Abstract

Aim: Limited research exists on how consistently dietitians are identifying refeeding syndrome risk in hospitalised patients. We aimed to describe how consistently Australian and New Zealand dietitians are at identifying refeeding syndrome risk and compare their responses to the application of refeeding syndrome guidelines and patients' electrolyte levels and supplementation provided.

Methods: Dietitians from Australia and New Zealand were invited to complete an online survey. The survey inquired about demographics and asked respondents to classify the level of refeeding syndrome risk (i.e. none, some, high) in 13 case studies. Electrolytes and supplementation data were sourced from electronic patient records. Descriptive statistics and t-tests were conducted.

Results: Two hundred and ninety-nine eligible people responded (33±9 years, 95%F, 48% had ≥7yrs of dietetic experience, 91% working clinically, 87% Australian). Respondents' answers were generally consistent and dietitians often reported the same level of refeeding syndrome risk as the application of NICE guidelines and patient electrolytes (49-98%). Respondents requested feedback on their responses, more detailed case information, and commented on factors that may influence their risk identification, including subsequent medical management and route of nutritional delivery.

Conclusions: Dietitians were generally consistent in the identification of refeeding syndrome risk. Dietitians often reported similar levels of refeeding syndrome risk to those found with the application of refeeding guidelines and patient electrolytes and supplementation treatment. Evaluation of practise was valued by dietitians. Enhancing

the evidence on which guidelines are based may improve translatability of guidelines to practice.

Key words: refeeding syndrome, risk, identification, dietitians, dietetic practise

Introduction

Refeeding Syndrome is the occurrence of severe fluid and electrolyte shifts and their associated complications in malnourished patients undergoing refeeding either orally, enterally or parenterally.[1] These effects have been well recognized since the 1940s and can result in serious and even fatal consequences if not identified, monitored and treated correctly.[2]

The UK National Institute for Clinical Excellence (NICE) refeeding guideline[3] is well recognised and may aid dietitians in the identification of at-risk patients. However it is based on low level evidence. How consistently dietitians are identifying refeeding syndrome risk has been evaluated only twice previously.[2, 4] London dietitians reported a lower level of refeeding syndrome risk in enteral feeding case studies when compared with the formal application of the NICE guidelines but generally chose the same (or adjacent) answer as the NICE guidelines over 85% of the time.[2] Similar results were found in Australian student and newly graduated dietitians who reviewed both oral and enteral feeding cases.[4] Further research that evaluates dietetic practice would be beneficial to ensure consistent identification of patients occurs both locally and internationally.

Given the limited evidence available, this study aimed to describe how consistently Australian and New Zealand dietitians are at identifying refeeding syndrome risk and compare their responses to the risk levels found after the application of refeeding syndrome guidelines and checking patients' electrolyte levels and supplementation treatment.

Methods

Ethical approval was obtained from the Metro South Hospital and Health Service Human Research Ethics Committee (HREC/14/QPAH/173) prior to the commencement of data collection. The provisions of the Declaration of Helsinki were followed and participants gave informed consent. These methods have been previously published for the survey of student and newly graduated dietitians.[4]

Participant Eligibility

Eligible participants were accredited dietitians or provisionally accredited dietitians who were practising in Australia or New Zealand. Participants were excluded if they were not working in either Australia or New Zealand, were a student dietitian or if the survey questions were not completed.

Survey Distribution

A weblink to the online survey was sent to all members of the Dietitians Association of Australia and the Dietitians New Zealand via an emailed newsletter, and via email to targeted members of specialist interest groups (e.g. Nutrition Support, Gastroenterology, Oncology, Eating Disorders) within the Dietitians Association of Australia. The survey was also advertised on 'Dietitian Connection' (www.dietitianconnection.com). Potential participants were given two weeks to complete the survey.

The survey was distributed using Lime Survey, version 1.9x. Survey piloting was completed by 11 people, including university students, nutrition lecturers and experienced dietitians.

Data Collection

The survey included 10 demographic or professional questions (e.g. years of experience, dietetic practice area) and 13 case studies. Respondents were asked to read the 13 case studies and record whether the patient was at risk of refeeding syndrome (i.e. 'no risk,' 'some risk,' or 'high risk' of refeeding syndrome). Matthews et al[4] previously published the first 10 case studies. These were summaries of medical histories from recent hospital inpatients who received oral nutrition intake and were admitted to acute medical or surgical wards. The final three enteral feeding case studies were previously published by Wagstaff[2] (i.e. Patient 1 in Wagstaff is Case 11 in our study, Patient 2 is Case 12, and Patient 3 is Case 13). After completion of the case study questions, respondents could opt to record any comments in an open-ended comments box.

