RESEARCH ARTICLE

Use of Complementary and Alternative Medicine (CAM) as Part of the Oncological Treatment: Survey about Patients’ Attitude towards CAM in a University-Based Oncology Center in Germany

Kerstin A. Kessel1,2*, Sabrina Lettner1, Carmen Kessel1,3, Henning Bier4, Tilo Biedermann5, Helmut Friess6, Peter Herrschbach7, Jürgen E. Gschwend8, Bernhard Meyer9, Christian Peschel10, Roland Schmid11, Markus Schwaiger12, Klaus-Dietrich Wolff13, Stephanie E. Combs1,2,3

1 Department of Radiation Oncology, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 2 Institute for Innovative Radiotherapy (iRT), Helmholtz Zentrum München, Ingolstädter Landstraße 1, Neuherberg, Germany, 3 Onkologisches Zentrum im RHCCC am Klinikum rechts der Isar, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 4 Department of Otorhinolaryngology, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 5 Department of Dermatology and Allergy Biederstein, Technical University of Munich (TUM), Biedersteiner Straße 29, Munich, Germany, 6 Department of Surgery, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 7 Roman-Herzog-Krebszentrum Comprehensive Cancer Center (RHCCC), Technical University of Munich (TUM), Trogerstraße 26, Munich, Germany, 8 Department of Urology, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 9 Department of Neurosurgery, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 10 3rd Department of Internal Medicine, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 11 2nd Department of Internal Medicine, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 12 Department of Nuclear Medicine, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany, 13 Department of Oral and Maxillofacial Surgery, Technical University of Munich (TUM), Ismaninger Straße 22, Munich, Germany

* Kerstin.Kessel@tum.de

Abstract

Introduction
To understand if and which patients would be open-minded to Complementary and Alternative Medicine (CAM) use parallel to their oncological treatment. Moreover, we sought to determine which methods are most accepted and which are the primary motivators to use CAM.

Methods
We developed and anonymously conducted a questionnaire for patients in the oncology center (TU Munich). Questions focus on different CAM methods, previous experiences, and willingness to apply or use CAM when offered in a university-based setting.
Results
A total of 171 of 376 patients (37.4% women, 62.0% men, 0.6% unknown) participated. This corresponds to a return rate of 45%. Median age was 64 years (17–87 years). Of all participants, 15.2% used CAM during their oncological therapy; 32.7% have used it in the past. The majority (81.9%) was not using CAM during therapy; 55.5% have not used CAM in the past respectively. The analysis revealed a significant correlation between education and CAM use during therapy ($r = 0.18; p = 0.02$), and CAM use in the past ($r = 0.17; p = 0.04$). Of all patients using CAM during therapy, favored methods were food supplements (42.3%), vitamins/minerals (42.3%), massage (34.6%). Motivations are especially the reduction of side effect and stress, the positive effect of certain CAM-treatments on the immune system and tumor therapy. Results showed no difference between women and men. Most patients not having had any experience with CAM complain about the deficiency of information by their treating oncologist (31.4%) as well as missing treatment possibilities (54.3%).

Conclusion
Since many patients believe in study results demonstrating the efficacy of CAM, it stresses our task to develop innovative study protocols to investigate the outcomes of certain CAM on symptom reduction or other endpoints. Thus, prospective trials and innovative evidence-based treatment concepts to include CAM into high-end oncology is what patients demand and what a modern oncology center should offer.

Background
When diagnosed with cancer, patients as well as their families are in immense distress; their life is filled with fear and worries. Many patients start searching for effective treatments, taking into account all possibilities offered by medicine, research, and technology. Often, the fear of treatment-related side effects drives the search for complementary and alternative medicine (CAM) options. Although data on the effect of standardized oncology is clear, patients often move to CAM and in some cases even turn away completely from Western medicine. As modern oncologists, we must keep in mind the patients’ interest and expectations, and offer individualized and well-tolerated therapies in terms of standardized high-end oncology coupled with supportive care including elements of CAM as a complementary treatment.

