

# Does Multifaceted Nutritional Education Improve Malnutrition Management?

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## Highlights

- Unawareness and unknowingness of nutritional issues and management are highly prevalent among hospital medical staff.
- There is an urgent need to rise medical staff nutritional knowledge, as well as related skills and abilities.
- The intervention in this study failed to improve physicians' nutritional awareness and prescribing behaviour.
- Time for action! As part of a nutritional management implementing initiative, a systematic nutritional screening will be introduced in our hospital to fight malnutrition.

## **Abstract**

**Background:** Malnutrition is a challenging issue in hospitals, but mostly reversible. Despite being associated with increased morbidity and mortality risk, it is however hardly recognized and treated. There is a strong need to raise awareness of treating residents to improve patients' nutritional management. This study aimed to investigate the impact of an educational intervention on residents' nutritional knowledge, perception, and prescribed nutritional therapies.

**Methods:** The prospective intervention study was conducted at the Department of General Internal Medicine of the Bern University Hospital. Nutritional risk was evaluated in consecutive patients admitted to the wards by the Nutritional Risk Screening 2002 and the number of prescribed nutritional therapies were assessed. The educational intervention included an interactive case discussion headed by consultants of the nutritional medicine. A pocket card with basic nutritional information was handed out. Residents' nutritional knowledge was checked by multiple choice test prior to the intervention, immediately after, and after two months.

**Results:** In total 609 patients were included (121 pre-, 161 post-I, 327 post-intervention-II). Overall prevalence of malnutrition was 35%. The percentage of prescribed nutritional therapies was 36%, there was neither significant difference between the phases (46% pre, 52% post-I, 27% post-intervention-II) nor between the test results (mean percentage of correct answers  $61\pm 15\%$ ,  $57\pm 12\%$  and  $60\pm 10\%$ ).

**Conclusion:** The multimodal intervention failed to achieve both objectives, neither residents' knowledge and awareness nor prescribed therapies could be increased. As nutritional risk remains highly prevalent, innovative and more effective teaching strategies are needed to rise knowledge, abilities and skills to fight malnutrition.

Keywords: nutritional management, malnutrition, education

## **Introduction**

Malnutrition is a worldwide challenging problem. In industrialized countries, it is highly prevalent in hospitals and care facilities, where diseases and disability are common [1-4]. So-called disease-related malnutrition is associated with an increased risk of complications, increased morbidity and mortality rates, thus influencing negatively patients' quality of life, prolonging hospital stay and leading to worse clinical outcome [5-11]. Malnutrition however mostly remains reversible when adequately and timely treated [12-15]. Early recognition and appropriate management are thereby essential. There is currently high evidence from two recent RCTs and a meta-analysis demonstrating the significant improvement of clinical outcomes through an adequate nutritional therapy [16-19].

The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends the use of the well validated Nutritional Risk Screening (NRS 2002) in hospitals to detect nutritional risk and to identify the patients likely to benefit from nutritional therapy [14, 20]. Several studies have shown that the non-recognition and thus the non-treatment of inpatients at risk is largely due to insufficient nutritional knowledge of residents [21-25]. This nescience affects each step of nutritional management, including screening (ideally within 48 hours after admission), assessment and the prescription of the nutritional treatment in malnourished patients or at risk [14, 24]. There is therefore an urgent need to rise knowledge, abilities and skills in this field [21, 26-28]. In a study conducted in 2014, Aeberhard et al. aimed to improve residents' nutritional knowledge implementing a narrate online educational presentation containing topics about basics in clinical nutrition and management of malnutrition [14, 20, 29]. Only this online learning tool turned out to be insufficient to increase both the nutritional knowledge and the number of nutritional therapy prescriptions.

The first aim of the present study is to assess whether the newly designed interactive and multifaceted educational intervention leads to an increase in nutritional knowledge of the residents, measured as percent rise of correct answers in a multiple choice test. A further objective of the study is to assess whether the acquired abilities and skills to of residents leads to an increase of nutritional treatment prescriptions in malnourished patients or at risk.

