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Results: EN and PN were used in all countries surveyed (100%), but to different extent. The country's income significantly influenced the reimbursement for EN and PN ($p<0.05$). It was also associated with the overall use of tube feeding and PN ($p=0.05$), but not with the use of oral nutritional supplements ($p=0.165$). The use of both, EN and PN at hospitals was not depended on the economy ($p>0.05$). Education was actively carried out in all countries, however the teaching at the pre-graduate level was the least widespread, and also correlated with the country income ($p=0.042$).
Conclusions: Results indicated that economic situation influences all aspects of ONCA, including education and treatment. The reimbursement for EN and PN seemed to be the key factor of effective campaign against malnutrition.

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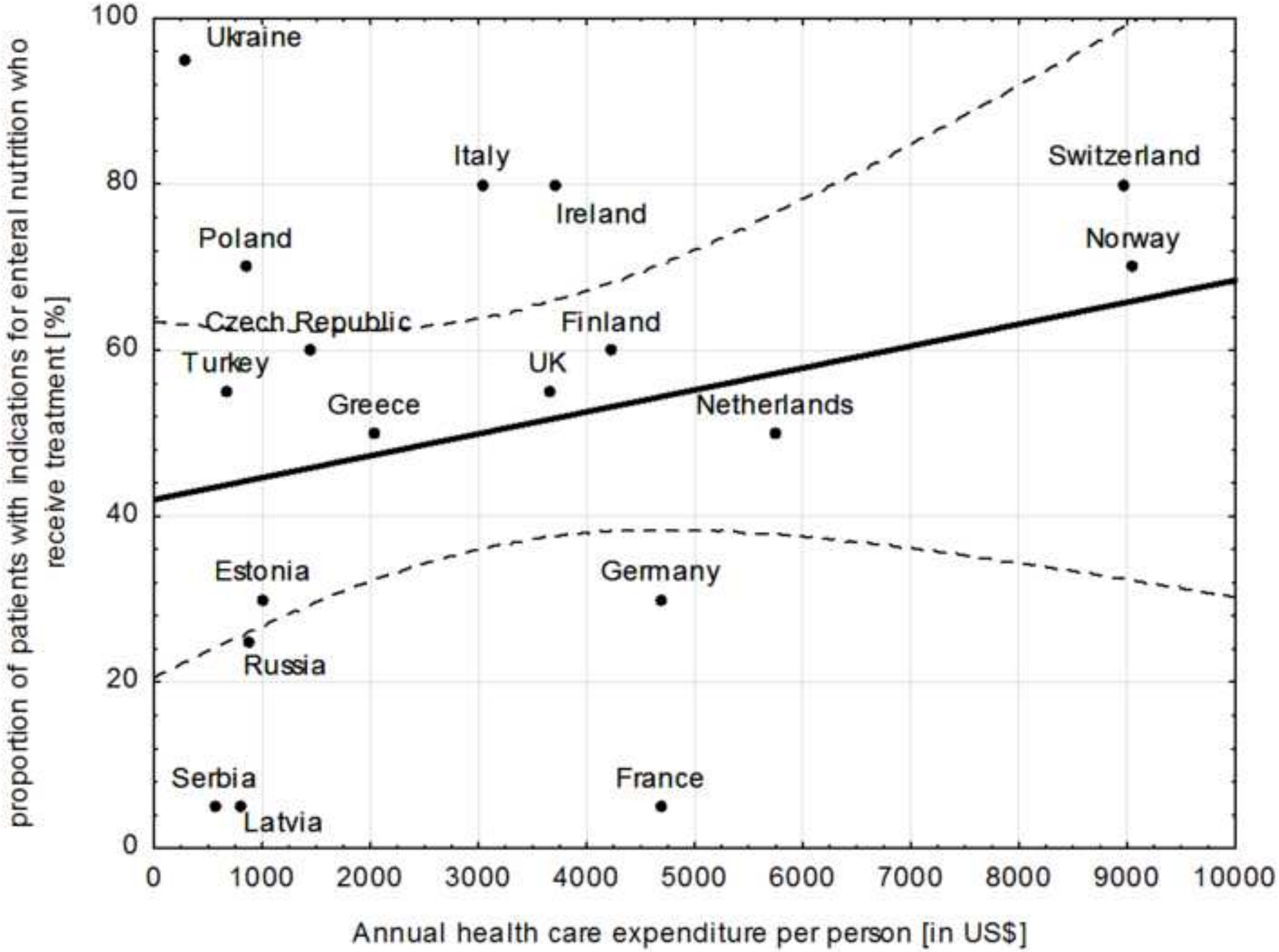

