

# Improving Oncology Nurses' Knowledge About Nutrition and Physical Activity for Cancer Survivors

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**Purpose/Objectives:** To assess what percentage of oncology nurses perceived themselves as having insufficient knowledge to provide advice on nutrition and/or physical activity (PA), which characteristics were associated with nurses' perception, and whether the content and information sources differed among those nurses.

**Design:** A cross-sectional study.

**Setting:** A web-based survey among oncology nurses in the Netherlands.

**Sample:** 355 oncology nurses provided advice on nutrition; of these, 327 provided advice on PA.

**Methods:** From May to July 2013, oncology nurses were invited to complete an online questionnaire. Pearson's chi-squared tests and uni- and multivariate logistic regression analyses were conducted.

**Main Research Variables:** Oncology nurses' perception of having sufficient or insufficient knowledge to be able to provide advice on nutrition and PA, the content of the advice, and the information sources on which the advice was based.

**Findings:** 43% of oncology nurses perceived themselves as having insufficient knowledge to provide advice on nutrition, and 46% perceived insufficient knowledge to provide advice on PA. Factors associated with perceiving insufficient knowledge on nutrition were being aged younger, having lower education, and providing counseling during treatment only. Those nurses were more likely to suggest taking oral nutritional supplements or visiting a dietitian and were less likely to provide information on fluid intake. Nurses perceiving insufficient knowledge about PA used oncology guidelines less often.

**Conclusions:** Almost half of the oncology nurses providing advice on nutrition and PA perceived themselves as having insufficient knowledge to be able to provide such advice. In particular, younger oncology nurses and oncology nurses with an intermediate vocational education may benefit most from education about these topics.

**Implications for Nursing:** Educational training for oncology nurses should include nutrition and PA. Oncology nurses should collaborate with dietitians to discuss what information should be provided to patients by whom, and specific PA advice should be provided by a physical therapist.

Oncology nurses play a key role in the provision of information for cancer survivors, defined as people who are living with a diagnosis of cancer, including those who have recovered from the disease (World Cancer Research Fund/American Institute for Cancer Research, 2007). Oncology nurses frequently meet with cancer survivors from diagnosis until follow-up after treatment, generally having more time to spend with survivors than oncologists. Therefore, they have ample opportunities to provide information and advice and to answer questions that may arise throughout the treatment process and thereafter (Ewing, 2015; Ocker & Plank,

2000) on appropriate nutrition and physical activity (PA) (Karvinen, McGourty, Parent, & Walker, 2012; Puhlinger et al., 2015).

According to guidelines (Kondrup, Allison, Elia, Vellas, & Plauth, 2003; Netherlands Comprehensive Cancer Organisation, 2011), oncology nurses should also be involved in detecting and referring cancer survivors in need of dietary and PA support. In case of risk for malnutrition, unintentional weight loss or gain, nutritional complaints, or impaired PA, oncology nurses can provide advice on nutrition and PA themselves or refer more complex cases to an oncology dietitian, an oncology physiotherapist, or a clinical or accredited exercise physiologist (Netherlands Comprehensive Cancer Organisation, 2011).

Nutrition and PA advice should be provided from prediagnosis until follow-up after treatment (Davies, Batehup, & Thomas, 2011; Garcia & Thomson, 2014; Kushi et al., 2012; Murphy & Girot, 2013; World Cancer Research Fund/American Institute for Cancer Research, 2007). However, Stevinson and Fox (2005) demonstrated that advice on PA and the use of exercise is rarely provided to patients with cancer.

Although cancer survivors need information on appropriate nutrition and PA, and oncology nurses are in a favorable position to provide advice (James-Martin, Koczwara, Smith, & Miller, 2014), nurses are generally not trained in providing advice on these topics and, therefore, may perceive themselves as having insufficient knowledge to be able to provide such advice (Hollis, Glaister, & Lapsley, 2014; Pfister et al., 2013). To what extent oncology nurses perceive themselves as having insufficient knowledge about nutrition and PA and whether this perception influences the content of the advice about nutrition and PA they provide are unknown. Also unknown are on what information sources oncology nurses base their advice and whether oncology nurses who perceive themselves as having insufficient knowledge use different information sources than oncology nurses who perceive themselves as having sufficient knowledge. This is of interest because oncology nurses are the healthcare providers who patients see most during treatment. Patients rely on the information they receive from oncology nurses. In addition, oncology nurses may be the major provider of nutritional information to patients with cancer (Puhlinger et al., 2015). If oncology nurses perceive themselves as having insufficient knowledge on nutrition and PA—and, therefore, maybe providing inappropriate advice—this may unintentionally harm the patient. To be able to help oncology nurses feel confident about the nutrition and PA advice they provide, adjusting training programs on nutrition and PA may be necessary. Before this is done, more information is needed