Over the years CAM, which includes acupuncture, homeopathy, naturopathy, or special dietary concepts, gained a widespread adoption and in some areas of healthcare has reached a firm role in interdisciplinary care; for certain indications some physicians and their patients consider CAM as the preferred treatment [1,2]. In oncology, these methods are also gaining further interest and the various treatment options foster this process; however, especially when the path of Western medicine is left special care has to be taken as available data are scarce and improper handling of CAM methods is occasionally present [3–9]. For selected indications and situations, clinical data are available: Acupuncture has been shown to be associated with significant benefit compared to standard treatments in patients with lower back pain, headache or nausea [10–13]. A large German study group performing acupuncture trials (GERAC-Studies) revealed that acupuncture can reduce the frequency of a migraine similar to standard
medication [12,14]. In patients with chronic back or knee pain acupuncture leveled down pain more effectively than any recommended treatment from established guidelines [15]. For many other aspects, no data or only small datasets are available, neither for acupuncture nor for other methods of CAM. In the field of oncology, smaller studies have shown beneficial effects of acupuncture to diminish fatigue, nausea, dysphagia, or other symptoms during and after oncology treatments [11–13,16].

Throughout most oncological therapies, patients suffer from side effects. Patients complain of tiredness and fatigue, loss of appetite, skin problems or headaches. The search for effective supportive care is a continuous process, also by patients themselves and their families. They choose methods of CAM to reduce their symptoms, strengthen their immune system, or follow their belief that CAM might help to cure the underlying disease.

Only few numbers are available on how many patients prefer CAM or would be open-minded to CAM treatments if offered to them when seeking medical attention. Especially in a university-based setting, where critical and skeptical voices are present against CAM, no information is available on how many patients apply CAM (in parallel) or would accept CAM when offered to them.

During setup and certification of our Oncology Center (Onkologisches Zentrum (OZ) am RHCCC am MRI TU Munich (TUM)) we have analyzed the use and acceptance of CAM scientifically. In the Munich metropolitan area, a large variety of therapists, homeopaths, physicians and others offers CAM on different levels. Numerous opportunities arise outside the university-based medicine. The aim of the present work is to understand if and which patients would be open-minded to CAM use parallel to their oncological treatment, and would favor individualized CAM within the hospital setting. Moreover, we sought to determine which methods summarized under CAM are most accepted by patients, independently of any scientific rationale, and which are the primary motivators for patients to opt for CAM.

**Materials and Methods**

The National Center for Complementary and Alternative Medicine (NCCAM) has summarized different methods in complementary medicine and has sorted them into different categories [17]. Following this categorization system, we developed a patient-oriented questionnaire for oncological patients. This standardized basis generates data that can be compared with previously published data from other centers and other cultural backgrounds. All questions were tailored to fit oncology patients, and focus not only on different CAM methods but also on previous experiences with CAM, willingness to apply or use CAM when offered in a university-based setting. Development of the questionnaire included a pre-survey of 15 patients to optimize format and wording and to eliminate any difficulties in understanding the content of the single questions. The final questionnaire included 18 questions, of which some have several subitems (S1 file).

The survey was performed within the Oncology Center (Onkologisches Zentrum (OZ) am RHCCC am MRI TU Munich (TUM)) in all certified units. Since the questionnaire was handed out to all patients during a three-month time frame between May and July 2015, patients filled out the questionnaire anonymously, hence, no written consent was required by each patient. Inclusion criteria for participation were age older than 18 years, German-speaking, physical and mental ability to fill out a structured questionnaire. The Ethics Committee of the Technical University of Munich (TUM) approved the nature and content of the study with the project number 267/15.

The questionnaire mainly focuses on the following aspects: Which methods classified as CAM are most popular? Have patients been treated with CAM in the past and have had a
benefit from it? Are there methods patients hesitate to accept? Which methods would patients prefer to be offered during their oncological treatment? Especially, we want to understand how the standard oncology spectrum could be expanded for oncological patients, and how many resources would they be willing to invest in such a treatment.

The survey was conducted in the Oncology Center between April and July 2015. All centers and departments involved in the certification process at that time took part in the survey. Patients were informed about the aim of the questionnaire, participation was voluntary and anonymous. Research assistants collected the anonymized data in the institutional database. The evaluation was based primarily following the criteria of the Deutsche Krebsgesellschaft (DKG) for the certification of Oncological Centers in Germany. Hence, the data was sorted according to the tumor entities, which belong to certain tumor centers, modules or focal points within the structure of the Oncology Center Munich, including the following: Nuclear medicine and radiation oncology as central units (CEN); Dermatooncology (DERMA) and Urology/Prostate (URO) representing tumor centers; Hematooncology (HEM), Endocrine malignoma (ENDO) and gastrointestinal surgery (SUR) representing focal points; as well as Neurooncology (NEURO) and head-and-neck tumors (HAN) representing a module of the Oncology Center. All patients included were treated within one of these units.