## **Materials and methods**

### ***Study design***

The prospective intervention study was conducted at the University Hospital of Bern on three wards of the General Internal Medicine (GIM) Department from April 7 to June 13 2019. The study flow chart is illustrate in Figure 1.

The primary outcome was the impact of a multifaceted educational intervention on residents' nutritional knowledge and perception as well as its translation into the clinical practice measured by the number of prescribed nutritional therapies. Secondary outcome was residents' nutritional knowledge checked by multiple choice questions prior to the intervention, immediately after, and after two months.

### ***Pre-intervention phase***

Consecutive newly admitted (<48 hours) adult patients (>18 years) on each of the three GIM wards were included in the study. An experienced research assistant evaluated the nutritional risk of each patients using the well validated NRS 2002 [20]. This screening tool adds up the impairment of nutritional status (BMI and general condition, weight loss, reduced nutritional intake in the preceding week: score 0 to 3 points), severity of disease (stress metabolism: score 0 to 3 points) and age (1 point if >70 years). The total risk screening score ranges from 0 to 7 points, whereas the patient is considered as malnourished when the total score is  $\geq 3$  points.

Demographic (age, gender) and anthropometric data (weight, height), length of stay, prescribed nutritional therapies, and referrals to dietician were collected from the electronic medical charts. If not documented, the research assistant had to ask the supervising nurse or the patient himself for additional information (e.g., actual weight, height, weight loss within the last three months, reduced food intake within the last week, presence of peripheral oedema and/or ascites). By that time, the residents were neither informed nor aware about the ongoing study to minimise potential bias.

### ***Intervention phase***

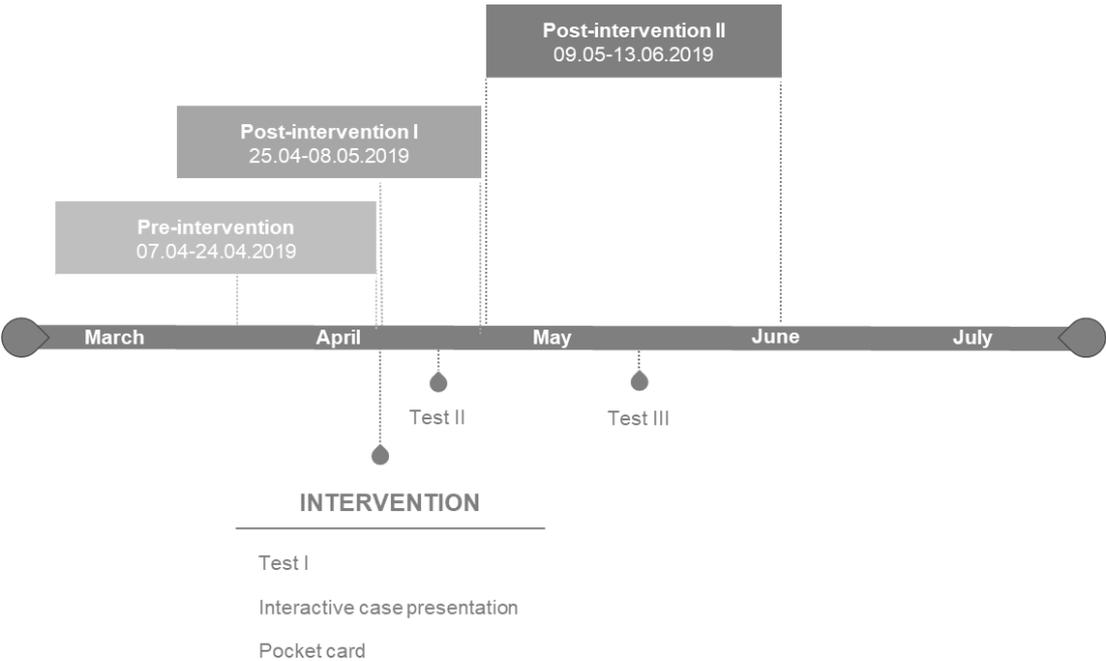
All residents attending the educational intervention, which took place at the weekly teaching and skills training for residents at the GIM Department were included in the study. Participation was voluntary. Simple information such as gender, number of years of practical experience, and current position were recorded. Residents who attended the ability and skills training had to answer a multiple choice questionnaire (test I) in order to assess their baseline knowledge about clinical nutrition (definition, prevalence, causes, consequences, and recognition of malnutrition), nutritional management (screening, assessment and treatment) and their attitude towards nutritional management. The questionnaire included 15 items and was created by experienced consultants in internal medicine and in nutritional medicine. The questionnaire was already validated in a pilot trial.