on oncology nurses and information provision on nutrition and PA.

The aims of the current study were to assess what percentage of oncology nurses perceived themselves as having insufficient knowledge to provide advice on nutrition and/or PA to their patients, which characteristics were associated with oncology nurses' perception of having insufficient knowledge, and whether the content of the nutrition and/or PA advice and the information sources on which this advice was based differed between nurses who perceived themselves as having insufficient knowledge and those who perceived themselves as having sufficient knowledge.

## Methods

A cross-sectional survey study was conducted among oncology nurses. Nurses had to be working in oncology health care to be included. In the current study, all nurses working with cancer survivors are referred to as oncology nurses. Ethical approval was not required.

## Data Collection

From May to July 2013, 3,564 oncology nurses were invited to complete an online questionnaire. SurveyMonkey® was used to compose and distribute the online questionnaire. A hyperlink to this questionnaire was distributed via direct mailing or via a newsletter through different oncology nursing networks in the Netherlands: the Dutch Oncology Nursing Society, the Nationwide Group of Specialized Oncology Nurses, and various networks of oncology nurses of the Netherlands Comprehensive Cancer Organisation. The number of oncology nurses who were invited for participation is estimated by summing the members of the different Dutch oncology networks and deleting oncology nurses who were members of more than one oncology network.

The questionnaire included questions on general characteristics of the oncology nurses, such as age, gender, education level (intermediate vocational, higher vocational, university), type of organization (hospital, other), and the number of years of work experience with cancer survivors (5 years or less, 6–15 years, 16–25 years, 25 years or more). Timing of counseling was assessed by the following question: "During which stage(s) in the treatment process do you see cancer survivors as part of your job?" Responses were during diagnosis and treatment, during treatment only, during treatment and after care, or during the whole trajectory.

Provision of advice on nutrition and PA was assessed by the questions, "Do you provide advice about nutrition to cancer survivors?" and "Do you

**TABLE 1. Characteristics of Oncology Nurses Providing Advice on Nutrition and Physical Activity**

Characteristic	Nutrition (N = 355)						Physical Activity (N = 327)					
	Insufficient Knowledge (N = 153)		Sufficient Knowledge (N = 202)		OR	95% CI	Insufficient Knowledge (N = 149)		Sufficient Knowledge (N = 178)		OR	95% CI
	M	Min–Max	M	Min–Max			M	Min–Max	M	Min–Max		
Age (years)	44	23–65	47	23–64	1.03	[1.01, 1.06]	46	23–64	47	23–62	1.01	[0.98, 1.03]
Characteristic	n	%	n	%	OR	95% CI	n	%	n	%	OR	95% CI
<b>Education level</b>												
University	10	7	24	12	REF	REF	11	7	25	14	REF	REF
Higher vocational	116	76	155	77	0.56	[0.26, 1.21]	120	81	133	75	0.49	[0.23, 1.03]
Intermediate vocational	27	18	23	11	0.36	[0.14, 0.89]	18	12	20	11	0.49	[0.19, 1.27]
<b>Gender</b>												
Female	146	95	191	95	REF	REF	138	93	172	97	REF	REF
Male	7	5	11	5	1	[0.46, 3.17]	11	7	6	3	0.44	[0.16, 1.21]
<b>Oncology experience (years)</b>												
More than 25	5	3	9	4	REF	REF	8	5	5	3	REF	REF
5 or less	48	31	55	27	0.64	[0.2, 2.03]	42	28	58	33	2.21	[0.68, 7.23]
6–15	46	30	68	34	0.82	[0.26, 2.61]	50	34	55	31	1.76	[0.54, 5.7]
16–25	15	10	18	9	0.67	[0.18, 2.42]	11	7	17	10	2.47	[0.64, 9.54]
Missing data	39	25	52	26	-	-	38	26	43	24	-	-
<b>Organization</b>												
Hospital	141	92	180	89	1.44	[0.69, 3]	133	89	161	90	0.88	[0.14, 1.8]
Other	12	8	22	11	REF	REF	16	11	17	10	REF	REF
<b>Timing of counseling</b>												
The whole trajectory	75	49	121	60	REF	REF	86	58	102	57	REF	REF
Diagnosis and treatment	29	19	32	16	0.68	[0.38, 1.22]	26	17	24	13	0.78	[0.42, 1.45]
Treatment	32	21	27	13	0.52	[0.29, 0.94]	22	15	29	16	1.11	[0.6, 2.07]
Treatment and after care	17	11	22	11	0.8	[0.4, 1.61]	15	10	23	13	1.29	[0.64, 2.63]