Statistical calculations were performed using SPSS Statistics v23 (IBM, USA) in a primarily descriptive way. For calculating the differences in the groups of gender, age, family status, education and monthly income nonparametric testing with the Kruskal-Wallis test was used. Pearson correlations were calculated for CAM use before and after treatment to predict the variables contributing to CAM use. A p-value ≤ 0.05 was considered as statistically significant.

Results

A total of 171 of 376 patients (37.4% women, 62.0% men, 0.6% unknown) from seven units participated in the survey. This corresponds to a return rate of 45%. Median age was 64 years (17–87 years). For a detailed patient distribution see Table 1; for a detailed patient socio-demographic characteristics see Table 2.

Of all participants, 15.2% (26/171) used CAM during their oncological therapy (12 women/14 men); 32.7% (56/171; 26 women/30 men) have used it in the past. A difference between the participating oncological units could be demonstrated (Fig 1): patients from the units neurooncology (NEURO) and urology/prostate (URO) use CAM the most.

The majority 81.9% (140/171) of patients was not using CAM during therapy; 55.5% (95/171) have not used CAM in the past respectively. The most common reasons for rejection are the following (multiple answers were possible): for 54.3% (76/140) of patients CAM was...

| Unit  | Patients, n (%) | Gender | Median age (range) [years] |
|-------|----------------|--------|--------------------------|
| all   | 171 (100%)     | 37.4%  | 62.0%                    | 64 (17–87)  |
| CEN   | 26 (15.2%)     | 50.0%  | 46.2%                    | 59 (29–80)  |
| DERMA | 11 (6.4%)      | 27.3%  | 72.7%                    | 71 (33–79)  |
| ENDO  | 11 (6.4%)      | 72.7%  | 27.3%                    | 37 (17–71)  |
| HEM   | 24 (14.0%)     | 50.0%  | 50.0%                    | 60 (30–80)  |
| NEURO | 37 (21.6%)     | 51.4%  | 48.6%                    | 66 (28–87)  |
| SUR   | 25 (14.6%)     | 36.0%  | 64.0%                    | 62 (39–76)  |
| URO   | 37 (21.6%)     | 0%     | 100%                     | 68 (54–77)  |

doi:10.1371/journal.pone.0165801.t001
Table 2. Patient socio-demographic characteristics of the 171 participants.

| Diagnosis                                      | Patients, n (%) |
|------------------------------------------------|-----------------|
| Prostate cancer                                | 39 (22.8%)      |
| Lung cancer                                    | 16 (9.4%)       |
| Upper gastrointestinal cancer                  | 13 (7.6%)       |
| Hepato-pancreato-biliary cancer                | 12 (7.0%)       |
| Lower gastrointestinal cancer                  | 13 (7.6%)       |
| Hematological cancer                           | 8 (4.7%)        |
| Brain tumors                                   | 13 (7.6%)       |
| Skin cancer                                    | 11 (6.4%)       |
| Thyroid cancer                                 | 10 (5.8%)       |
| Bone / Spine cancer                            | 11 (6.4%)       |
| Other                                          | 17 (9.9%)       |
| Unknown                                        | 8 (4.7%)        |
| Received therapy                               |                 |
| Chemotherapy                                   | 40 (23.4%)      |
| Radiation therapy                              | 33 (19.3%)      |
| Hormonal therapy                               | 1 (0.6%)        |
| Surgery                                        | 98 (57.3%)      |
| Other                                          | 16 (9.4%)       |
| Unknown                                        | 19 (11.1%)      |
| Insurance status                               |                 |
| Government insurance                           | 41 (70.8%)      |
| Privately insured                              | 125 (24.0%)     |
| Unknown                                        | 5 (2.3%)        |
| Marital status                                 |                 |
| Single                                         | 17 (9.9%)       |
| Married/in a relationship                      | 125 (73.1%)     |
| Divorced/separated Widowed                     | 9 (5.3%)        |
| Unknown                                        | 1 (0.6%)        |
| Children                                       |                 |
| Yes                                            | 124 (72.5%)     |
| No                                             | 44 (25.7%)      |
| Unknown                                        | 3 (1.8%)        |
| Educational level                              |                 |
| Secondary (High) school 9 years                | 44 (25.7%)      |
| Secondary (High) school 10 years               | 55 (32.2%)      |
| Secondary (High) school 12–13 years            | 13 (7.6%)       |
| College / University                           | 52 (30.4%)      |
| Other                                          | 2 (1.2%)        |
| Unknown                                        | 5 (2.9%)        |
| Monthly income (€)                             |                 |
| <1000                                          | 25 (14.6%)      |
| 1000–2000                                      | 49 (28.7%)      |
| 2000–3000                                      | 33 (19.3%)      |
| 3000–5000                                      | 11 (6.4%)       |
| >5000                                          | 14 (8.2%)       |
| Unknown                                        | 39 (22.8%)      |