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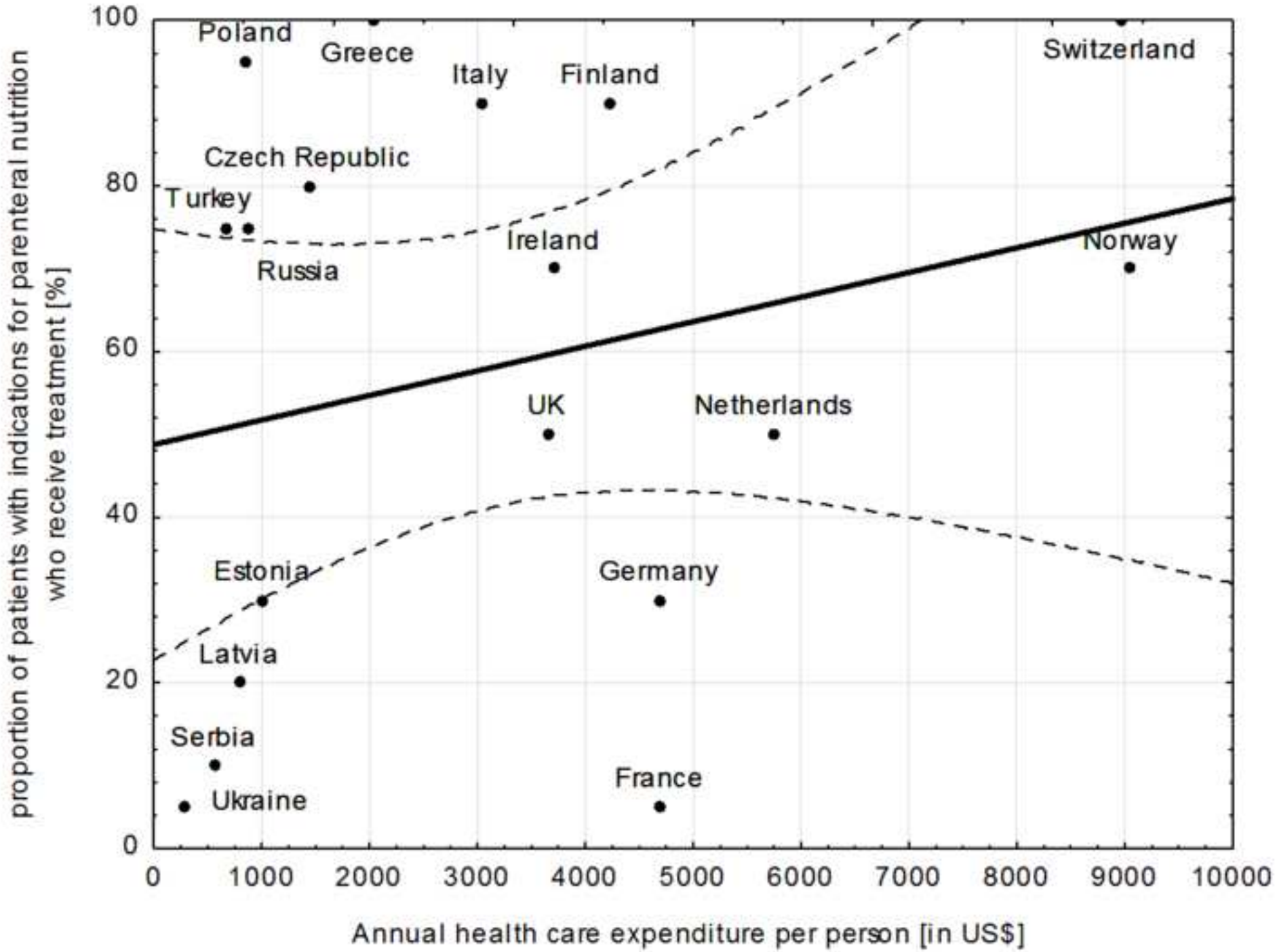

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24th September 2015

N.E.P. Deutz

Editor-in-Chief

Clinical Nutrition

Dear Sir,

I am honored to re-submit a manuscript entitled 'Economy matters to Fight Against Malnutrition: results from a multicenter survey' written by the group of international Authors with my kind request to review and to publish in Clinical Nutrition.

The manuscript was again re-written according to Reviewer's remarks. I hope you will find them suitable and you will find our article worth publication.

The file containing answers to Reviewer's comments was attached to the submission.

I hope you will find our manuscript worth interest and publication.

I look forward to your comments and opinion,

Yours faithfully,

Stanislaw Klek

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ABSTRACT

Background and Aim: Malnutrition represents a serious health care threat, as it increases morbidity, mortality and health care cost. The effective screening and treatment with enteral (EN) or parenteral (PN) nutrition are the key elements of the policy called Optimal Nutrition Care for All (ONCA). The study tried to analyze the impact of the state's economy on the implementation of EN and PN to define its role in ONCA.