Additionally, NICE guidelines were applied independently by two research dietitians to the 13 case studies, and a level of refeeding syndrome risk was determined. When there were discrepancies in the classification of refeeding syndrome risk after the application of the NICE guidelines, a third dietitian independently applied the guidelines to the case studies and discussions were held until agreement was reached. NICE guidelines provided criteria for 'some risk' which was "eaten little or nothing for more than five days and/or likely to eat nothing for the next five days or longer", or "poor absorptive capacity, and/or high nutrient losses and/or increased nutritional needs from causes such as catabolism".[3] The NICE guidelines category of 'extremely high risk'[3] was grouped with 'high risk'. For each case study, respondents' answers were assigned a score of 1 if they reported the same refeeding risk level as the risk level determined after the application of the NICE guidelines. A score of 0 was assigned if the dietitian's reported risk level was not the same. Respondents were therefore able to produce a score of up to 13.

Patients' electrolyte levels and any supplementation treatment received for the seven days following their initial dietetic assessment was also reviewed for the first 10 case studies. Patient data was sourced from electronic medical records and was used to determine level of refeeding syndrome risk. A case study was classified as 'high risk' of refeeding syndrome if the patient's potassium, magnesium, or phosphate level was low, or supplementation of these electrolytes was provided. Low electrolyte levels were defined as potassium <3.5mmol/L, magnesium <0.7mmol/L and phosphate <0.81mmol/L.[5] If electrolytes remained within normal limits and no supplementation was prescribed, the case study was classified as 'no risk' of refeeding syndrome. As electrolytes were not tested in two case studies, the level of refeeding risk in these two cases could not be obtained. For each case study, respondents' answers were assigned a score of 1 if their response was the same as the risk level from patients' electrolyte levels and supplementation treatment. A score of 0 was assigned if the dietitian's reported risk level was not the same. Respondents were therefore able to produce a score of up to eight.

Medical charts were also reviewed in the first 10 case studies to see if any other factors (e.g. medications, patient conditions) might explain low patient electrolyte levels or the provision of electrolyte supplementation.

Membership statistics at time of survey administration were sought from Dietitians Association of Australia and Dietitians New Zealand via email.

Data Analysis

All survey data was analysed in SPSS version 22.0 for Windows. An alpha level was set at $p<0.05$. Descriptive statistics were used to summarise respondents' demographics and the responses from the case studies. Independent t-tests were used to assess whether respondents who were more likely to choose levels of refeeding risk similar to risk levels found after the application of guidelines and patients' electrolyte levels and supplementation treatment received differed according to their demographics. Respondents' comments were grouped according to similar themes.

Results

Three hundred and seventy-one survey responses were received and 299 eligible responses were included. Survey responses were excluded if respondents were students (n=6), respondents reported living outside of Australia or New Zealand (n=5), or the majority of the survey questions were not completed (n=61).

Eligible responses were received from 40 New Zealand dietitians (13%, n=40/299) and 259 Australian dietitians (87%, n=259/299). At the time of survey administration, the Dietitians New Zealand reported 583 members on 04/08/2014 (email correspondence, Dietitians New Zealand, 10th September 2014), and Dietitians Association of Australia reported 4159 accredited members, with an additional 1013 Australian members being provisional accredited practising dietitians (email correspondence, Dietitians Association of Australia, 23rd October 2014). The total survey response as a proportion of total membership from accredited dietitians in both countries was 5% (n=299/5755). Additional member information were unable to be obtained from dietetic associations.

Respondents' characteristics:

Respondents were predominantly female (95%) and aged 33±9 years (Table 1). Dietetic experience varied between respondents with 48% having at least seven years of experience as an accredited dietitian. Most respondents worked in a hospital setting (83%), in a clinical role (91%), for more than 20 hours per week (85%) and in a metro or large urban location (71%). In the two months prior to survey completion, half (51%) of respondents had read refeeding syndrome guidelines and 19% had read the NICE guidelines.

Comparing dietitians' responses with the application of NICE guidelines, and patients' electrolyte levels or supplementation treatment.