* multiple answers were possible

doi:10.1371/journal.pone.0165801.t002
not offered by their physician; 17.9% (25/140) had no interest in adding CAM to their therapy; 31.4% (44/140) had not enough information about CAM. This corresponds with the fact that only 26 patients (15.2%, 26/171) talked with their physician about CAM methods.

We statistically analyzed CAM use by groups of gender, age, family status, education and monthly income, and we could not prove any significant differences within the groups. However, the analysis revealed a significant correlation between education and CAM use during therapy ($r = 0.18; p = 0.02$), and CAM use in the past ($r = 0.17; p = 0.04$).

Of all patients using CAM during therapy, the most applied methods were food supplements (42.3%) and vitamins/minerals (42.3%) as well as massage (34.6%) and physiotherapy/manual medicine (26.9%) followed by homeopathy (23.1%) and herbs/plants (23.1%). Fig 2 summarizes the user rates of all CAM methods, also divided by gender. Apart from vitamins, massage, and hyperthermia, women represent the majority using CAM. Moreover, the effect of the CAM treatment was rated as good (46.2%, 12/26), moderate (19.2%, 5/26) and uncertain (34.6%, 9/26). Only one patient eating food supplements reported side effects by using CAM caused by diabetes. In comparison, Fig 3 shows the user rates of CAM methods used in the past.

Patients found out about CAM (multiple answers possible) by their treating physician/therapist (50.0%; 48.2% during and before therapy, respectively) or oncologist (23.1%; 3.5%), by self-research (23.1%; 30.3%) and through recommendations of family/friends (34.6%; 50.0%).

All patients (n = 171) stated their motives for using CAM during therapy or for possibly using it in the future: Primarily to improve the immune system (42.1%, 72/171) and to take advantage of every opportunity (33.3%, 57/171) as well as to reduce therapy side effects (25.7%,
become more active (25.7%, 44/171) and the assumption of improving the impact of the oncological therapy (23.4% 40/171) by using CAM (Fig 4). Results showed no difference between women and men.

Patients suggested improving the information about CAM for supporting oncological therapies by including personal consultations by specialists during their treatment period (49.1%, 84/171), offering flyer/brochures (29.2%, 50/171) and providing information on the department/clinic homepage (16.4%, 28/171). Among all respondents, 40.9% (70/171) would bear the costs for a concomitant CAM treatment integrated into their oncological therapy if the health insurance would not pay. Consequently, if a CAM method would be offered as concomitant therapy, 54.4% (93/171) patients would be willing to add it to their treatment.

**Discussion**

The present study evaluates the attitude towards CAM in a university-based Oncology Center. We analyzed answers from 171 patients and the results show that about 15–33% of all patients in oncology have used CAM in the past, and used CAM in parallel to their standard treatment in the current situation. Differences between tumor entities can be observed. Especially patients with neuro-oncological diagnoses have a strong affinity to CAM. Moreover, independently of the underlying cancer, about 41% of patients in favor of CAM are willing to invest a certain amount of money should the treatment not be covered by their health insurance.

