Title Page

Title: Comparing hospital staff nutrition knowledge, attitudes and practices, before and 1 year after improving nutrition care: Results from the More-2-Eat implementation project.

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**Abstract:**

*Background:* Staff plays a key role in the prevention, detection and treatment of hospital malnutrition. Understanding staff knowledge, attitudes, and practices (KAP) is important for developing and evaluating change management strategies.

*Methods:* The More-2-Eat project aims to improve nutrition care in five Canadian hospitals by implementing the Integrated Nutrition Pathway for Acute Care (INPAC). To understand staff views before (T1) and after one year of implementation (T2), a reliable KAP questionnaire, based on INPAC, was administered. T2 included questions about involvement in implementation. The mean difference between T2 and T1 responses were calculated. T-tests were used for comparisons.

*Results:* The questionnaire was completed at T1 (n=189) and T2 (n=147) (unpaired); 57 staff completed both questionnaires (paired). A significant increase in total score was seen in unpaired results at T2 (from 93.6/128, Range 51-124 to 99.5/128, Range 54-119;t=5.97, p<0.0001), with an increase in knowledge/attitudes (KA) (t=2.4, p=0.016) and practice (t=3.57, p<0.0001) components. There were no statistically significant changes in paired responses. 70% (n=102/147) noticed positive changes in practices, 12% (n=18) noticed positive/negative changes, 1% (n=1) noticed negative change, and 17% (n=25) noticed no change. Positive changes included: increased awareness of nutrition importance, food intake monitoring, mealtime readiness, volunteer support, increased availability of food, nutrition screening, recording weights, supplement use, staff working together, and improved patient outcomes. 59% (n=86) felt involved in the change and these staff had higher KA and KAP scores than those who did not feel involved.

*Conclusion:* Staff involvement is important in the implementation process for improving nutrition care.

**Clinical Relevancy:**

All hospital staff should be involved in the prevention, detection, and treatment of hospital malnutrition. Improving nutrition care requires a multi and interdisciplinary approach to the safe and effective provision of food, fluid and nutritional care. Staff that felt involved in nutrition care improvements had a greater increase in nutrition knowledge/attitudes and total scores after implementation of nutrition care activities.

**Introduction**

Hospital malnutrition is prevalent in Canada1 and similar countries worldwide2-4, impacting negative health outcomes such as length of stay, mortality, and readmission1,4-6. To address this issue, there is increasing recognition that all hospital staff should be involved in nutrition care and a multi- and interdisciplinary approach is required7-11. However, many practicing healthcare providers, including physicians, physiotherapists and social workers, may not be aware of the importance of nutrition, nor the prevalence of malnutrition12. The cross cutting nature of nutrition within healthcare can lead to diffusion of responsibility with everyone seeing nutrition care as someone else’s responsibility. Dietitians play an important role, but they are a specialized resource and are often focused on addressing the more complex nutrition related problems of patients13. As nurses have the most day-to-day contact with patients, they should play an important role in nutrition care. A survey by Duerksen et al indicates that nurses believe they lack the time to provide quality nutrition care and knowledge to manage nutrition problems14. However, nurses agree that they can play an important role in identifying those at risk through nutrition screening14. Physicians also need to be involved and knowledgeable about nutrition prevention, detection and treatment, but they recognize a gap between their current versus optimal nutrition care practices in hospital15. Health Care Assistants/Aides also have a role to play, particularly regarding getting patients ready for meals (sitting up, tray within reach etc.) and providing eating assistance, however they are not in all hospitals, and may not have adequate time to meet the needs of all patients7. It is evident that different staff can play a variety of roles to meet the nutrition needs of patients, yet a coordinated approach is needed.

In addressing hospital malnutrition, it is important to focus on prevention, detection and treatment. To fulfill this need, a consensus based Integrated Nutrition Pathway for Acute Care (INPAC) was developed, which incorporates evidence of best practice into an algorithm specifying key nutrition care activities16. The INPAC activities include nutrition screening at admission (e.g., with Canadian Nutrition Screening Tool [CNST]17), diagnosing and triaging patients with the subjective global assessment (SGA)18, monitoring food intake, standard and advanced care activities such as opening packages or prescription of medpass (a small amount of oral nutrition supplement provided at regular intervals, typically with medication), and discharge planning16. INPAC emphasizes that all staff have a role in the prevention, detection, and treatment of malnutrition.

INPAC implementation in hospital requires a variety of implementation strategies, and change management activities, as well as methods of tracking and evaluating progress. Understanding staff’s knowledge, attitudes, and practices (KAP) is a vital step for the development and evaluation of change management activities. KAP questionnaires are designed to measure what is “known, believed, and done in relation to a particular topic” 19 (p. 6). The aim of this manuscript is to compare the change in knowledge/attitude (KA), practice, and total KAP scores before and after INPAC implementation in hospital, and to describe staff perceptions of the change management process.

**Methods**

The More-2-Eat project (M2E) implemented INPAC for 1 year in 5 Canadian hospitals (1 medical unit/ward per hospital) 20. The 5 hospitals were geographically diverse (located in 4 provinces), and ranged in size from 185 to >1000 beds, but the study unit size was relatively consistent at 20-35 beds. All units were medical: one respiratory care unit; one was also implementing the Accountable Care Unit model; and the other three were mixed units (one with beds for acute stroke care and one in a small community hospital). Each M2E unit had the flexibility to decide which aspects of INPAC to focus on and how to implement the change. All 5 units aimed to raise awareness of the importance of nutrition, and implemented nutrition screening and diagnosis. More tailoring occurred with improving standard and advanced nutrition care by using a range of strategies such as medpass, or weight or food intake monitoring. Results will highlight those common components of implementation used by sites (e.g. INPAC activities and strategies).