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Conclusions: Results indicated that economic situation influences all aspects of ONCA, including education and treatment. The reimbursement for EN and PN seemed to be the key factor of effective campaign against malnutrition.

INTRODUCTION

Malnutrition (also: disease-related malnutrition, DRM) is undoubtedly a serious public health issue worldwide.[1,2] It increases morbidity, mortality, the length of hospital stay, and health-care costs.[1,2,3] The prevalence of malnutrition differs depending on the patient's population, country, clinical settings, yet it can be diagnosed in 7-16% of outpatients and in 20-60% patients at admission to hospital.[3-8] The criteria for that diagnostic varied significantly among authors, but in most of cases the body mass index (BMI) of < 18.5 kg/m^2 and unintentional body weight loss >10% last 3-6 months, were applied. [3-8] Unfortunately, the problem of malnutrition is often unnoticed, undiagnosed or untreated, while it generates more costs than overnutrition or obesity, according to British Society for Enteral and Parenteral Nutrition (BAPEN).[9]

The European Society for Clinical Nutrition and Metabolism (ESPEN) recognized DRM as a grave problem more than thirty years ago. Since then, the society has undertaken many actions to change this situation. At the beginning, those activities were called the Fight Against Malnutrition (FAM).[1] In 2014 FAM became a part of a campaign called Optimal Nutrition Care for All (ONCA).[10] ONCA's aim is to facilitate screening for risk of disease-related malnutrition/undernutrition and nutritional care implementation across Europe.[10] ONCA includes, among others, the worldwide 'NutritionDay' survey, many local and international events (including ONCA conferences in Brussels, Prague, Vienna, Warsaw and Zagreb), scientific and research grants, scientific and educational symposia, workshops and trainings. This activity is administered by European Nutrition for Health Alliance (ENHS), an association of stakeholders, in which ESPEN is the strategic partner. Therefore, it is possible

to perform all actions in a close cooperation with national scientific societies for enteral and parenteral nutrition (or clinical nutrition) societies, so-called ‘PEN’ societies. Those activities increased awareness, improved screening, amplified the use of enteral (EN) and parenteral nutrition (PN), representing two types of clinical nutrition support (CN), hence, improved the situation. Results differed, however, among countries. The question what are the key elements of efficient ONCA emerged and remained unanswered. Therefore, the purpose of the study was to answer that query by assessing the situation in European countries. Following aspects were analyzed: the presence of the reimbursement for each type of clinical nutrition (CN); the level of education for CN and the real use of EN and PN in various short- and long term settings.

METHODS

An European survey was performed using an electronic questionnaire [Table 1]. The whole project was accomplished within 12 months, between January and December 2014, due to questionnaires distribution, local surveys and further data collecting. The questionnaire was circulated to representatives of twenty-two PEN societies. Participants were supposed to answer all questions, including the prevalence of malnutrition, using recent, already collected, data or new survey performed for the purpose of the study. The diagnostic criteria for malnutrition were (either of the following):

- body mass index (BMI) of < 18.5 kg/m^2
- and unintentional body weight loss >10% last 3-6 months.

For the purpose of financial analysis, all participating countries were categorized by their economic status according to the World Bank criteria for national income [9], and by tertiles of the average health care expenditure per head for 2012 [9].

On the basis of the national income, three categories were selected:

a. lower middle income countries: Ukraine
b. upper middle income countries: Serbia, Turkey
c. high income: Croatia, Czech Republic, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Russia, Spain, Switzerland, UK

On the basis of annual healthcare expenditure, three tertiles were named:

a. 1st tertile (293 - 908 US Dollars/per person): Croatia, Latvia, Poland, Russia, Serbia, Turkey, Ukraine
b. 2nd tertile (1010-3708 USD/per person): Czech Republic, Estonia, Greece, Ireland, Italy, Spain, UK
c. 3rd tertile (4232-9055 USD/per person): Finland, France, Germany, Netherlands, Norway, Switzerland

The following parameters were analyzed for each participating country:

- prevalence of malnutrition
- institution responsible for health care regulations
- presence and type of insurance company (public/ private/ both)
- use of EN and PN at various settings (hospitals, home, chronic care facilities)
- presence of the reimbursement for EN and PN
- presence and type of education in the field of CN

The term ‘hospital settings’ referred to all in-patients, ‘home’ to all out-patients staying at home along/ with family/ other care-givers, but without any additional chronic care provided at his/her household level, chronic care and palliative care centers referred to all patients staying outside home, at long term care facilities, due to untreatable cancer (the latter) or any chronic condition, other than cancer (the first).