Three consultants of the nutritional medicine team headed an interactive case discussion in small groups on the intervention day. The interactive case discussion combined a case

presentation and teaching inputs on basics of nutritional management (NRS 2002, nutritional treatment and refeeding syndrome, which often occurs in malnourished, catabolic patients. The intervention thus combined practice and theory, making the teaching session clinically applicable. A pocket card with a basic nutritional information was handed out to the participants. At the end of the educational session, the participants were offered the possibility to taste different oral nutritional supplements.

**Post-intervention phase I and II**

A second online multiple choice questionnaire (using the survey tool surveymonkey®, test II) was performed by the same residents two weeks after the intervention. At the same time, a second patients’ data collection took place on the three wards, identical process as during the pre-intervention phase. The same procedure was repeated after two months. Regular reminders were sent to the participating residents for completing the multiple choice questionnaire (test III).



**Figure 1:** Study Flow Chart

**Statistical considerations**

The statistical analysis was performed with the R software (version 3.5.0, The R Foundation for Statistical Computing, 2018, Vienna, Austria). The data were assessed with descriptive statistical methods as a whole sample and for multiple subgroups. Results are reported as mean ± standard deviation (mv±sd), or as number (n) and percentage (%). Wilcoxon test,

oneway ANOVA and Pearson two-sided chi-square test were used to compare data between the different phases. A p-values of  $p < 0.05$  were considered as statistically significant.

### ***Ethical approval***

The study was conducted in accordance with the ethics guidelines of the 1957 Declaration of Helsinki and approved by the Bernese Cantonal Ethics committee, Bern, Switzerland (KEK 2016-00607).

## **Results**

### ***Patient characteristics***

Figure 2 shows the study profile. Table 1 shows the characteristics of included medical inpatients. In total, 609 patients and 18 residents were included in the study. There were no statistically significant differences in the patients' population characteristics between the groups pre-, post-intervention I and II.

Malnourished patients or at risk (NRS 2002 total score  $\geq 3$ ) were on average older ( $69.1 \pm 17.6$  y vs  $65.4 \pm 17.9$  y), and showed a longer length of hospital stay ( $8.2 \pm 6.1$  d vs  $6.4 \pm 4.9$  d) than well-nourished patients (NRS 2002 total score  $< 3$ ). The mean BMI of the malnourished patients or at risk was also lower ( $23.7 \pm 5.4$  kg/m<sup>2</sup> vs  $27.6 \pm 5.9$  kg/m<sup>2</sup>).

Underweight (BMI  $< 18.0$  kg/m<sup>2</sup>) was found in 4%, overweight (BMI 25.0-29.9 kg/m<sup>2</sup>) in 9% and obesity (BMI  $\geq 30$  kg/m<sup>2</sup>) in 4% of the malnourished patients against 1%, 25% and 17% respectively in the well-nourished patients.