A pre-INPAC implementation questionnaire was completed by 30 staff on each M2E unit. The KAP questionnaire, regarding nutrition care practices based on INPAC activities,21 was used as part of a needs assessment and as a baseline to evaluate post implementation changes in staff knowledge and perceptions. Results of the initial questionnaire were reported back to the units to provide information on staffs’ perceptions and possible directions for implementation, education and areas for improvement.20 The staff were resurveyed a year later, adding questions focusing on the recognition of change and involvement of staff during the INPAC implementation process (rating 1-10; low/high; agree/disagree).

The KAP questionnaire used at baseline and after 1 year of INPAC implementation has demonstrated test-retest reliability21. Additional questions regarding involvement in the change processes were developed based on consultation with the M2E team and were included on the post-implementation survey. A Likert scale was used for response options22. Categories for KA questions and some regarding involvement in implementation included strongly disagree (score=1) through to strongly agree (score=5). For the practice questions, a four-point scale was deemed appropriate and responses included: never (score=1), sometimes, often, always (score=4), and not applicable (score=1). Practice questions left blank were treated as not applicable. For the remaining questions regarding involvement in implementation, responses were ranked from 1 (low/poor/negative) to 10 (high/good/positive). The final questions on screening and follow-up proportions had participants select from a list of ranges between 0-100%. All staff, except dietitians, who had a direct clinical role with patients on the M2E units, were eligible to complete the questionnaire. Dietitians were excluded since many of the questions were not relevant. Dietitians are aware and knowledgeable of the importance of nutrition, thus their responses would not be representative of the general staff on the unit.

Baseline data (T1) were collected in autumn 201521 using the Simple Survey (Outsidesoft Solutions Inc., Quebec, QC, Canada) platform. Sample size was based on consideration of feasibility and the anticipated response rate of 50% of eligible staff from each unit (e.g. 30 nurses (full and part time) and 60 total staff). Each site was required to recruit 30 eligible staff at baseline considering the expected challenges with recruitment. The primary purpose of T1 data collection was a needs assessment for the sites to support implementation processes. One year later (T2), the updated questionnaire was placed on the same online survey platform. Consent was provided by each hospital for e-mail invitations to be sent to unit staff that had previously completed the questionnaire at T1 and consented to be contacted for T2. Three reminders were sent (1 per week for 3 weeks) before the questionnaire was opened to all other eligible M2E unit staff. Recruitment was facilitated by the M2E personnel seconded at the unit for M2E data collection. Regular reminders were provided (by e-mail and in person) until the quota (30/unit) was complete (open from November 2016 to January 2017).

*Analysis*

Knowledge and attitude questions were added for a summary scale (KA), as it is difficult to distinguish between what staff knows versus what they believe. The mean difference between T2 and T1 responses for individual questions and for total responses was calculated for KA, practice, and KAP total scores. Comparisons were made using independent sample t-tests as the majority of respondents did not complete both questionnaires. A paired sample t-test was calculated for the subset of respondents who completed both pre and post implementation questionnaires. Comparison between units was not completed due to the small samples. For the staff recognition, involvement, and support of changes in practice questions added at T2, a score of >7 indicated awareness and positive views, unless it was reverse coded where negative scores indicated positive changes. T-tests (independent and paired) were used to compare these groups (positive vs. more negative view) by the KA, practice and KAP scores for the T2 and T2-T1 paired responses. Comparison was also made to determine if there was a difference in perceived level of screening based on being a nurse versus another profession. All analyses were completed on SPSS version 22.

Participants at T2 were asked to explain what changes they noticed and the most significant change. Since most participants listed similar responses for both questions without necessarily highlighting the single most significant change, the results from the two questions were collapsed and analyzed together. Direct quote responses were organized into topic areas using NVivo 11.

Ethics

Ethical approval for M2E was obtained from the University of Waterloo Research Ethics Board (ORE #20590) and from the ethics committees at each of the five participating hospitals. All data remained anonymous to all researchers, excluding the lead author. Data was stored in password-protected files on locked computers.

**Results**

The online, 27-item KAP questionnaire was completed at T1 (n=189), and T2 (n=147) (unpaired sample); 57 staff completed both questionnaires (paired sample) (Table 1). A large proportion of respondents were Registered Nurses (31% at T1 and 43% at T2), and Registered Practical Nurses/Licensed Practice Nurses (15% at T1 and 16% at T2). More than half of the respondents were employed full time and had been employed for less than 10 years overall, not only at their current hospital. Nearly half were under the age of 39 and the majority female. Similar demographics were found for paired responses (Table 1), with slightly fewer responses from Registered Practical Nurses/Licensed Practice Nurses (9%) and slightly higher for Attending Physicians (6%, 4% and 9% for T1, T2, and paired respectively) and Physiotherapists/Occupational Therapists at T2 (9%, 9% and 14% for T1, T2, and paired respectively). There were no statistically significant differences between these demographics for paired and unpaired samples.