Statistical Analysis

The statistical analysis was performed using the SPSS v.19 (SPSS Inc., Chicago, IL) software package. Because in every analysis the expected frequency was less than 5 in more than 20% of cells, the Fisher test was used for the analyses of categorical variables. The prevalence of malnutrition, and the proportion of patients with indicators for EN or PN who receive treatment were considered as continuous variables. As the sample size was relatively small,

the normal distribution was not tested due to low power to reject a null hypothesis (assuming equivalence to normal distribution). Consequently, the U-Mann-Whitney test for two-group and the Kruskal-Wallis test for three-group comparisons were used. To show more detailed descriptive information, means, standard deviation, medians, interquartile range, minimal and maximal values were provided. A p-value <0.05 was accepted as being statistically significant.

RESULTS

Twenty answered questionnaires were returned (the response rate was 90.1%), and analyzed. Insurance companies operated as health care financiers in all twenty participating countries (100%). There were only private institutions in Serbia, Ukraine and the United Kingdom (UK), while in Croatia, France and Poland health care expenses were covered by the state-funded and state-governed entity. In the other fourteen countries both private and state insurance companies were present.

The Ministry of Health (or its local equivalent) was the institution responsible for forming health policy in all countries (100%). Additionally, Interterritorial Council and Regional Governments contributed to that process in Spain, while the insurance companies participated in the process in Croatia, Finland, Ireland and Poland. In Estonia the opinion of medical societies was always formally taken into account, while in Norway the direct input of the National Assembly was important.

Enteral (EN) and parenteral nutrition (PN) were used in all European countries (100%), but to different extend. This relation was clear as far as the place of care was considered (hospital, home, long term facility). EN and PN were available to all patients in all countries at the hospital settings. EN and PN were not used on a regular basis in chronic care facilities in Croatia, Latvia and Ukraine, at home in Latvia and Russia, nor at palliative cancer care

centers in Croatia, Latvia, Russia and Serbia. The UK's situation regarding palliative care nutrition is much more complicated as intravenous infusions are often not permitted in palliative care homes, although the use of PN for cancer-related intestinal failure has been one of the most quickly growing patient groups.

A general overview shows that the use of EN and PN in European countries fails to correlate closely with the income of the country, as presented in Table 2. The level of *per capita* healthcare expenditure and use of clinical nutrition were not correlated, for all countries there was no statistically significant difference ($p>0.05$)

The use of clinical nutrition in chronic care centers, in palliative centers, and at home, seemed to be associated with the country's overall income, but those associations were not statistically significant ($p=0.302$, $p=0.302$ and $p=0.088$, respectively).

Analysis based on the influence of health care expenditure per capita showed no statistical differences as far as the use of EN ($p=1.000$) was concerned, but significant differences for PN. The latter was observed to be of a higher prevalence at home and chronic care facilities in countries from the 2^{nd} and 3^{rd} tertiles ($p=0.018$).

The level of the country's income was associated with reimbursement for EN and PN, as presented in Table 3. The reimbursement was crucial as far as the use of tube feeding and intravenous nutrition were considered ($p=0.05$), but did not matter in the case of oral nutritional supplements ($p=0.165$, Table 4). Similar observations were made for the differences in use of PN in chronic settings and in the patient's home ($p=0.001$ and $p=0.014$, respectively)

If EN and/or PN was not reimbursed, all costs were covered by patient or his/her family.

The prevalence of malnutrition, as identified by our respondents, is significantly and negatively associated with national income ($p=0.038$). The data for the prevalence were collected by representatives of local PEN societies.

The greater use of CN across categories of income level was also associated with a lower proportion of patients with indications for EN and PN, but the numbers here are small and the results are not statistically significant (Table 5). The reimbursement proved to be a strong predictor for the use of enteral tube feeding, and for all types of CN, in chronic care facilities ($p=0.001$ for both), as well as for the use of parenteral nutrition, and all types of CN, at home ($p=0.014$ for both) (Table 7).

The proportion of patients with indications for CN to those who actually received treatment was also calculated. Our analyses confirm positive links for both EN and PN, but there are countries (Ukraine for EN, Poland for EN and PN, Czech Republic for EN and PN, and Greece for PN) with relatively low amounts of money but high proportions of treated patients, and, on the other hand, countries (France and Germany, both for EN and PN) with more money available but lower proportions of treated patients (Figure 1 and Figure 2)

Local PEN societies representative collected the data on education. Trainings for clinical nutrition was present in all twenty countries participating in the study (100%). Most frequently these activities were organized by national PEN societies as local trainings (17 countries [85%]), quite common were also postgraduate trainings and ESPEN LLL programs (16 [80%] and 12 [60%] countries respectively). Investigation of the relationship between different types of medical training and the average per capita healthcare expenditure showed little linkage with postgraduate, ESPEN LLL or local PEN society training. The prevalence of undergraduate training was clearly related to the country's health care expenditure showing a significant increase across categories of financial commitment ($p=0.042$) (Table 6).