**Figure 2:** Study profile

**Table 1:** Patients characteristics

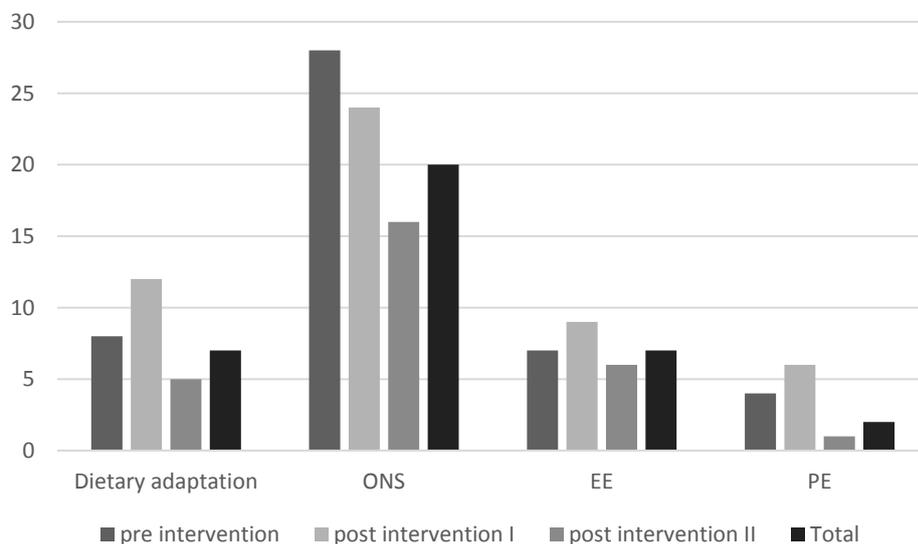
	<b>Pre-intervention</b>	<b>Post intervention I</b>	<b>Post intervention II</b>	<b>Overall</b>
Patients, n (%)	161 (100)	121 (100)	327 (100)	609 (100)
Women, n (%)	67 (42)	40 (33)	147 (45)	254 (42)
Men, n (%)	94 (58)	81 (67)	180 (55)	355 (58)
Age, mv $\pm$ sd	68.0 $\pm$ 17.4	64.9 $\pm$ 18.0	69.6 $\pm$ 17.6	66.7 $\pm$ 17.9
Weight, mv $\pm$ sd	74.7 $\pm$ 18.3	78.2 $\pm$ 20.1	70.0 $\pm$ 17.2	76.1 $\pm$ 19.2
BMI, mv $\pm$ sd	26.0 $\pm$ 6.1	26.4 $\pm$ 6.1	24.2 $\pm$ 5.3	26.3 $\pm$ 6.0
LOS, mv $\pm$ sd	7.2 $\pm$ 5.1	7.3 $\pm$ 5.9	7.9 $\pm$ 5.9	7.0 $\pm$ 5.4
NRS 2002 score, mv $\pm$ sd	2.3 $\pm$ 0.9	2.1 $\pm$ 1.0	3.6 $\pm$ 0.7	2.3 $\pm$ 1.1
Reduced nutritional intake grade 1, n (%)	41 (25)	22 (18)	41 (13)	128 (21)
Reduced nutritional intake grade 2, n (%)	29 (18)	14 (12)	52 (16)	96 (16)
Reduced nutritional intake grade 3, n (%)	5 (3)	6 (5)	25 (8)	36 (6)

NRS 2002 <3, n (%)	104 (65)	88 (73)	205 (63)	397 (65)
NRS 2002 ≥3, n (%)	57 (35)	33 (27)	122 (37)	212 (35)
NRS 2002 >3, n (%)	1 (1)	1 (1)	15 (5)	17 (3)

mv: mean value; sd: standard deviation; BMI: body mass index; LOS: length of hospital stay; NRS 2002: Nutritional Risk Screening 2002