*Knowledge, Attitudes and Practices Scores*

At T1, the mean KAP score across hospitals was 93.6/128 (Range 51–124). It increased to 99.5/128 (Range 54-119) at T2 for unpaired respondents. For paired responses a smaller increase in scores was noted from baseline to follow up with T1 being 96.1/128 (Range 66-114) and T2 being 97.5/128 (Range 54-113). There was a significant increase in overall KA (mean difference (MD) 2.4, 95% Confidence Interval (CI) [0.51, 4.28], p=0.016), practice (MD 3.57, 95% CI [2.06, 5.09], p<0.0001), and KAP scores (MD 5.97, 95% CI [3.21, 8.73], p<0.0001) for the unpaired respondents. No statistically significant differences were found in paired responses despite similar trends in improvement at T2 for KA (MD 0.35, 95% CI [-1.60, 2.30], p=0.72), practice (MD 1.02, 95% CI [-0.32, 2.35], p=0.13), and KAP scores (MD 1.37, 95% CI [-1.45, 4.19], p=0.34) (Table 2 and 3).

Statistically significant mean differences were found for individual KA questions for both unpaired (16/20 KA questions) and paired respondents (9/20 KA questions) (Table 2). More respondents in T2 thought all patients should be screened for malnutrition (unpaired MD 0.42, 95% CI [0.24, 0.61], p<0.0001; paired MD 0.40, 95% CI [0.11, 0.70], p=0.008) and that nutrition is now a high priority at their hospital (unpaired MD 0.56, 95% CI [0.34, 0.77] p<0.0001; paired MD 0.37, 95% CI [0.08, 0.66], p=0.013). T2 respondents knew more about *when* to refer a patient to a dietitian (unpaired MD 0.53, 95% CI [0.29, 0.77], p<0.0001; paired MD 0.60, 95% CI [0.28, 0.91], p<0.0001); *how* to refer a patient to a dietitian (unpaired MD 0.41, 95% CI [0.18, 0.65], p<0.0001; paired MD 0.37, 95% CI [0.09, 0.65], p<0.01); could recognize a malnourished patient (unpaired MD 0.583, 95% CI [0.36, 0.81] p<0.0001; paired MD 0.39, 95% CI [0.09, 0.69], p=0.013); and fewer felt they needed more training to better support the nutrition needs of their patients (unpaired MD -0.51 95% CI [-0.76, -0.26] p<0.0001; paired MD -0.60, 95% CI [-0.94, -0.26], p=0.001). There was a statistically significant increase in scores for all practice questions in the unpaired respondents between T2 and T1, but not for paired responses (Table 3).

*Recognition and Support of the Change Processes*

For the questions regarding staff perceptions of the changes on the unit and support provided for the change process, 70% (n=102/147) of respondents reported noticing positive changes in the past year, 12% (n=18) positive and negative changes, 1% (n=1) a negative change, and 17% (n=25) no change. Responses were similar for unpaired and paired respondents (Table 4). Those in the unpaired sample who recognized positive change had significantly higher KA (p=0.003), practice (p=0.049), and KAP (p=0.003) scores. These change process responses were not statistically significantly different by KA, practice and KAP scores for the paired sample, although similar trends were noted.

Table 4 indicates that there were significantly higher KA, practice, and KAP scores for unpaired respondents who ranked the impact of the M2E project on patient’s overall health and recovery as positive (>7) (KA: t=3.90, p<0.0001; practice: t=2.56, p=0.012); KAP: t=4.06, p<0.0001), had positive job satisfaction (KA: t=3.41, p=0.001; practice: t=2.12, p=0.032; KAP: t=3.61, p<0.0001), and/or considered the project a positive overall value to the unit (KA: t=4.39, p<0.0001; practice: t=2.12, p=0.04; KAP: t=4.07, p<0.0001). No statistically significant difference was found for paired responses, although similar trends were noted. Eighty-four percent (n=122) of respondents felt there was more focus on nutrition care in their hospital, with positive scores associated with significantly higher KA (t=3.74, p=0.001), and KAP (t= 3.169, p=0.004) scores for overall T2 responses. Just over 79% (n=116) felt supported to make changes to nutrition care over the past year, and 91% (n=132) agreed that they were aware that changes were underway on their unit. Being aware of the change did not lead to increased KA, practice, or KAP scores potentially as only 9% (n=13) were unaware of the change. Two-thirds (n=97) of staff felt that they were asked what changes to nutrition care were needed, and those who felt they had been asked had significantly higher KA (t=4.40, p<0.0001) and KAP (t=3.95, p<0.0001) scores. Fifty-nine percent (n=86) agreed they were involved in planning and making changes, and those who agreed also had significantly higher KA (t=4.56, p<0.0001), practice (t=2.05, p=0.04) and KAP (t=4.38, p<0.0001) scores.

*Perceptions of Screening and Referral Processes*

As nutrition screening is a crucial part of INPAC and all hospitals had implemented screening and diagnosis by T2, questions regarding staff perceptions of the proportion of patients screened, referred, and receiving appropriate treatment were included (Table 5). Forty-eight percent thought that 75-100% of patients were being screened and 30% did not know. Fifty-nine percent (n=50) of nurses believed that 75-100% of patients were screened for nutrition risk, compared to 32% (n=19) of other staff (non-nurses) [X2 (1, N=145)=10.4, p=0.001]. Fifty-four percent of respondents believed that 75-100% of patients were referred to a dietitian if they were thought to be at nutritional risk, with 60% believing those patients received appropriate care following identification of the risk.