CI—confidence interval; M—median; Max—maximum; Min—minimum; OR—odds ratio; REF—reference category  
 Note. Because of rounding, percentages may not total 100.

provide advice about PA to cancer survivors?” Both had a “yes” or “no” response. Having sufficient knowledge on nutrition or PA was assessed by the following “yes” or “no” questions: “Do you perceive to have sufficient knowledge to provide advice on nutrition to cancer survivors?” and “Do you perceive to have sufficient knowledge to provide advice on PA to cancer survivors?” The population for analysis consisted of oncology nurses who positively answered at least one of the questions on information provision and also provided an answer to the appropriate question on sufficient knowledge. The questionnaire included open-ended questions on the content of the advice and on the information sources on which the nutrition and PA advice was based.

**Data Analyses**

Independent sample t tests were used to analyze differences between included and excluded nurses. Descriptive statistics were used to describe characteristics of oncology nurses and to describe the proportion of oncology nurses who did and did not report having sufficient knowledge about nutrition and/or PA. Univariate logistic regression analyses were conducted to investigate associations between characteristics of the oncology nurses and perceiving to have insufficient versus sufficient knowledge to provide advice on nutrition and/or

PA. Each of these analyses was conducted with “having sufficient knowledge (yes/no)” as the dependent variable, and one of the characteristics—age, gender, education level, type of organization, timing of counseling, and number of years of work experience—as the independent variable. Variables were included only if at least 80% of the cells in the cross tabulation had an expected cell frequency of 5 or more. In addition, multivariate logistic regression analyses were conducted with all characteristics that were statistically significantly ( $p < 0.05$ ) associated with having sufficient knowledge (yes/no) in the univariate logistic regression analyses. To be included in the final multivariate regression model, a characteristic had to be statistically significantly ( $p < 0.05$ ) associated with the perception of insufficient versus sufficient knowledge after backwards selection.

Answers to the open-ended questions (e.g., on information sources and on content of the advice) were categorized according to the content of the answers. Differences between oncology nurses perceiving themselves as having sufficient and insufficient knowledge were analyzed using Pearson’s chi-squared test. Statistical analyses were conducted using SPSS®, version 23.0.

## Results

### Sample Characteristics

Of the 3,564 oncology nurses who were invited to participate in the current study, 486 (14%) filled in the online questionnaire. After removal of 26 duplicates and 2 nurses who did not fit the definition of an oncology nurse, 458 valid questionnaires remained. The questionnaires of oncology nurses with missing values on the questions, “Do you provide advice about nutrition/PA to cancer survivors?” and “Do you perceive to have sufficient knowledge to provide advice on nutrition/PA to cancer survivors?” were excluded. After exclusion, the study population consisted of 355 oncology nurses who reported that they provide advice about nutrition to cancer survivors, of whom 327 also reported advising about PA.

Most oncology nurses in the current study were female, had completed higher vocational education, were currently employed in a hospital, and had counseled patients with cancer for 15 years or less. See Table 1 for an overview of the characteristics of the study population.