### Nutritional therapy

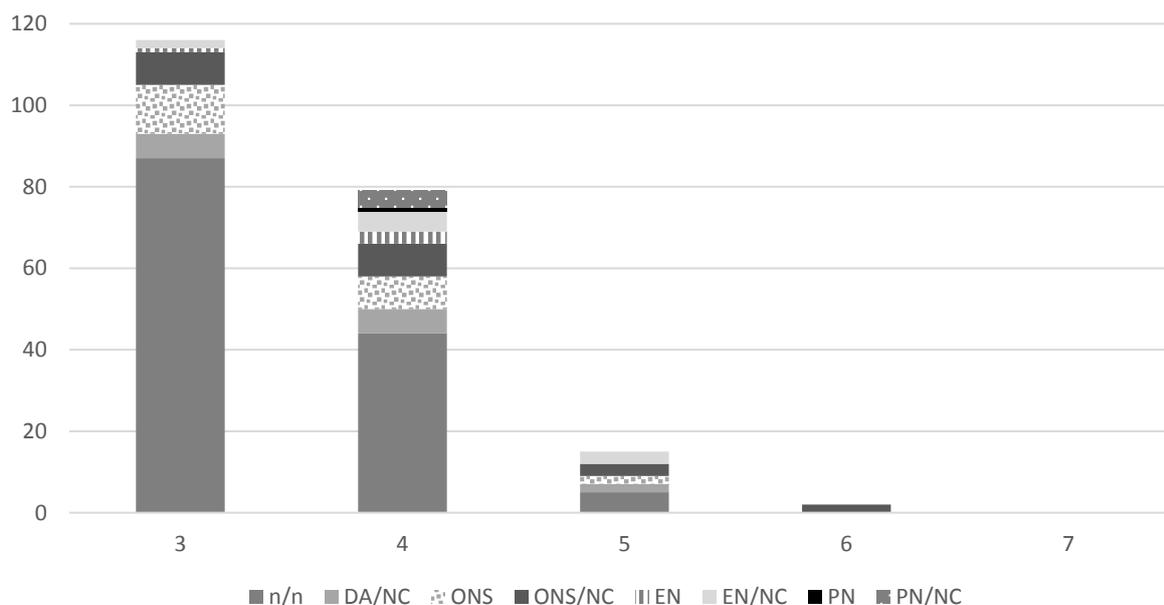
Nutritional therapies were performed in 46% of the patients in the pre-intervention phase, 52% in the post-intervention phase I and 27% in the post-intervention phase II (overall 36%). No significant difference were observed regarding the number of nutritional prescriptions between the diverse study phases. Figure 3 shows the number of performed nutritional interventions during the study.



**Figure 3:** Percentage of nutritional therapies during the study course

Among the patients at nutritional risk, 36% received nutritional therapies (46% pre-intervention, 52% post-intervention I, and 27% post-intervention II). Nutritional counselling was performed in 23% (26% pre-intervention, 39% post-intervention I, and 17% post-intervention II) of the patients during the whole study period. (Figure 4)

The prescription of nutritional therapy weakly correlates with the deterioration of the nutritional status ( $r=0.544$ ), with the increasing age ( $r=0.275$ ), with the stress metabolism ( $r=0.288$ ) and with the length of hospital stay ( $r=0.340$ ).



**Figure 4:** Nutritional interventions including nutritional counselling, displayed according to the NRS 2002 score. DA: dietary adaption; NC: nutritional counselling; ONS: oral nutritional supplement; EN: enteral nutrition; PN: parenteral nutrition