*Qualitative Comments*

When respondents at T2 were asked to explain what change they noticed, 65% (n=96) responded. Most comments (89.6%; n=86) were from those who noticed positive changes. Responses focused on areas of INPAC that each unit was implementing. Main topics included: increased nutrition awareness, monitoring of patient food intake, mealtime readiness, food availability, volunteer support, nutrition screening, supplement use, recording weights, staff working together and improvements to patient outcomes. Of the few negative comments, respondents indicated the need for more attention on setting patients up for the meal, the difficulty in opening packages, and lack of eating assistance.

**Discussion**

It is encouraging to see the increase in KA, practice, and KAP scores in unpaired responses before and 1 year after INPAC implementation, with practice scores generally increasing more than KA scores. As the same statistically significant changes were not seen in the paired responses, despite their similar demographics, it cannot be confirmed that the changes in scores were due solely to the M2E project. The lack of significance within the paired responses is likely due to the limited sample size, as all changes in this subgroup were in the anticipated direction and consistent with the unpaired sample.

Both the unpaired and paired groups had a significant increase in their understanding that nutrition is important to every patient’s recovery and is a high priority at their hospital (Table 2). The importance of nutrition was a key area of implementation across all sites. Having the hospital involved in M2E appears to have influenced staff to see that their hospital recognizes nutrition is a priority. Both groups also recognized the need for nutrition screening, a key component of INPAC and a priority for all sites. Within M2E, by T2, all units were screening above 70% of admitted patients (unpublished results). Many staff were accurately predicting screening rates at above 50%. The proportions of “do not know” responses indicate that some staff was still unaware of screening. Nurses were more likely to report screening prevalence, as they were typically more involved in this activity. For implementing screening and other INPAC activities, the most commonly used behavior change techniques included education, enablement, and environmental restructuring (unpublished results).

In the qualitative responses, nutrition screening was mentioned but not as frequently as standard care activities. This was an expected result, as screening would only impact certain staff, and implementation efforts would only be applicable to those staff. Screening was also implemented at the beginning of the year and minimal comment may be because it had already been incorporated into the routine, thus not thought of as a recent change. When considering that staff reported an increased recognition of the need for screening, had positive qualitative comments regarding early identification of malnutrition, and were generally aware that screening was underway, this suggests that M2E efforts with respect to screening will be sustained in these study units.

Based on KA results, there was an increased recognition of when a patient was at risk of malnutrition, when and how to refer to a dietitian, and that not all patients require individualized support from a dietitian. These changes are in line with the implementation efforts focused on raising awareness, increasing nutrition screening, and working toward increased recognition that everyone should be involved in nutrition care. There was no change regarding views that nutritional care of a patient is only the role of the dietitian, which may mean more focus should be placed on having staff recognize nutrition as everyone’s responsibility, not just the dietitian. As predicted, diagnosis with subjective global assessment, although implemented across all five sites, was not mentioned in the qualitative comments, as this questionnaire was not completed by dietitians who were the ones typically involved in this care activity in M2E. Having screening as part of the routine and staff having an increased understanding of when and how a dietitian should be involved, suggests success with educating staff and is an example of a multidisciplinary approach to nutrition care, espoused by INPAC.

Qualitative comments regarding monitoring food intake and patient set-up at mealtimes were the most commonly reported positive changes, in line with INPAC standard care activities. Involvement of volunteers at mealtimes was another standard care approach. Volunteers were mentioned in qualitative comments more frequently in those units that had launched a volunteer mealtime program; staff was recognizing the change and the benefit of including volunteers. This feedback is beneficial for the units, and may support the implementation of volunteer programs at other hospitals as a way to address standard care activities within INPAC.

There was no change in the perception that interruptions during the meal can negatively affect patient food intake. This result is in line with observed practices, as most units took the approach of having staff, volunteers, family and friends provide encouragement and company during mealtimes to support the social side of eating rather than restricting access to patients’ rooms. It is not clear if staff considered this as interruptions or not. Although protected mealtimes23,24 discourage mealtime interruptions, some are unavoidable, and responses to this question may reflect this reality.

Although not mentioned as an INPAC activity, regular and accurate (not estimated) weights, such as through a weekly weighing program, were seen as changes as a result of M2E implementation efforts in some sites. An overall change was not experienced because in some sites staff recognized the importance of accurate weights at admission at T1 and the opinion did not change at T2. In addition, not all sites focused on weights. There was a significant increase in the number of staff who felt a patient’s weight was necessary at discharge.

There was minimal change in opinion regarding the need for malnourished patients to be followed-up in the community and little emphasis on discharge planning in the qualitative feedback. Many units were unable to address this care step within the implementation year. Lack of difference may also be due to the fact that at T1, staff were already supportive of community follow-up, recognizing that connecting the hospital to the community is important. There was also a significant increase in practice regarding the number of staff who reported providing the patients or families with nutrition education material at discharge. These results highlight the need for future work to focus on the transition from hospital to home, ensuring that patients are receiving adequate follow-up and support regarding their nutrition needs in the community.

The qualitative results are consistent with INPAC activities and demonstrate that staff recognized the changes underway. Some comments were about changes (e.g. selective menus) that occurred at the same time as M2E, but were not necessarily part of the project. As well, the changes mentioned are not reflective of all changes on the units, but do reflect those that had an impact on the daily practice of staff on all units. Staff no longer felt the need for more training to better support the nutrition needs of their patients, which may be because there were several education sessions provided for staff at each unit throughout the year. All practice scores had increased and staff was more aware of the importance of nutrition, could accurately comment on many of the changes, and many felt involved in the overall change process at T2.