Oncology nurses who were excluded from the analyses on nutritional advice were younger (44 years versus 47 years,  $p = 0.023$ ) and less educated (66% versus 76% higher vocational education,  $p < 0.001$ ) than oncology nurses who were included in the study population. For nurses giving advice on PA, excluded nurses were less educated (67% versus 76% higher vocational education,  $p < 0.001$ ) and less often counseled patients during the whole trajectory (33% versus 57%,  $p = 0.003$ ) than oncology nurses who were included in the study population.

### Oncology Nurses Who Reported Insufficient Knowledge

Of the oncology nurses providing advice on nutrition, 153 (43%) reported insufficient knowledge on nutrition, and 149 (46%) providing advice on PA reported insufficient knowledge on PA.

Older oncology nurses were more likely to perceive themselves as having sufficient knowledge on nutrition (odds ratio [OR] 1.03; 95% confidence interval [CI] [1.01, 1.06]). Less educated nurses (intermediate vocational education versus university) (OR 0.36; 95% CI [0.14, 0.89]) and nurses providing counseling during treatment only versus counseling during the whole trajectory (OR 0.52; 95% CI [0.29, 0.94]) were less likely to perceive sufficient knowledge on nutrition.

**TABLE 2. Content of Nutrition Advice Oncology Nurses Provide by Group**

Content of Advice	Insufficient Knowledge (N = 153)		Sufficient Knowledge (N = 202)		p
	n	%	n	%	
To follow nutritional guidelines	50	33	63	31	0.76
To visit a dietitian	43	28	38	19	0.03
To consume small portions during the day	36	24	39	19	0.33
To consume an energy-enriched diet	26	17	45	22	0.21
To consume a protein-enriched diet	12	8	22	11	0.33
To take oral nutritional supplements	21	14	9	4	< 0.01
To drink fluids	4	3	15	7	0.04
To maintain a stable body weight	7	5	10	5	0.87
To read brochures	6	4	9	4	0.8



**TABLE 3. Content of PA Advice Oncology Nurses Provide by Group**

Content of Advice	Insufficient Knowledge (N = 149)		Sufficient Knowledge (N = 178)		p
	n	%	n	%	
To stimulate exercise in general	79	53	90	51	0.65
To meet PA guidelines	21	14	30	17	0.49
To visit a physical therapist	23	15	26	15	0.83
To attend a Dutch cancer rehabilitation program	17	11	19	11	0.83
To find a balance of exercise and rest	13	9	21	12	0.36

PA—physical activity

Multivariate logistic regression analysis showed that younger age and intermediate vocational education remained associated with having insufficient knowledge on nutrition after backward selection. None of the characteristics were associated with having insufficient knowledge on PA.

### Content of Nutrition and Physical Activity Advice

An overview of the content of the nutrition and PA advice oncology nurses reported providing is displayed in Tables 2 and 3. Oncology nurses most often reported that their nutritional advice was to adhere to nutritional guidelines. Other frequently reported advice was to visit a dietitian, to consume small portions during the day, and to consume an energy-enriched diet. Oncology nurses who perceived insufficient knowledge more frequently advised patients to visit a dietitian ( $p = 0.03$ ), more frequently advised patients to take oral nutritional supplements ( $p < 0.01$ ), and less often provided information about fluid intake ( $p = 0.04$ ) than oncology nurses who perceived sufficient knowledge.

Oncology nurses most often reported that their PA advice was to promote PA in general. Other reported PA advice included to meet PA guidelines by being physically active 30 minutes per day, five times a week; to visit a physical therapist; and to attend a Dutch cancer rehabilitation program (Gijssen, Hellendoorn-van Vreeswijk, Koppejan-Rensenbrink, & Remie, 2005). No differences in the content of the PA advice were found between nurses who perceived insufficient knowledge on PA and those who perceived sufficient knowledge.

### Information Sources

Tables 4 and 5 provide an overview of information sources on which oncology nurses reported to

base their nutrition and PA advice. The most frequently reported information sources included a dietitian, the Dutch Cancer Society's leaflets and website (<https://www.kwf.nl/english/pages/the-organisation.aspx>), and other materials (e.g., materials from previous training, information from the industry, information from doctors, experiences from other patients, common sense). No significant differences were found between information sources used by oncology nurses who perceived insufficient knowledge and those who perceived sufficient knowledge.