The use of complementary and alternative medicine is rising worldwide, not only in Western countries, but also in the Far East or in third-world countries, and it is becoming increasingly popular in cancer patients worldwide [18–33]. Previous reports have shown that in certain countries, such as the United States of America, up to 91% of cancer patients are
In our study, the most preferred methods of CAM were food supplements (42.3%) and vitamins/minerals (42.3%) as well as massage (34.6%) and physiotherapy/manual medicine (26.9%) followed by homeopathy (23.1%) and herbs/plants (23.1%). This is in line with the literature: Abdallah and colleagues described a frequent utilization of vitamins/minerals as well as herbs in a group of women with gynecological malignancies [25]; Nazik et al. reported 90.2% of all patients in their study favoring herbal therapy [44]. For the subgroup of head-and-neck cancer patients, Molassiotis et al. showed that 47.1% of all patients chose herbal medicine, followed by medicinal teas (23.5%) or vitamins/minerals (11.8%) [5]. Within the large
European study on 956 patients with various diagnoses also homeopathy, medicinal teas, and vitamins/minerals were the most frequently used CAM methods [6].

Eventually, there are several patient-specific reasons why patients choose CAM. One aspect is the common belief that different methods of CAM have the potential to “boost” the immune system and to strengthen the body to fight cancer. This was revealed in different studies and consistent with our results (Fig 4): Yildirim et al. observed that modulation of the immune system was the main argument for the use of CAM in a Turkish group of patients with gynecological cancer [45]. A European survey on the use of CAM reported that over 50% of all patients were using CAM to increase their body’s ability to fight the disease [6].

Importantly, there is some evidence that the interaction between certain methods of CAM and chemotherapy or radiation might counteract their efficacy: The production of free radicals by cancer treatment, which is thought to be an essential part of the treatment efficacy, could potentially antagonize by the antioxidant effect of some supplements. However, preclinical and clinical evaluations have led to inconsistent data [46–52].

**Conclusion**

About one-third of all patients have had experience with CAM in the past and are open to the possibility to include CAM into their standard oncological treatment. Motivations are especially the reduction of side effect and stress, the positive effect of certain CAM-treatments on the immune system and tumor therapy. Most patients not having had any experience with CAM complain about the deficiency of information by their treating oncologist as well as missing treatment possibilities. This underlines the necessity to evaluate CAM in a university-based setting to determine which options have efficacy and which do not; moreover, this might have
the potential to offer evidence-based CAM as a complementary treatment to high-end oncology care. Since many patients believe in study results demonstrating the efficacy of CAM, which is somewhat controversial in the existing literature, it stresses our task to develop innovative study protocols to demonstrate the positive effect of certain CAM on symptom reduction or other endpoints. Currently, in our Department of Radiation Oncology, we are conducting a prospective trial to evaluate the effect of acupuncture to reduce radiotherapy-related side effects (ROSETTA-Trial). Thus, prospective trials and innovative evidence-based treatment concepts to include CAM into high-end oncology is what patients demand and what a modern oncology center should consider offering.

Supporting Information
S1 File. CAM questionnaire. Questionnaire about complementary and alternative medicine handed out to all patients of the Munich Oncology Center. (PDF)

Author Contributions
Conceptualization: KAK SEC.
Formal analysis: KAK SL.
Investigation: SL CK.
Methodology: KAK SL CK.
Project administration: KAK CK.
Resources: HB TB HF PH JEG BM CP RS MS KW SEC.
Supervision: SEC.
Validation: KAK SEC.
Visualization: KAK.
Writing – original draft: KAK.
Writing – review & editing: KAK CK HB TB HF PH JEG BM CP RS MS KW SEC.

References
1. Horneber M, Bueschel G, Dennert G, Less D, Ritter E, Zwahlen M. How Many Cancer Patients Use Complementary and Alternative Medicine: A Systematic Review and Metaanalysis. Integr Cancer Ther. 2012; 11: 187–203. doi: 10.1177/1534735411423929 PMID: 22019489
2. Nissen N, Schunder-Tatzber S, Weidenhammer W, Johannessen H. What Attitudes and Needs Do Citizens in Europe Have in Relation to Complementary and Alternative Medicine? Forsch Komplementmed. 2012; 19: 9–17. doi: 10.1159/000342710 PMID: 23883940
3. Huebner J, Münstedt K. Alternative therapies in oncology. Onkologe. 2009. doi: 10.1007/s00761-009-1764-3
4. Huebner J, Prott FJ, Micke O, Muecke R, Senf B, Dennert G, et al. Online survey of cancer patients on complementary and alternative medicine. Oncol Res Treat. Karger Publishers; 2014; 37: 304–308. doi: 10.1159/000362616 PMID: 24903760
5. Molassiotis A, Ozden G, Platin N. Complementary and alternative medicine use in patients with head and neck cancers in Europe. European Journal of ... 2006. doi: 10.1111/j.1365-2354.2005.00615.x/pdf
6. Molassiotis A, Fernadez-Ortega P, Pud D, Ozden G, Scott JA, Panteli V, et al. Use of complementary and alternative medicine in cancer patients: a European survey. 2005; 16: 655–663. doi: 10.1093/annonc/mdi110 PMID: 15699021