*An interdisciplinary approach where staff feels involved*

Recognition of a positive change on the unit was associated with higher KA, practice, and KAP scores. Higher KA and KAP scores were also found for staff who felt they were asked about what changes were needed and felt involved in the change process. These findings support the literature that staff should be involved in the change process9,10,25. Staff know what works in practice and their opinions should be considered throughout the process.

The study results are in line with literature indicating that a multi- and interdisciplinary approach is needed to address hospital malnutrition7-11. As mentioned by Duerksen et al, nutrition care goes beyond dietitians, with nurses, for example, being involved in standard nutrition care practices such as ensuring trays are within reach of the patient, as well as monitoring food consumption and body weight14. Food services staff could play a role in encouraging food intake, while hospital management could support a culture of proactive nutrition care. Nutrition care practices cannot be left solely to nurses and dietitians, as all staff, clinical or non-clinical, has a role to play in improving nutrition care. For M2E, being involved in making improvements made staff more likely to understand the issues associated with hospital malnutrition.

*Limitations*

There are limitations to the use of the questionnaire(s), particularly as they were conducted on a wide variety of professionals, but may not represent the opinions of all staff 21. The questions regarding recognition and support of change processes were added for T2. The M2E team confirmed the questions, but pilot testing was not completed. The small sample size for the paired responses was also a limitation. It was deemed impractical to increase the sample size, and three weeks of reminders for those who completed at T1 was deemed realistic before opening the questionnaire to all eligible staff. The limited sample size also restricted the ability to compare results at the unit level to the specific INPAC activities implemented on that unit. For example, it was not possible to see if the scores for the questions about weight monitoring had more change in units that focused on this activity. Practice scores also need to be interpreted carefully, as they are self-perceived practices that may not be representative of actual practice. It is also not possible to say based on these data if changes had an impact on patient outcomes. Further analyses in M2E will focus on these research questions.

Although the paired and unpaired samples were not different in their demographic characteristics (Table 1) sample differences appeared for baseline KAP scores. The paired group started with higher scores at T1, leaving less room for improvement at T2. The paired sample also typically had lower practice scores at T2, indicating that the unit efforts may not have had as much effect on the paired sample as the group overall, but it is unclear why these differences may have existed. Having a wide variety of professionals complete the questionnaire may appear as a disadvantage for interpreting the results. This broad approach is in line with the need to have everyone involved in nutrition care, yet does not allow for comparison of changes based on profession. A global, rather than a profession specific approach may be the way forward when working towards implementing INPAC.

*Future Directions*

All hospitals interested in improving nutrition care or implementing INPAC are encouraged to evaluate the KAP of hospital staff before and after making changes. Baseline results can be used to inform areas for improvement, while repeating the questionnaire allows for recognition of change. This repetition may also allow for quantification of impact for some implementation efforts, such as raising awareness of the importance of nutrition. Making improvements in practice is a continuous process and using existing tools, such as this KAP questionnaire, to track progress and feed back the results is part of good practice for making sustainable change26-29. The importance of understanding the KAP of patient and families regarding the importance of nutrition may be another important consideration in INPAC implementation and future work should consider developing a questionnaire specific to this group. Further analyses in M2E will highlight patient perceptions of the importance of nutrition, as well as success with INPAC implementation, and improvements in-patient reported outcomes.

An online toolkit is being created regarding learnings from M2E on how to implement INPAC. This toolkit will include tips for making change in hospital, strategies and models for implementing INPAC activities, as well as tools and resources important for the change process. This INPAC KAP questionnaire will be available in the toolkit for use by any hospital.

**Conclusion**

This is the first known questionnaire assessing staff KAP with respect to nutrition care in hospitals. As part of the change management process, all hospitals are encouraged to conduct a needs assessment of staff perceptions of nutrition care to inform changes before implementation and to evaluate change later on. Understanding the KAP of hospital staff can provide direction regarding understanding perceptions and areas for improvement. KAP was shown to significantly improve during the M2E implementation study. The additional questions regarding the change processes further demonstrate staff perceived involvement and extent of the impact, as well as the positive association of those perceptions on KAP scores. With this bottom-up approach of involving unit staff in the change process, the staff increased their KA, practice and KAP scores during the year of INPAC implementation, and recognized that positive changes were occurring on their unit. Many staff felt they had been asked what was needed and felt involved in the process, which may have supported overall INPAC implementation. All staff should be involved in the change process when working towards improving nutrition care in hospital and a KAP questionnaire can support this engagement.

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**Table 1.** Demographic information of the hospital staff for T1, T1 and paired responses.