Information sources on which PA advice was based included the guidelines of a cancer rehabilitation program (Gijssen et al., 2005); a physical therapist; education such as symposia, training via a medical doctor, and training to become a physical therapist; OncoLine (a website designed for the consultation of nationwide guidelines from the Netherlands for the field of oncology and palliative care) (Netherlands Comprehensive Cancer Organisation, 2011); and oncology nurses' own experience.

## Discussion

The current study showed that nearly half of the oncology nurses who reported providing advice on nutrition and PA perceived themselves as having insufficient knowledge to be able to provide such advice to cancer survivors. Younger oncology nurses, less educated nurses, and nurses who counseled cancer survivors during treatment only particularly reported insufficient knowledge on nutrition. The content of nutritional advice differed between oncology nurses with and without perceived sufficient knowledge on nutrition. Nurses with perceived insufficient knowledge were more likely to suggest taking oral nutritional supplements or visiting a dietitian and were less likely to give advice on drinking and fluids. Similar information sources were used among nurses with and without perceived sufficient knowledge on nutrition. None of the characteristics were associated with having perceived insufficient knowledge about PA. Regarding the content of advice on PA and information sources used, differences were found between oncology nurses with and without perceived insufficient knowledge on PA with regard to the use of OncoLine. Nurses who reported insufficient knowledge on PA less often used OncoLine as an information source.

A search of the literature revealed no studies on oncology nurses and their knowledge levels regarding

giving advice on nutrition and PA. Therefore, the current study is the first relatively large study to report the effect of oncology nurses' perceived knowledge levels on information sources used, content of provided information, and characteristics of oncology nurses perceiving themselves as having sufficient or insufficient knowledge.

The response rate in the current study was comparable to Karvinen et al.'s (2012) response rate (13.6% versus 13.8%) but lower than Stevinson and Fox's (2005) response rate (62%). The higher response rate in Stevinson and Fox (2005) may be explained by differences in sampling method. Stevinson and Fox (2005) used direct mailing, which likely leads to a higher response rate than using a combination of direct mailing and providing a link in a newsletter as in the current study. The current response rate could not be compared to Puhlinger et al. (2015) because they did not provide an estimate of eligible respondents.

The finding that oncology nurses reported providing advice on nutrition and PA even though they perceived insufficient knowledge to provide such advice is in line with other studies within and outside the field of oncology (Hollis et al., 2014; Karvinen et al., 2012; Pfister et al., 2013; Puhlinger et al., 2015). In line with the current study, Karvinen et al. (2012) showed that a lot of oncology nurses are unsure what to recommend to their patients regarding PA. In addition, Puhlinger et al. (2015) showed that a lack of expertise on nutrition was reported to be a common barrier for information provision on nutrition. The current findings seem to contradict this, because nearly half of the oncology nurses in the current study did provide advice on nutrition and PA even though they perceived a lack of knowledge on these subjects. Earlier studies among nurses in other specialties showed that advice was provided despite a reported lack of knowledge and skills (Bachrach-Lindström, Jensen, Lundin, & Christensson, 2007; Bjerum, Tewes, & Pedersen, 2012); for example, nurses in geriatric care and nurses from medical and surgical wards who received training on nutrition and afterwards felt they had achieved more insight into nutrition. When comparing the current study population with the results of a survey by Klemp, Frazier, Glennon, Trunecek, and Irwin (2011), the authors found that the current study population had even higher information needs than Klemp et al.'s (2011) population. Klemp et al.'s

(2011) survey of oncology nurses showed that 30% of respondents had a need for information to assist their patients on topics of health behaviors, such as diet and exercise. In the current study, 43% (nutrition) and 46% (PA) of nurses perceived themselves as having insufficient knowledge.

In contrast to the authors' finding that younger nurses more often reported insufficient knowledge to provide advice on nutrition, a study of palliative care nurses showed that older, more experienced nurses felt less equipped to properly care for their palliative patient group (Pfister et al., 2013). The association between younger age and insufficient knowledge observed in the current study may be explained by a lack of experience in younger oncology nurses. However, findings from the current study and Pfister et al.'s (2013) study suggest that work experience is not associated with perceiving insufficient knowledge.