7. Rausch SM, Winegardner F, Kruk KM, Phatak V, Wahner-Roedler DL, Bauer B, et al. Complementary and alternative medicine: use and disclosure in radiation oncology community practice. Supportive Care in Cancer. 2010; 19: 521–529. doi: 10.1007/s00520-010-0846-5 PMID: 20336329

8. Robinin M, Holliday C, Bensoussan A. Defining research priorities in complementary medicine in oncology. 2012; 19: 521–529. doi: 10.1007/s00520-012-0846-5 PMID: 22863560

9. Micke O, Bruns F, Glatzel M, Schönkea K, Micke P, Mücke R, et al. Predictive factors for the use of complementary and alternative medicine (CAM) in radiation oncology. European Journal of Integrative Medicine. 2009; 1: 19–25.

10. Vickers A, Rees R, Zollman C, McCarnery R, Smith C, Ellis N, et al. Acupuncture of chronic headache disorders in primary care: randomised controlled trial and economic analysis. Health Technol Assess. 2004; 8. doi: 10.3310/hta8480

11. Simcock R, Fallowfield L, Monson K, Solis-Trapatla I, Parlour L, Langridge C, et al. ARIX: A randomised trial of acupuncture vs oral care sessions in patients with chronic xerostomia following treatment of head and neck cancer. 2013; 24: 776–783. doi: 10.1093/annonc/mds515 PMID: 23104718

12. Haake M. German Acupuncture Trials (Gerac) For Chronic Low Back Pain. Randomized, Multicenter, Blinded, Parallel-Group Trial With 3 Groups. Arch Intern Med. 2007; 167: 1892. doi: 10.1001/archinte.167.17.1892 PMID: 17893311

13. Endres HG, Zenz M, Schaub C, Molsberger A, Haake M, Streitberger K, et al. German Acupuncture Trials (gerac) address problems of methodology associated with acupuncture studies. Schmerz. 2004; 19: 201–213. doi: 10.1007/s00482-004-0345-z PMID: 15959826

14. Endres HG. Akupunktur bei chronischen Kopfschmerzen. Dtsch... 2007.

15. Vickers AJ, Straus DJ, Fearon B, Cassileth BR. Acupuncture for Postchemotherapy Fatigue: A Phase II Study. J Clin Oncol. 2004; 22: 1731–1735. doi: 10.1200/JCO.2004.04.102 PMID: 15117996

16. National Institutes of Health, Bethesda, MD (US). Activities of Human Gene Nomenclature Committee. 2002 Jul. 10.2172/80479

17. Gunawan S, Arnoldussen M, Gordijn MS, Sitaresmi MN, van de Ven PM, Broeke ten CAM, et al. Comparing Health-Care Providers' Perspectives on Complementary and Alternative Medicine in Childhood Cancer Between Netherlands and Indonesia. Pediatr Blood Cancer. 2015; 63: 118–123. doi: 10.1002/pbc.25689 PMID: 26274831

18. Magi T, Kuehni CE, Torchetti L, Wengenroth L, Lüer S, Frei-Erb M. Use of Complementary and Alternative Medicine in Children with Cancer: A Study at a Swiss University Hospital. Sethi G, editor. 2015; 10: e0145787. doi: 10.1371/journal.pone.0145787 PMID: 26694320

19. Naja F, Fadel RA, Alameddine M, Aridi Y, Zarif A, Hariri D, et al. Complementary and alternative medicine use and its association with quality of life among Lebanese breast cancer patients: a cross-sectional study. BMC Complement Altern Med. 2015; 15: 102. doi: 10.1186/s12906-015-0969-9 PMID: 26692096