|  |  |  |  |
| --- | --- | --- | --- |
| **Profession**  | **T1****% (numerator)****N=189** | **T2****% (numerator)** **N=147** | **Paired (T1 & T2)****% (numerator)****N=57** |
| Registered Nurse | 31% (58) | 43% (63) | 35% (20) |
| Registered Practical Nurse/Licensed Practical Nurse |  15% (28) | 16% (23) | 9% (5) |
| Dietetic Technician | 0.5% (1) | 1% (1) | 0 |
| Health Care Aide/Personal Support Worker | 5% (9) | 4% (6) | 3.5% (2) |
| Physiotherapist/Occupational Therapist | 9% (17) | 9% (13) | 14% (8) |
| Speech-Language Pathologist | 4% (8) | 3% (4) | 5% (3) |
| Attending Physician | 6% (11) | 4% (6) | 9% (5) |
| Fellow | 0 | 1% (1) | 0 |
| Other | 25% (48) | 20% (30) | 25% (14) |
| **Employment**+ |  |  |
| Full Time | 63% (119) | 64% (94) | 63% (36) |
| Part Time | 29% (55) | 31% (45) | 32% (18) |
| Casual | 7% (14) | 5% (8) | 5% (3) |
| **Years Employed**++ |  |  |
| Less than 2 years | 10% (19) | 9.5% (14) | 14% (8) |
| 2-5 years | 24% (45) | 23% (34) | 21% (12) |
| 6-10 years | 21% (40) | 20% (29) | 16% (9) |
| 11-20 years | 19% (36) | 24.5% (36) | 23% (13) |
| 21-30 years | 18% (34) | 15% (22) | 21% (12) |
| 31+ years | 7% (13) | 8% (12) | 5% (3) |
| **Age**  |  |  |
| less than 30 years of age | 23% (43) | 22% (32) | 23% (13) |
| 30-39 years of age | 26% (48) | 22% (33) | 23% (13) |
| 40-49 years of age | 26% (48) | 29% (43) | 28% (16) |
| 50-59 years of age | 21% (40) | 22% (33) | 25% (14) |
| 60 years of age | 5% (9) | 4% (6) | 2% (1) |
| **Gender**  |  |  |
| Female | 86% (162) | 89% (131) | 84% (48) |
| Male | 14% (27) | 11% (16) | 16% (9) |

Note: no statistically significant differences were noted in demographics for paired and unpaired samples.

+ Missing n=1

++ Missing n=2

T1, Time 1; T2, Time 2

**Table 2:** Mean difference scores comparing KA scores for T2 to T1 unpaired and for paired responses.

|  |  |  |  |
| --- | --- | --- | --- |
| **Questions** | **Unpaired Mean scores** **out of 5**(Standard Deviation) | **Mean difference unpaired T2-T1** **T1 n=189** **T2 n=147**(95% Confidence Interval) | **Mean difference for T2-T1 Paired Responses****n=57**(95% Confidence Interval) |
| **T1**  | **T2** |
| 1. Nutrition is **not** important to every patient’s recovery in hospital^ | 4.7 (1.0) | 4.2 (1.5) | -0.47 \*\*(-0.76, -0.18) | -0.53 \*\* (-0.91, -0.14) |
|
| 2. All patients should be screened for malnutrition at admission to hospital | 4.2 (1.0) | 4.7 (0.7) | 0.42 \*\*\*\*(0.24, 0.61) | 0.40 \*\*(0.11, 0.70) |
|
| 3. A patient’s weight should be taken at admission | 4.5 (1.0) | 4.6 (0.7) | 0.16(-0.03, 0.34) | 0.14(-0.16, 0.44) |
|
| 4. All staff involved in patient care can help set up the tray, open packages etc. | 4.4 (1.1) | 4.7 (0.7) | 0.28 \*\*(0.08, 0.47) | 0.21(-0.03, 0.45) |
|
| 5. All staff involved in patient care can provide hands-on assistance to eat when necessary | 4.0 (1.2) | 4.3 (1.0) | 0.23\* (-0.00, 0.47) | 0.07(-0.23, 0.37) |
|
| 6. Malnutrition is a high priority at this hospital | 3.6 (1.1) | 4.1 (0.9) | 0.56 \*\*\*\*(0.34, 0.77) | 0.37 \*(0.08, 0.66) |
|
| 7. Giving malnourished patients an adequate amount of food will enhance their recovery | 4.3 (1.0) | 4.6 (0.7) | 0.27 \*\*(0.09, 0.46) | 0.26(-0.04, 0.56) |
|
| 8. All malnourished patients require individualized treatment by a dietitian^ | 1.6 (0.9) | 1.4 (0.7) | -0.19 \*(-0.37, -0.02) | -0.35 \*\*(-0.60, -0.10) |
|
| 9. I have an important role in promoting a patient’s food intake | 4.0 (1.1) | 4.3 (1.0) | 0.35 \*\*(0.13, 0.57) | 0.04 (-0.21, 0.28) |
|
| 10. Monitoring food intake is a good way to determine a patient’s nutritional status | 4.1 (0.9) | 4.4 (0.8) | 0.28 \*\*(0.09, 0.47) | -0.09(-0.30, 0.12) |
|
| 11. Interruptions during the meal can negatively affect patient food intake | 4.3 (0.8) | 4.4 (0.8) | 0.14 (-0.03, 0.32) | 0.18(-0.01, 0.36) |
|
| 12. Promoting food intake to a patient is every staff member’s job | 4.2 (1.1) | 4.4 (0.8) | 0.28\*\*(0.09, 0.48) | -0.05 (-0.20, 0.30) |
|
| 13. Nutritional care of a patient is only the role of the dietitian^ | 4.1 (1.2) | 4.1 (1.2) | 0.02(-0.23, 0.27) | 0.23 (-0.09, 0.55) |
|
| 14. Malnourished patients who are discharged need follow up in the community | 4.4 (0.9) | 4.4 (0.8) | 0.09 (-0.09, 0.27) | -0.04(-0.29, 0.22) |
|
| 15. A patient’s weight is not necessary at discharge^ | 3.7 (1.1) | 2.2 (1.1) | -1.52\*\*\*\*(-1.75, -1.29) | -1.63 \*\*\*\*(-2.06, -1.20) |
|
| 16. I always know *when* to refer to a dietitian | 3.5 (1.2) | 4.0 (1.0) | 0.53 \*\*\*\*(0.29, 0.77) | 0.60 \*\*\*\*(0.28, 0.91) |
|
| 17. I know *how* to refer to a dietitian | 4.1 (1.3) | 4.5 (0.9) | 0.41 \*\*\*(0.18, 0.65) | 0.37 \*\*(0.09, 0.65) |
|
| 18. I know when a patient is at risk of malnutrition or is malnourished | 3.4 (1.2) | 4.0 (1.0) | 0.58 \*\*\*\*(0.36, 0.81) | 0.39 \*(0.09, 0.69) |
|
| 19. I know some strategies to support food intake at meals | 3.5 (1.1) | 4.0 (1.0) | 0.50 \*\*\*\*(0.28, 0.72) | 0.28(-0.01, 0.57) |
|
| 20. I need more training to better support the nutrition needs of my patients | 3.7 (1.2) | 3.2 (1.1) | -0.51 \*\*\*\*(-0.76, -0.26) | -0.60 \*\*\*(-0.94, -0.26) |
|
| **Total KA score (out of 100)** | **78.2****(9.8)** | **80.6****(7.8)** | **2.4** \***(0.51, 4.28)** | **0.35** **(-1.60, 2.30)** |
|