No literature was found to explain the finding that less educated oncology nurses more often reported insufficient knowledge to provide advice on nutrition. Less educated oncology nurses may have received less training in nutritional topics than their more educated colleagues. However, this possible explanation is in contrast with the results of Klemp et al. (2011), in which no association between knowledge deficits on diet and exercise and formal nursing training was found. The authors also speculated why nurses who provide counseling to patients with cancer during treatment only more often perceive insufficient knowledge. The occurrence of diverse and serious complaints and complications in the treatment phase may enhance the feeling of insufficient knowledge

**TABLE 4. Information Sources on Which Oncology Nurses Reported to Base Their Nutrition Advice by Group**

Information Source	Insufficient Knowledge (N = 153)		Sufficient Knowledge (N = 202)		p
	n	%	n	%	
Dietitian	90	59	124	61	0.62
Dutch Cancer Society <sup>a</sup>	40	26	62	31	0.34
Internet	26	17	38	19	0.65
Guidelines	22	14	38	19	0.27
Internal brochures	17	11	32	16	0.2
Literature	8	5	19	9	0.14
Other materials <sup>b</sup>	27	18	52	26	0.06

<sup>a</sup> Information sources, including leaflets and the website

<sup>b</sup> Materials were from previous training, information from the industry, information from doctors, experiences from other patients, and common sense.

compared to the more general nutritional advice that needs to be given after treatment has finished.

In the current study, healthcare professionals, such as dietitians and physical therapists, were most often mentioned as information sources for knowledge on nutrition and PA. This is in line with a study among oncology healthcare professionals in Australia, which found that experienced colleagues were the preferred source of information (James, James, Davies, Harvey, & Tweddle, 1999).

The majority of the content of the advice on nutrition and PA as reported in the current study seems to be in line with nutritional and PA recommendations (Davies et al., 2011; Garcia & Thomson, 2014; Kushi et al., 2012; Murphy & Girot, 2013; Rock et al., 2012; World Cancer Research Fund/American Institute for Cancer Research, 2007). However, the advice to take oral nutritional supplements reported in the current study is not according to guidelines. This finding is concerning, particularly because the authors found that nurses with a perceived lack of knowledge on nutrition more often provide advice to take these supplements (Netherlands Comprehensive Cancer Organisation, 2011; Rock et al., 2012). Oncology nurses should be taught to refer their patients to a dietitian if they suspect a need for oral nutritional supplements. A dietitian is the designated person to give advice on this. They have more knowledge about different types of nutritional supplements and can determine the specific needs of the patient. Previous research has demonstrated that educating oncology nurses can increase their knowledge about the importance of nutrition and its impact in oncology and their providing early and consistent interventions, such as nutritional advice, to prevent the incidence of

malnutrition (Malone, 2015). For example, in a study of nurses who followed a nutritional training program in which they gained knowledge on risk assessment, consequences of malnutrition, and the assessment of nutritional needs, they reported feeling an increased responsibility for nutritional care compared to the period before the training program (Bjerrum et al., 2012). In addition, educating oncology nurses will likely promote knowledge on nutrition and PA recommendations among cancer survivors (Bjorklund & Fridlund, 1999).

Regarding the content of nutritional advice, the current study showed that nurses who reported insufficient knowledge more often advised their patients to visit a dietitian compared with nurses who perceived sufficient knowledge. Nurses who perceive insufficient knowledge to provide advice may be aware of their lack of knowledge and, therefore, refer patients to a dietitian more often. In addition, the current findings suggest that oncology nurses provide general PA advice. Because Garcia and Thomson (2014) showed that advice on PA should be tailored to meet the individual needs of the patient, providing individually tailored PA advice seems more appropriate. Such tailored PA advice may be better provided by a physical therapist, suggesting that it would be more appropriate for oncology nurses to refer patients in need of information to physical therapists rather than to provide general PA advice themselves.

No literature has been found to explain the fact that no associations were found between perceived insufficient knowledge on PA and nurse characteristics and content of advice. A possible explanation for this may be that the PA advice oncology nurses provide is so basic and general that they are unlikely to perceive a lack of sufficient knowledge.