20. Akpunar D, Bebis H, Yayan T. Use of Complementary and Alternative Medicine in Patients with Gynecologic Cancer: a Systematic Review. Asian Pac J Cancer Prev. 2015; 16: 7847–7852. doi: 10.7314/APJCP.2015.16.17.7847 PMID: 26625809

21. Mani J, Jungel E, Bartsch G, Filman N, Nelson K, Ackermann H, et al. Use of complementary and alternative medicine before and after organ removal due to urologic cancer. PPA. 2015; 10: e0145787. doi: 10.1371/journal.pone.0145787 PMID: 26694320

22. Üstündağ S, Demir Zencirci A. Complementary and Alternative Medicine Use Among Cancer Patients and Determination of Affecting Factors. Holistic Nursing Practice. 2015; 29: 357–369. doi: 10.1097/HNP.0000000000000113 PMID: 26465625

23. AliBedah AM, Khalil MK. Cancer Patients, Complementary Medicine and Unmet Needs in Saudi Arabia. Asian Pac J Cancer Prev. 2015; 16: 6799–6799. PMID: 26434915

24. Abdullah R, Xiong Y, Lancaster JM, Judson PL. Complementary and Alternative Medicine Use in Women With Gynecologic Malignancy Presenting for Care at a Comprehensive Cancer Center. 2015; 25: 1724–1730. doi: 10.1097/IGC.0000000000000549 PMID: 26397156
26. Ojukwu M, Mbizo J, Leyva B, Olaku O, Zia F. Complementary and Alternative Medicine Use Among Overweight and Obese Cancer Survivors in the United States. Integr Cancer Ther. 2015; 14: 503–514. doi: 10.1177/1534735415589347 PMID: 26044767

27. Adams J, Valery P. C., Sibbritt D, Bernardes CM, Broom A, Garvey G. Use of Traditional Indigenous Medicine and Complementary Medicine Among Indigenous Cancer Patients in Queensland, Australia. Integr Cancer Ther. 2015; 14: 359–365. doi: 10.1177/1534735415583555 PMID: 25953415

28. Knight A, Hwa YS, Hashim H. Complementary Alternative Medicine Use Amongst Breast Cancer Patients in the Northern Region of Peninsular Malaysia. Asian Pac J Cancer Prev. 2015; 16: 3125–3130. doi: 10.7314/APJCP.2015.16.8.3125 PMID: 25921108

29. Sullivan A, Gilbar P, Curtain C. Complementary and Alternative Medicine Use in Cancer Patients in Rural Australia. Integr Cancer Ther. 2015; 14: 350–358. doi: 10.1177/1534735415580679 PMID: 25873293

30. Montazeri A, Sajadian A, Ebrahimi M, Akbari ME. Depression and the use of complementary medicine among breast cancer patients. Supportive Care in Cancer. 2004; 13: 339–342. doi: 10.1007/s00520-004-0709-z PMID: 15549425

31. Montazeri A, Sajadian A, Ebrahimi M, Haghighat S, Harirchi I. Factors predicting the use of complementary and alternative therapies among cancer patients in Iran. Eur J Cancer Care. 2007; 16: 144–149. doi: 10.1111/j.1365-2354.2006.00722.x PMID: 17371423

32. Cassileth BR, Schraub S, Robinson E, Vickers A. Alternative medicine use worldwide: the International Union Against Cancer survey. 2001; 91: 1390–1393. doi: 10.1002/1097-0142(20010401)91:7<1390::aid-cncr1143>3.0.co;2-c

33. Asadpour R, Meng Z, Kessel KA, Combs SE. Use of acupuncture to alleviate side effects in radiation oncology—Current evidence and future directions. Advances in Radiation Oncology VL—IS—SP—EP—PY—T2. 2016. http://dx.doi.org/10.1016/j.adro.2016.08.002

34. Yates JS, Mustian KM, Morrow GR, Gillies LJ, Padmanaban D, Atkins JN, et al. Prevalence of complementary and alternative medicine use in cancer patients during treatment. Supportive Care in Cancer. 2005; 13: 806–811. doi: 10.1007/s00520-004-0770-7 PMID: 15711946

35. Hyodo I. Nationwide Survey on Complementary and Alternative Medicine in Cancer Patients in Japan. J Clin Oncol. 2004; 23: 2645–2654. PMID: 15728227

36. Burstein HJ, Gelber S, Guadagnoli E, Weeks JC. Use of Alternative Medicine by Women with Early-Stage Breast Cancer. 1999; 340: 1733–1739. doi: 10.1056/NEJM199906033402206 PMID: 10352166

37. Risberg T, Jacobsen BK. The association between mental distress and the use of alternative medicine among cancer patients in North Norway. 2003; 12: 539–544.