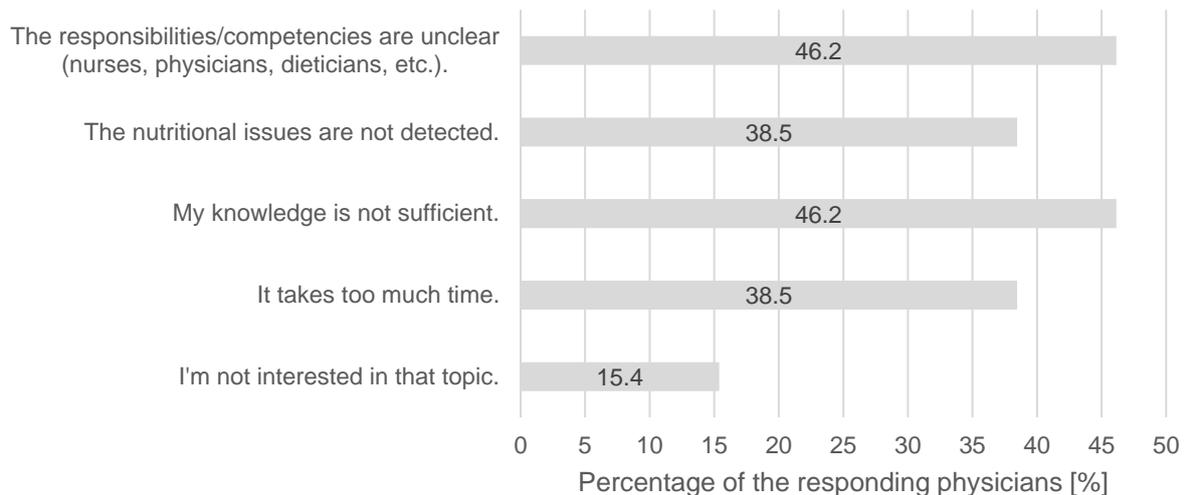
### *Intervention and knowledge test*

Table 3 shows the mean percentage of correct answers in the multiple choice questionnaire (tests I, II and III). There was a slight improvement in correct answers in the test III compared to the test II. There were no significant difference in the percentage of correct answers between the three tests.

In the last multiple choice questionnaire, residents were asked following question: Why do residents pay little attention to nutritional issues? The two most frequent answers were that nutritional issues (nutritional risk) are not detected and that the responsibilities concerning nutritional care are unclear (Figure 5).

**Table 2:** Results of the multiple choice tests

	Pre- intervention TEST I	Post- intervention I TEST II	$\Delta$ POST I-PRE	Post- intervention II TEST III	$\Delta$ POST II-I	$\Delta$ POST II-PRE
Overall	61±15%	57±12%	-3±19%	60±10%	1±17%	-2±13%



**Figure 5:** Responses to the question: “Why do residents pay little attention to nutritional issues?”

## Discussion

The aim of this educational intervention study was to assess the impact of a multifaceted interactive skills training (case discussion) together with a ready-to-use pocket card could raise residents’ awareness for malnutrition and lead to an increased number of prescribed nutritional therapies. Unfortunately, the intervention failed to achieve both objectives.

Our findings are in line with several other studies, showing that nutritional knowledge and perception are low among residents, and therefore malnutrition is not identified and consequently not treated [30-34]. Basic teaching in medical schools (knowledge) and training of abilities and skills in clinical nutrition is largely lacking in the traineeship [26]. Residents training is primarily concentrated on other goals of clinical skills, clinical reasoning and therapies. The results of the multiple choice tests in this study further underline the lack of awareness and knowledge. The residents themselves also recognize the fact of lacking knowledge, answering by 46.2% that their knowledge is insufficient to pay more attention to nutritional issues, and all residents identify nutritional support as important for the healing process as well for a better outcome. Lack of time and interest are also pointed out in the answers to the multiple choice tests. This problem is however not specific for Switzerland [35-37]. In 2002, the Public Health Committee of the Council of Europe adopted a resolution to prevent and treat malnutrition in hospitals, including recommendations on nutritional teaching and education for medical staff [22]. At that time, many countries were faced to the same problem and the committee of ministers found unacceptable the number of undernourished and untreated hospital patients in Europe. The resolution focussed mainly on the following five points: Implementation of nutritional management in hospitals, the

distribution of responsibilities for nutritional care, optimization of the cooperation between different staff groups, and education as well as nutritional knowledge at all levels.

To the question “why the residents pay so little attention to nutritional issues”, approximately half of the participants answered that malnutrition remain often undetected and that responsibilities for nutritional care in hospitals are unclear. The same reasons were identified in a Danish study [38]. Further, Mowe et al. showed that approximately half of the medical staff lacked techniques to identify malnutrition, and had difficulties to prescribe adequate nutritional treatment [24]. They also could show that higher nutritional knowledge correlates with better daily nutritional management practice [24].