No relation between the number of educational activities and the factual use of CN was observed. ($p>0.05$)

DISCUSSION

Malnutrition represent a serious health care thread as it increases morbidity, mortality and health care cost for all age groups. [1,2] A new Croatian study showed that the total cost of adult malnutrition for selected diagnoses was €97.35 million per year, accounting for 3.38% of the total Croatian national health care budget, and the average cost per patient was estimated at €1640.48. [12] The largest share was used for medications (43%), followed by 34% for hospitalization, 13% for community health nursing, while PN and EN costs contributed with 6% and 1% respectively.[12] Malnutrition is widespread - recent European survey showed that 57.4% of Estonian, 39.4% of Turkish, 32.8% Greek, 21.9% Polish and 14.2% of Lithuanian patients were diagnosed with malnutrition [13] Moreover, severe malnutrition was reported in 19.7% of Turkish patients, and in 9.9% of Polish and Greek individuals (9.4%).[13]

Therefore, actions like FAM, are of the utmost importance. The implementation of EN and PN, which are, along with screening, key elements for the efficient FAM, vary among countries. The same study showed that they could be influenced by the political situation, economy as well as the activity of the national PEN societies in term of raising the awareness, education, cooperation with funding and policy-making authorities. The latter seemed to be affected by the economy as well.

The factual associations among education, economy, reimbursement and the utilization of EN and PN have, however, never been thoroughly analyzed. Therefore, the following study was supposed to address those ambiguities.

Some of results were really encouraging: both EN and PN are used in all of the European countries surveyed, apparently independently of the income of the country. They are, however, mostly available to patients at hospital settings, and often unavailable to those at chronic care facilities or at home. National income did not appear to influence that situation directly, but greatly influenced reimbursement both for EN and PN, which seem to have important effects on their utilization. Oral nutritional supplements (ONS) were the only treatment method to prove otherwise. Education for clinical nutrition was present in all participating countries (100%). Those included, however, mostly postgraduate activities, often held by the national PEN or ESPEN, not by the local institutions. Pregraduate education was much less frequent, and that fact was inversely related to country income. The level of education did not influence the administration of neither EN nor PN.

To our knowledge this is the first survey on the educational and economic aspects of the fight against malnutrition. Authors are aware of the limitations of the study, particularly the dependence on local PEN's representatives regarding the provision of data. It is important, however, to emphasize that there is no other method of collecting such circuitous data. Undoubtedly, the study offered a lot of new data, which provided a new insight into the treatment of malnutrition.

Results indicated unequivocally that economic situation influences all aspects of actions against malnutrition, including education and treatment. The reimbursement for EN and PN seemed also to be of a vital role for those activities.

CONFLICT OF INTEREST

The authors hereby declare that the article is original, is not under consideration for publication anywhere else and has not been previously published. Authors declare no potential or actual personal, political or financial interest in the material, information or techniques described in the paper.

STATEMENT OF AUTHORSHIP

SK coordinated the research, he was responsible for critical data analysis, evaluation of the outcome, and writing of the manuscript. AG was responsible for the statistics and data analysis. All authors have made substantial contributions to the data collection and drafting of the manuscript, for which they take collective responsibility.

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TABLES

FIGURES

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Key words: enteral nutrition, parenteral nutrition, disease-related malnutrition, reimbursement

ABSTRACT

Background and Aim: Malnutrition represents a serious health care threat, as it increases morbidity, mortality and health care cost. The effective screening and treatment with enteral (EN) or parenteral (PN) nutrition are the key elements of the policy called Optimal Nutrition Care for All (ONCA). The study tried to analyze the impact of the state's economy on the implementation of EN and PN to define its role in ONCA.

Material and Methods: an international survey in twenty two European countries was performed between January and December 2014. An electronic questionnaire was distributed to 22 representatives of clinical nutrition (PEN) societies. The questionnaire comprised questions regarding country economy, reimbursement, education and the use EN and PN. Return rate was 90.1% (n=20)

Results: EN and PN were used in all countries surveyed (100%), but to different extent. The country's income significantly influenced the reimbursement for EN and PN ($p<0.05$). It was also associated with the overall use of tube feeding and PN ($p=0.05$), but not with the use of oral nutritional supplements ($p=0.165$). The use of both, EN and PN at hospitals was not depended on the economy ($p>0.05$). Education was actively carried out in all countries, however the teaching at the pre-graduate level was the least widespread, and also correlated with the country income ($p=0.042$).