38. Correa-Velez I, Clavaro A, Barnett AG, Eastwood H. Use of complementary and alternative medicine and quality of life: changes at the end of life. Palliat Med. 2003; 17: 695–703. PMID: 14694921

39. Shumer G, Warber S, Motohara S, Yajima A, Plegue M, Bialko M, et al. Complementary and alternative medicine use by visitors to rural Japanese family medicine clinics: results from the international complementary and alternative medicine survey. BMC Complement Altern Med. 2014; 14: 360. doi: 10.1186/1472-6882-14-360 PMID: 25256591

40. Begbie SD, Kerestes ZL, Bell DR. Patterns of alternative medicine use by cancer patients. Med J Aust. 1996; 165: 545–548. PMID: 8941239

41. Barnes PM, Bloom B, Nahin RL. Complementary and Alternative Medicine Use Among Adults and Children: United States, 2007.

42. Richardson MA, Sanders T, Palmer JL, Greisinger A, Singletary SE. Complementary/alternative medicine use in a comprehensive cancer center and the implications for oncology. J Clin Oncol. 2000; 18: 2505–2514. PMID: 10893280

43. Paul M, Davey B, Senf B, Stoll C, Münstedt K, Mucke R, et al. Patients with advanced cancer and their usage of complementary and alternative medicine. J Cancer Res Clin Oncol. 2013; 139: 1515–1522. doi: 10.1007/s00432-013-1460-y PMID: 23832609

44. Nazik E, Nazik H, Api M, Kale A, Aksu M. Complementary and Alternative Medicine Use by Gynecologic Oncology Patients in Turkey. Asian Pac J Cancer Prev. 2012; 13: 21–25. doi: 10.7314/APJCP.2012.13.1.021 PMID: 22502670

45. Yıldırım Y, Tınar S, Yorgun S, Toz E, Kaya B, Sonmez S, et al. The use of complementary and alternative (CAM) therapies by Turkish women with gynecological cancer. Eur J Gynaecol Oncol. 2006; 27: 81–85. PMID: 16550977

46. Nakayama A, Alladin KP, Igbokeke O, White JD. Systematic Review: Generating Evidence-Based Guidelines on the Concurrent Use of Dietary Antioxidants and Chemotherapy or Radiotherapy. Cancer Investigation. 2011; 29: 655–667. doi: 10.3109/07357907.2011.626479 PMID: 22085269
47. Lawenda BD, Kelly KM, Ladas EJ, Sagar SM, Vickers A, Blumberg JB. Should Supplemental Antioxidant Administration Be Avoided During Chemotherapy and Radiation Therapy? JNCI Journal of the National Cancer Institute. 2008; 100: 773–783. doi: 10.1093/jnci/djn148 PMID: 18505970

48. Simone CB, Simone NL, Simone V. Antioxidants and other nutrients do not interfere with chemotherapy or radiation therapy and can increase kill and increase survival, part 1. Altern Ther Health Med. 2007; 13: 22–28.

49. Simone CB, Simone NL, Simone V, Simone CB. Antioxidants and other nutrients do not interfere with chemotherapy or radiation therapy and can increase kill and increase survival, Part 2. Altern Ther Health Med. 2007; 13: 40–47.

50. D’Andrea GM. Use of Antioxidants During Chemotherapy and Radiotherapy Should Be Avoided. CA Cancer J Clin. 2005; 55: 319–321. doi: 10.3322/canclin.55.5.319 PMID: 16166076

51. Labriola D, Livingston R. Possible interactions between dietary antioxidants and chemotherapy. 1999; 13: 1003–8– discussion 1008–1011–2.

52. Yeung KS, Gubili J. Clinical Guide to Herb-Drug Interactions in Oncology. J Soc Integr Onco. 2007; 05: 113.