Many studies have tried to implement various educational strategies with different outcomes [7, 29]. For example, the implementation of nutritional therapy protocols, workshops for medical staff, and bedside clinical case discussions improved the quality of nutritional therapies in a Brazilian intensive care unit [39]. Aeberhard et al. showed that an online learning program could improve the knowledge of residents but the transition into clinical practice failed and was indirectly objectified thorough the unvaried remained number of nutritional therapies after educational intervention [29]. In our study, we included the consultants of the nutritional medicine – being themselves clinically active, enthusiastic and qualified, visible and available in the hospital – into the training of the residents, also as role models for the participants. This seems to insufficiently influence the residents attitude and training. Active forms of continuing medical education and multifaceted interventions have been shown to be the most effective methods for implementing a change in residents behaviour [40]. We could demonstrate solely a slight improvement in the number of prescribed nutritional therapies during the post-intervention I phase using case discussions in small interactive groups (workshops) and handing over a useful pocket card. This effect however faded out later on. To be more effective, workshops would possibly require more active involvement of the participants using concrete own clinical cases. Pocket card should probably be better explained or replaced by an electronic application, so that participants can use it more easily and transfer the content directly into daily practice without any excessive time consuming. Additionally the multifaceted and interactive workshops should be repeated in regular intervals to rise knowledge, abilities and skills needed to ensure an adequate nutritional management as well as to finally achieve behavioural changes on a long-term perspective [41]. Such strategies take already place in medical schools as well as in hospitals, in regular recurrences (continuing medical education) [42]. The interdisciplinary and multiprofessional nutritional support team should be an essential part of such educational strategies as they may bring different perspectives and long-term expertise [26,

43-45]. Role models of and training by consultants could also positively influence young residents performance [42].

Rasmussen et al. showed that the implementation of a comprehensive nutritional care plan including introduction of a systematic screening system, nutrition sheet for residents, nutrition record for nurses, and implementation of international guidelines, increased the percentage of screening from 3% to 50% within one week, as well as the nutritional therapies increased by 26% [7]. In our study, residents pointed out unclear responsibilities when it comes to nutritional management. Hospital-wide structural strategies may be able to improve the situation quickly, especially implementing guidelines on nutritional support including a systematic nutritional screening at hospital admission.

We found a high prevalence of nutritional risk in our study, confirming the prevalence found in many other international studies, ranging from 30 to 50% [6, 36, 46, 47]. Among these patients, there were underweighted patients as well as overweight or obese patients, requiring special awareness to be identified as malnourished and to be treated, as they are mainly prone to sarcopenia. Since the evidence for an effective and efficient nutritional therapy is getting from year to year better, patients may benefit from it and have a right to receive it timely [19].

The strength of this study was, that it has been conducted in a clinical setting, in the “real daily clinical life” at the Department of GIM in a large University Hospital. A further positive point is the methodology, recruiting consecutively all patients admitted to the Department and screening them all during the study period. The limitations of the study are mainly inherent to the fact that it was a every day reality clinical study, e.g. small number of residents, due to many causes as holiday, working times, etc. and the unequal number of treated patients per residents, which would have allowed assumptions on the individual effect.

## **Conclusion**

The presented intervention aiming to improve residents’ nutritional knowledge and awareness as well as prescriptions for nutritional therapies was not successful. As nutritional risk remains highly prevalent, innovative and more effectively teaching strategies are needed to rise knowledge, abilities and skills capable to fight malnutrition as proposed in the Prague Declaration. Other innovative and effective educational programs like multimodal repetitive training with joint interdisciplinary efforts – possibly mandatory – are necessary to achieve behavioural changes necessary to attain long time effects. Clear responsibilities, roles and procedures must be defined to ensure continued proper as well effective functioning nutritional management in hospitals. Further, there must be an attempt from the healthcare

system and political side to establish nutritional medicine as an important discipline in medical schools and in the postgraduate medical training as well as continuing medical education. These measures will improve and ensure high quality of nutritional care in medical inpatients ultimately translate into better clinical outcome.

As part of a nutritional management implementing initiative in our University Hospital – consecutively to the results of the current and previous educational studies – we will establish a hospital-wide mandatory systematic nutritional screening in the near future.

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