A strength of the current study was that data were collected nationwide in a large heterogeneous sample of oncology nurses with different education backgrounds and a large variety of number of years of work experience. However, the nurses who participated in the current study may not be representative of the population at large. The authors cannot make a comparison between the respondents and the nonrespondents because they have no information on the nonrespondents. Nurses who participated in the current study may have been more interested in nutrition and PA and, therefore, may perceive sufficient knowledge on these topics more frequently. When this is the case, an even higher need exists for improving

**TABLE 5. Information Sources on Which Oncology Nurses Reported to Base Their Physical Activity Advice by Group**

Information Source	Insufficient Knowledge (N = 149)		Sufficient Knowledge (N = 178)		p
	n	%	n	%	
Dutch cancer rehabilitation program	46	31	50	28	0.58
Physical therapist	39	26	53	30	0.47
Oncoline	17	11	44	25	< 0.01
Education	19	13	36	20	0.07
Own experience	18	12	25	14	0.6
Literature	15	10	24	13	0.34
Brochures	12	8	13	7	0.79

knowledge about nutrition and PA in oncology nurses because the number of oncology nurses with insufficient knowledge would be underestimated in the current study. Because the content of the advice was measured with a questionnaire, details are lacking on the precise content of the reported advice. For example, it is not precisely clear what oncology nurses meant by “adhere to nutritional or PA guidelines” or “an energy-enriched diet.” To gain more insight into the precise content of the advice provided by oncology nurses, qualitative data should be gathered (e.g., by means of semi-structured interviews). However, the current data on the content of the advice provide more insight into the topics nurses discuss with their patients. Another limitation was that the survey did not include questions about the frequency of providing advice on nutrition and PA. Whether advice on nutrition and PA is given routinely to every patient or only when it accidentally comes up is important.

## Implications for Nurses

The results of the current study indicate that improvement of knowledge about nutrition and PA in oncology nurses is needed. The current findings can be used as a starting point to educate oncology nurses on appropriate nutrition and PA advice for cancer survivors. The current study suggests that younger oncology nurses, less educated nurses, and nurses who counsel patients during treatment only should be particularly targeted for such education.

Nutrition and PA should become part of educational training for oncology nurses so that all future oncology nurses will be properly educated (Groenewoud & Lange, 2012; Zuidema-Cazemier, 2014). For example, online education may provide an easy, accessible, and relatively cheap method of educating nurses. Research has demonstrated that nurses are already familiar with online education tools and have access to the Internet at work and at home, providing a viable method for reaching oncology nurses (Klemp et al., 2011). An option is to use an e-learning module for oncology healthcare professionals to improve knowledge on nutrition, PA, and cancer (Murphy, Worswick, Pulman, Ford, & Jeffery, 2015).

Some of the advice reported by oncology nurses in the current study preferably should be provided by a dietitian. For example, providing advice on oral nutritional supplements or an energy- or protein-enriched diet fits the expertise of a dietitian rather than the expertise of an oncology nurse. Therefore, it is important for oncology nurses to closely cooperate with oncology dietitians and to discuss what information should be provided by whom. Agreements about what advice belongs to the scope of oncology nurses need

## Knowledge Translation

- Almost half of oncology nurses providing advice on nutrition and physical activity (PA) to their patients reported insufficient knowledge on nutrition, PA, and cancer.
- Oncology nurses perceiving insufficient knowledge were younger, less educated nurses and nurses who counsel patients during treatment only.
- An educational training program on nutrition, PA, and cancer for oncology nurses may be used to improve knowledge.

to be made and may be facilitated by using screening tools such as the Patient-Generated Subjective Global Assessment Short Form (Bauer, Capra, & Ferguson, 2002) and the Malnutrition Universal Screening Tool (Elia, 2003), as is recommended in the nutritional guidelines. For example, agreement needs to be made about what cutoff points should be used for referral to a dietitian. Specific PA advice, adjusted to the patient's needs, should be given by a physical therapist. The authors recommend incorporating such criteria for referral to a dietitian or a physical therapist in educational materials.

## Conclusion

Nearly half of the oncology nurses who reported providing advice to their patients on nutrition and PA perceived insufficient knowledge to be able to provide such advice. Younger oncology nurses, oncology nurses with an intermediate vocational education, and nurses who counseled their patients during treatment only were less likely to have sufficient knowledge on nutrition. Therefore, these nurses should be educated. Additional research is needed to gain more knowledge on preferred education tools.

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