computer reminders on physician behavior: a systemic review. *Canadian Medical Association Journal, 182*(5), E216-E225.

Thomas, A. C., & Staiger, P. K. (2012). Introducing mental health and substance use screening

into a community-based health service in Australia: usefulness and implications for service change. Health & Social Care In The Community, 20(6), 635-644