^Reverse coded questions, negative difference indicates improvement at T2

\* <0.05, \*\* <0.01, \*\*\*<0.001, \*\*\*\*<0.0001

T1, Time 1; T2, Time 2; KA, knowledge, attitudes

**Table 3:** Mean difference scores comparing practice score for T2 to T1 for all responses and for paired responses.

|  |  |  |  |
| --- | --- | --- | --- |
| **Questions** | **Mean practice scores out of 4**(Standard Deviation) | **Mean difference T2-T1****T1 n=189****T2 n=147**(95% Confidence Interval) | **Mean difference T2-T1 Paired Responses****n=57**(95% Confidence Interval) |
| **T1**  | **T2** |
| 1. Check the patient has all that they need to eat (e.g. dentures, glasses) | 2.3 (1.5) | 3.0 (1.2) | 0.64 \*\*\*\*(0.35, 0.92) | 0.18 (-0.09, 0.44) |
|
| 2. Help a patient with opening food packages  | 2.8 (1.4) | 3.2 (1.1) | 0.44 \*\*\*(0.18, 0.70) | 0.04(-0.18, 0.25)  |
|
| 3. Assist a patient to eat if they need help | 2.3 (1.5) | 2.8 (1.3) | 0.45 \*\*(0.15, 0.76) | 0.05(-0.22, 0.32)  |
|
| 4. If permitted, encourage a patient’s family to bring food from home for the patient | 2.4 (1.3) | 2.9 (1.2) | 0.53 \*\*\*\*(0.26, 0.79) | 0.11 (-0.12, 0.33) |
|
| 5. Visit and check a patient during their meal time to see how well they are eating | 2.1 (1.5) | 2.6 (1.3) | 0.54 \*\*\*\*(0.24, 0.84) | 0.18 (-0.10, 0.45) |
|
| 6. Realign my tasks so I do not interrupt a patient during their meal time | 2.2 (1.3) | 2.8 (1.1) | 0.55 \*\*\*\*(0.29, 0.81) | 0.25 (-0.07, 0.56) |
|
| 7. At discharge of a malnourished patient, provide the patient or family with nutrition education material  | 1.3 (1.1) | 1.8 (1.2) | 0.43 \*\*(0.18, 0.69) | 0.23 (0.00, 0.46) |
|
| **Total Practice Score (out of 28)** | **15.4**(7.6) | **19.0**(6.5) | **3.57** \*\*\*\***(2.06, 5.09)** | **1.02** (-0.32, 2.35) |
|
| **Total KAP score (out of 128)** | **93.6**(14.2) | **99.5**(11.5) | **5.97** \*\*\*\***(3.21, 8.73)** | **1.37** (-1.45, 4.19) |
|

\* <0.05, \*\* <0.01, \*\*\*<0.001, \*\*\*\*<0.0001

T1, Time 1; T2, Time 2; KAP, knowledge, attitudes, practices.