Conclusions: Results indicated that economic situation influences all aspects of ONCA, including education and treatment. The reimbursement for EN and PN seemed to be the key factor of effective campaign against malnutrition.

INTRODUCTION

Malnutrition (also: disease-related malnutrition, DRM) is undoubtedly a serious public health issue worldwide.[1,2] It increases morbidity, mortality, the length of hospital stay, and health-care costs.[1,2,3] The prevalence of malnutrition differs depending on the patient's population, country, clinical settings, yet it can be diagnosed in 7-16% of outpatients and in 20-60% patients at admission to hospital.[3-8] The criteria for that diagnostic varied significantly among authors, but in most of cases the body mass index (BMI) of < 18.5 kg/m^2 and unintentional body weight loss >10% last 3-6 months, were applied. [3-8] Unfortunately, the problem of malnutrition is often unnoticed, undiagnosed or untreated, while it generates more costs than overnutrition or obesity, according to British Society for Enteral and Parenteral Nutrition (BAPEN).[9]

The European Society for Clinical Nutrition and Metabolism (ESPEN) recognized DRM as a grave problem more than thirty years ago. Since then, the society has undertaken many actions to change this situation. At the beginning, those activities were called the Fight Against Malnutrition (FAM).[1] In 2014 FAM became a part of a campaign called Optimal Nutrition Care for All (ONCA).[10] ONCA's aim is to facilitate screening for risk of disease-related malnutrition/undernutrition and nutritional care implementation across Europe.[10] ONCA includes, among others, the worldwide 'NutritionDay' survey, many local and international events (including ONCA conferences in Brussels, Prague, Vienna, Warsaw and Zagreb), scientific and research grants, scientific and educational symposia, workshops and trainings. This activity is administered by European Nutrition for Health Alliance (ENHS), an association of stakeholders, in which ESPEN is the strategic partner. Therefore, it is possible

to perform all actions in a close cooperation with national scientific societies for enteral and parenteral nutrition (or clinical nutrition) societies, so-called ‘PEN’ societies. Those activities increased awareness, improved screening, amplified the use of enteral (EN) and parenteral nutrition (PN), representing two types of clinical nutrition support (CN), hence, improved the situation. Results differed, however, among countries. The question what are the key elements of efficient ONCA emerged and remained unanswered. Therefore, the purpose of the study was to answer that query by assessing the situation in European countries. Following aspects were analyzed: the presence of the reimbursement for each type of clinical nutrition (CN); the level of education for CN and the real use of EN and PN in various short- and long term settings.

METHODS

An European survey was performed using an electronic questionnaire [Table 1]. The whole project was accomplished within 12 months, between January and December 2014, due to questionnaires distribution, local surveys and further data collecting. The questionnaire was circulated to representatives of twenty-two PEN societies. Participants were supposed to answer all questions, including the prevalence of malnutrition, using recent, already collected, data or new survey performed for the purpose of the study. The diagnostic criteria for malnutrition were (either of the following):

- body mass index (BMI) of < 18.5 kg/m^2
- and unintentional body weight loss >10% last 3-6 months.

For the purpose of financial analysis, all participating countries were categorized by their economic status according to the World Bank criteria for national income [9], and by tertiles of the average health care expenditure per head for 2012 [9].

On the basis of the national income, three categories were selected:

a. lower middle income countries: Ukraine
b. upper middle income countries: Serbia, Turkey
c. high income: Croatia, Czech Republic, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Netherlands, Norway, Poland, Russia, Spain, Switzerland, UK

On the basis of annual healthcare expenditure, three tertiles were named:

a. 1st tertile (293 - 908 US Dollars/per person): Croatia, Latvia, Poland, Russia, Serbia, Turkey, Ukraine
b. 2nd tertile (1010-3708 USD/per person): Czech Republic, Estonia, Greece, Ireland, Italy, Spain, UK
c. 3rd tertile (4232-9055 USD/per person): Finland, France, Germany, Netherlands, Norway, Switzerland

The following parameters were analyzed for each participating country:

- prevalence of malnutrition
- institution responsible for health care regulations
- presence and type of insurance company (public/ private/ both)
- use of EN and PN at various settings (hospitals, home, chronic care facilities)
- presence of the reimbursement for EN and PN
- presence and type of education in the field of CN

The term ‘hospital settings’ referred to all in-patients, ‘home’ to all out-patients staying at home along/ with family/ other care-givers, but without any additional chronic care provided at his/her household level, chronic care and palliative care centers referred to all patients staying outside home, at long term care facilities, due to untreatable cancer (the latter) or any chronic condition, other than cancer (the first).

Statistical Analysis

The statistical analysis was performed using the SPSS v.19 (SPSS Inc., Chicago, IL) software package. Because in every analysis the expected frequency was less than 5 in more than 20% of cells, the Fisher test was used for the analyses of categorical variables. The prevalence of malnutrition, and the proportion of patients with indicators for EN or PN who receive treatment were considered as continuous variables. As the sample size was relatively small,

the normal distribution was not tested due to low power to reject a null hypothesis (assuming equivalence to normal distribution). Consequently, the U-Mann-Whitney test for two-group and the Kruskal-Wallis test for three-group comparisons were used. To show more detailed descriptive information, means, standard deviation, medians, interquartile range, minimal and maximal values were provided. A p-value <0.05 was accepted as being statistically significant.

RESULTS

Twenty answered questionnaires were returned (the response rate was 90.1%), and analyzed. Insurance companies operated as health care financiers in all twenty participating countries (100%). There were only private institutions in Serbia, Ukraine and the United Kingdom (UK), while in Croatia, France and Poland health care expenses were covered by the state-funded and state-governed entity. In the other fourteen countries both private and state insurance companies were present.

The Ministry of Health (or its local equivalent) was the institution responsible for forming health policy in all countries (100%). Additionally, Interterritorial Council and Regional Governments contributed to that process in Spain, while the insurance companies participated in the process in Croatia, Finland, Ireland and Poland. In Estonia the opinion of medical societies was always formally taken into account, while in Norway the direct input of the National Assembly was important.

Enteral (EN) and parenteral nutrition (PN) were used in all European countries (100%), but to different extend. This relation was clear as far as the place of care was considered (hospital, home, long term facility). EN and PN were available to all patients in all countries at the hospital settings. EN and PN were not used on a regular basis in chronic care facilities in Croatia, Latvia and Ukraine, at home in Latvia and Russia, nor at palliative cancer care

centers in Croatia, Latvia, Russia and Serbia. The UK's situation regarding palliative care nutrition is much more complicated as intravenous infusions are often not permitted in palliative care homes, although the use of PN for cancer-related intestinal failure has been one of the most quickly growing patient groups.

A general overview shows that the use of EN and PN in European countries fails to correlate closely with the income of the country, as presented in Table 2. The level of *per capita* healthcare expenditure and use of clinical nutrition were not correlated, for all countries there was no statistically significant difference ($p>0.05$)

The use of clinical nutrition in chronic care centers, in palliative centers, and at home, seemed to be associated with the country's overall income, but those associations were not statistically significant ($p=0.302$, $p=0.302$ and $p=0.088$, respectively).

Analysis based on the influence of health care expenditure per capita showed no statistical differences as far as the use of EN ($p=1.000$) was concerned, but significant differences for PN. The latter was observed to be of a higher prevalence at home and chronic care facilities in countries from the 2^{nd} and 3^{rd} tertiles ($p=0.018$).

The level of the country's income was associated with reimbursement for EN and PN, as presented in Table 3. The reimbursement was crucial as far as the use of tube feeding and intravenous nutrition were considered ($p=0.05$), but did not matter in the case of oral nutritional supplements ($p=0.165$, Table 4). Similar observations were made for the differences in use of PN in chronic settings and in the patient's home ($p=0.001$ and $p=0.014$, respectively)

If EN and/or PN was not reimbursed, all costs were covered by patient or his/her family.

The prevalence of malnutrition, as identified by our respondents, is significantly and negatively associated with national income ($p=0.038$). The data for the prevalence were collected by representatives of local PEN societies.

The greater use of CN across categories of income level was also associated with a lower proportion of patients with indications for EN and PN, but the numbers here are small and the results are not statistically significant (Table 5). The reimbursement proved to be a strong predictor for the use of enteral tube feeding, and for all types of CN, in chronic care facilities ($p=0.001$ for both), as well as for the use of parenteral nutrition, and all types of CN, at home ($p=0.014$ for both) (Table 7).

The proportion of patients with indications for CN to those who actually received treatment was also calculated. Our analyses confirm positive links for both EN and PN, but there are countries (Ukraine for EN, Poland for EN and PN, Czech Republic for EN and PN, and Greece for PN) with relatively low amounts of money but high proportions of treated patients, and, on the other hand, countries (France and Germany, both for EN and PN) with more money available but lower proportions of treated patients (Figure 1 and Figure 2)

Local PEN societies representative collected the data on education. Trainings for clinical nutrition was present in all twenty countries participating in the study (100%). Most frequently these activities were organized by national PEN societies as local trainings (17 countries [85%]), quite common were also postgraduate trainings and ESPEN LLL programs (16 [80%] and 12 [60%] countries respectively). Investigation of the relationship between different types of medical training and the average per capita healthcare expenditure showed little linkage with postgraduate, ESPEN LLL or local PEN society training. The prevalence of undergraduate training was clearly related to the country's health care expenditure showing a significant increase across categories of financial commitment ($p=0.042$) (Table 6).