**Table 4:** Recognition of change on the unit and support provided contrasting unpaired T2, paired samples, and KAP scores.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Frequencies for** **% (numerator)** | **Median Scores**  | **Median KA total (out of 100)** | **Median Practice total (out of 28)** | **Median KAP total (out of 128)** |
| **T2 only** **n=147** | **Paired sample****n=57** | **T2 only****n=147** | **Paired sample****n=57** | **T2 only****n=147** | **Paired sample****n=57** | **T2 only****n=147** | **Paired sample****n=57** | **T2 only****n=147** | **Paired sample****n=57** |
| **1. Have you noticed any change in nutrition care practice on the study unit over the past year?** |
| Yes, positive change noticed | 70% (102)+ | 72% (41) | - | - | 83^\*\* | 83 | 21\* | 19 | 103\*\* | 102 |
| Positive and negative changes | 12% (18)+ | 7% (4) | - | - | 82.5 | 75 | 22 | 22 | 103 | 90.5 |
| No change noticed | 17% (25)+ | 19% (11) | - | - | 77^ | 75 | 18\* | 13 | 95 | 92 |
| Negative change noticed | 1% (1)+ | 2% (1) | - | - | 71 | - | 23 | - | 94 | - |
| **2. On a scale of 1 (low/poor/negative) to 10 (high/good/positive), rank how the change you noticed …** |
| *a. Impacted patients’ overall health and recovery* |
| Yes (7 +)  | 67% (98)+ | 65% (37)+ | 7/10 | 7/10 | 83\*\*\*\* | 83 | 21\* | 20 | 104\*\*\*\* | 103 |
| No (<7)  | 33% (48)+ | 33%(19)+ | 77 | 77 | 19 | 15 | 95.5 | 92 |
| *b. Affected your job satisfaction* |
| Yes (7 +) | 63% (92)+ | 60% (34)+ | 7.5/10 | 7/10 | 83\*\*\* | 83 | 21\* | 20 | 104\*\*\*\* | 102.5 |
| No (<7)  | 37% (54)+ | 39% (22)+ | 77.5 | 78.5 | 19\* | 16 | 97.5 | 96 |
| *c. Provided overall value to the unit* |
| Yes (7 +) | 81% (83)+ | 75% (43)+ | 8/10 | 8/10 | 83\*\*\*\* | 83 | 21\* | 20 | 104\*\*\*\* | 103 |
| No (<7)  | 14% (20)+ | 23% (13)+ | 76 | 75 | 18.5\* | 15 | 93.5 | 90 |
| **3. On a scale of 1 (lower) to 10 (higher), rate the focus of this unit on nutrition care as compared to one year ago?** |
| High focus (7+) | 84% (122)+ | 84% (48)++ | 8.5/10 | 9/10 | 83\*\*\* | 83 | 21 | 19 | 103\*\* | 101.5 |
|  Lower focus (< 7) | 16% (24)+ | 12% (7)++ | 76.5 | 69 | 19.5 | 15 | 92.5 | 84 |
| **4. On a scale of 1 (low/poor) to 10 (high), rate how supported you felt to make changes to nutrition care over the past year?** |
| Yes, supported (7 +) | 79.5% (116)+ | 79% (45)++ | 8/10 | 8/10 | 83\*\*\*\* | 83 | 21\*\* | 19 | 104\*\*\*\* | 102 |
| Not supported (<7) | 20.5% (30)+ | 17.5% (10)++ | 76 | 71.5 | 16.5 | 14 | 91.5 | 85 |
| **6. Please rate your agreement with each of the following statements (Strongly Disagree, Somewhat Disagree, Neutral, Somewhat Agree, Strongly Agree)** |
| *a. I was aware that changes were occurring regarding nutrition care on the study unit* |
| Agree | 91% (132)++ | 91% (52)++ | 5 (strongly agree) | 5 (strongly agree) | 82 | 82.5 | 20.5 | 19 | 102 | 100.5 |
| Disagree/ Neutral | 9% (13)++ | 5% (3)++ | 78 | 77 | 21 | 20 | 100 | 90 |
| *b. I was asked what changes to nutrition care I wanted to see on the unit* |
| Agree | 67% (97)++ | 77% (44)++ | 4 (some-what agree) | 4 (some-what agree) | 83\*\*\*\* | 83 | 21 | 19.5 | 104\*\*\*\* | 102.5 |
| Disagree/Neutral | 33% (48)++ | 19% (11)++ | 77 | 74 | 19 | 13 | 97 | 90 |
| *c. I was involved in planning and making changes to nutrition care on the unit* |
| Agree | 59% (86)++ | 63% (36)++ | 4 (some-what agree) | 4 (some-what agree) | 83\*\*\*\* | 83.5 | 21\* | 20 | 104\*\*\*\* | 103.5 |
| Disagree/Neutral | 41% (59)++ | 32% (18)++ | 78 | 78 | 20\* | 13 | 97 | 90.5 |

+ Missing n=1, ++ Missing n=2

\* <0.05, \*\* <0.01, \*\*\*<0.001, \*\*\*\*<0.0001

T1, Time 1; T2, Time 2; KA, knowledge, attitude; KAP, knowledge, attitudes, practices.

^ Comparison between Yes, positive change noted, and No change noticed. Negative change noticed and positive/negative changes noticed were not included in this comparison due to the small number of responses and categorization with either a yes or no response was considered logical.

**Table 5:** Perception of proportion of patients screened, referred and receiving appropriate care compared by paired and unpaired samples.

|  |  |  |
| --- | --- | --- |
|  | **Frequencies for Unpaired Sample****% (numerator)****n=146**++ | **Frequencies for Paired Sample****% (numerator)****n=57**++ |
| **5. *What proportion of patients at your hospital are:*** |
| *a. Screened for nutrition risk?* |
| None | 1% (1) | 0 |
| Less than 10% | 1% (1) | 0 |
| 11-49% | 6% (9) | 7% (4) |
| 50-74% | 14.5% (21) | 11% (6) |
| 75-100% | 48% (69) | 54.5% (30) |
| Don’t Know | 30% (44) | 27% (15) |
| *b. Referred to a dietitian if they are thought to be at nutrition risk* |
| None | 1% (1) | 0 |
| Less than 10% | 1% (2) | 2% (1)  |
| 11-49% | 8% (11) | 9% (5) |
| 50-74% | 14.5% (21) | 18% (10) |
| 75-100% | 54% (78) | 51% (28) |
| Don’t Know | 22% (32) | 20% (11) |
| *c. Received appropriate nutrition care following identification of nutrition risk* |
| None | 0 | 0 |
| Less than 10% | 1% (1) | 2% (1) |
| 11-49% | 3% (5) | 4% (2) |
| 50-74% | 12% (18) | 14.5% (8) |
| 75-100% | 60% (87) | 51% (28) |
| Don’t Know | 23% (34)  | 20% (11) |

++ Missing n=2