No relation between the number of educational activities and the factual use of CN was observed. ($p>0.05$)

DISCUSSION

Malnutrition represent a serious health care thread as it increases morbidity, mortality and health care cost for all age groups. [1,2] A new Croatian study showed that the total cost of adult malnutrition for selected diagnoses was €97.35 million per year, accounting for 3.38% of the total Croatian national health care budget, and the average cost per patient was estimated at €1640.48. [12] The largest share was used for medications (43%), followed by 34% for hospitalization, 13% for community health nursing, while PN and EN costs contributed with 6% and 1% respectively.[12] Malnutrition is widespread - recent European survey showed that 57.4% of Estonian, 39.4% of Turkish, 32.8% Greek, 21.9% Polish and 14.2% of Lithuanian patients were diagnosed with malnutrition [13] Moreover, severe malnutrition was reported in 19.7% of Turkish patients, and in 9.9% of Polish and Greek individuals (9.4%).[13]

Therefore, actions like FAM, are of the utmost importance. The implementation of EN and PN, which are, along with screening, key elements for the efficient FAM, vary among countries. The same study showed that they could be influenced by the political situation, economy as well as the activity of the national PEN societies in term of raising the awareness, education, cooperation with funding and policy-making authorities. The latter seemed to be affected by the economy as well.

The factual associations among education, economy, reimbursement and the utilization of EN and PN have, however, never been thoroughly analyzed. Therefore, the following study was supposed to address those ambiguities.

Some of results were really encouraging: both EN and PN are used in all of the European countries surveyed, apparently independently of the income of the country. They are, however, mostly available to patients at hospital settings, and often unavailable to those at chronic care facilities or at home. National income did not appear to influence that situation directly, but greatly influenced reimbursement both for EN and PN, which seem to have important effects on their utilization. Oral nutritional supplements (ONS) were the only treatment method to prove otherwise. Education for clinical nutrition was present in all participating countries (100%). Those included, however, mostly postgraduate activities, often held by the national PEN or ESPEN, not by the local institutions. Pregraduate education was much less frequent, and that fact was inversely related to country income. The level of education did not influence the administration of neither EN nor PN.

To our knowledge this is the first survey on the educational and economic aspects of the fight against malnutrition. Authors are aware of the limitations of the study, particularly the dependence on local PEN's representatives regarding the provision of data. It is important, however, to emphasize that there is no other method of collecting such circuitous data. Undoubtedly, the study offered a lot of new data, which provided a new insight into the treatment of malnutrition.

Results indicated unequivocally that economic situation influences all aspects of actions against malnutrition, including education and treatment. The reimbursement for EN and PN seemed also to be of a vital role for those activities.

CONFLICT OF INTEREST

The authors hereby declare that the article is original, is not under consideration for publication anywhere else and has not been previously published. Authors declare no potential or actual personal, political or financial interest in the material, information or techniques described in the paper.

STATEMENT OF AUTHORSHIP

SK coordinated the research, he was responsible for critical data analysis, evaluation of the outcome, and writing of the manuscript. AG was responsible for the statistics and data analysis. All authors have made substantial contributions to the data collection and drafting of the manuscript, for which they take collective responsibility.

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TABLES

FIGURES

ANSWERS TO EDITOR AND REVIEWER's COMMENTS

MS. Ref. No.: YCLNU-D-15-00488

Title: "Economy matters to Fight Against Malnutrition: results from a multicenter survey"

Comment:

For this article the authors did some changes which are acceptable.
However in the Introduction it is imperative to mention that ONCA is an action driven by ENHA -an association of stakeholders in which ESPEN is a Key player

Answer: The text was changed – see below.

'In 2014 FAM became a part of a campaign called Optimal Nutrition Care for All (ONCA).[10] ONCA's aim is to facilitate greater screening for risk of disease-related malnutrition/undernutrition and nutritional care implementation across Europe.[10] It includes, among others, the worldwide 'NutritionDay' survey, many local and international events (including ONCA conferences in Brussels, Prague, Vienna, Warsaw and Zagreb), scientific and research grants, scientific and educational symposia, workshops and trainings. This activity is govern by European Nutrition for Health Alliance (ENHS), an association of stakeholders, in which ESPEN is the key player. Therefore, actions could be performed in a close cooperation with national scientific societies for enteral and parenteral nutrition (or clinical nutrition) societies, so-called 'PEN' societies.'