Respondents reported the same level of refeeding syndrome risk as the application of the NICE guidelines in (mean±SD) 7.9±1.5 of 13 case studies. Respondents also reported the same level of refeeding risk as patients' electrolyte levels and supplementation treatment in 4.5±1.1 of 8 case studies (patient electrolytes were not measured in two case studies).

For nine out of 13 case studies, the majority response reported by dietitians (48-98%) was the same level of refeeding syndrome risk as the application of guidelines and/or patients' electrolytes and supplementation treatment (Table 2). In the remaining four case studies (cases 1, 2, 7 & 8), the risk level reported by the majority of dietitians was lower than the risk level found after the application of the NICE guidelines in two cases (cases 1 & 2).

Additionally, patients had low electrolyte levels and may have been provided with supplementation in five case studies (cases 2, 7, 5, 9 & 10). However, reasons other than refeeding syndrome likely explain reductions in electrolytes or the need for supplementation in four of these cases (cases 2, 7, 9 & 10). Dietitians recognised this in two out of the four case studies as the majority of respondents did not report a high risk of refeeding syndrome (cases 2 & 7). Few dietitians (<11%) reported a high risk of refeeding syndrome in the two case studies that did not measure patient electrolytes (cases 1 & 4).

The number of times that respondents reported the same level of refeeding syndrome risk as the application of the NICE guidelines or patient electrolytes and supplementation provision generally did not differ according to their demographics ($p>0.05$, Table 3). Dietitians working in clinical areas and working in Australia may select the same level of refeeding syndrome risk as the application of the NICE guidelines on one more occasion than those working in non-clinical areas or in New Zealand, respectively ($p<0.05$).

Consistency of respondents' answers:

Dietitians showed high consistency across case studies (Table 2). In each case study, at least 48% (48-98%) of respondents selected the same risk level. Additionally, less than 15% of respondents selected the risk level furthest away from the majority response.

Respondents' comments

Forty-nine respondents provided comments at the end of the survey (17%, n=49/293). Thirty-one percent (n=15/49) of respondents requested answers to the survey questions with comments such as "*I would be interested to know how I scored!*" Eight percent (n=4/49) of respondents also commented that the survey was a useful exercise as "*I enjoyed the case study aspect of the survey*", and that continuing professional development on refeeding syndrome might be beneficial as "*It was difficult to decide whether some of the patients were at moderate or high risk of refeeding syndrome. A workshop on this topic would be helpful.*"

Twenty-two percent (n=11/49) of respondents requested more information to be provided in the case studies. Requests for more information focussed on intake, whether

patient was for oral or artificial intake, biochemistry and intravenous fluid provision at time of nutritional assessment. For example, "*some of the questions were ambiguous and did not provide enough information to make a clinical decision*", "*some answers will vary depending on interpretation of terms such as minimal / poor intake*", and "'*Without more information to clarify intake, anyone taking this survey may be tempted to always say the patient is at some risk (just to cover themselves) whereas in reality, a good dietitian will investigate intake further at the time of initial assessment and hopefully avoid over (or under) diagnosing refeeding risk.*" Additionally, fourteen percent (n=7/49) of respondents requested definitions of the refeeding risk categories, particularly 'some' risk. For example, "*When you state 'some risk of refeeding' vs. 'high risk', I'm not really sure what you are asking.*"

Ten percent (n=5/49) commented that variations in the medical monitoring of refeeding syndrome in their clinical setting and in patients receiving oral instead of enteral or parenteral nutrition may influence their decision making regarding refeeding risk. For example, "*I only worry about it [refeeding syndrome] if the patient is for enteral/parenteral feeding or has a mental health condition. I haven't seen good evidence in oral interventions.*" Also, "*Lack of knowledge or support from doctors and medical team re: refeeding syndrome is an issue.*"

Finally, twelve percent (n=7/49) of respondents made reference to refeeding guidelines, particularly with regards to use in practice or to request consensus guidelines. For example, "*The NICE guidelines are followed at this hospital.*" Also, "*Consensus guidelines for the diagnosis and management of refeeding syndrome would be good.*" One respondent suggested that International Dietetics and Nutrition Terminology include refeeding syndrome to assist with improving documentation as "*..the current*

guidelines don't really allow for proper use of PES [problem, etiology, signs and symptoms] statements for us when clearly it's our role to identify refeeding syndrome risk."

Discussion

This study described dietitians' consistency with the identification of refeeding syndrome risk in both enteral and oral nutrition case studies and compared dietitians' responses to the application of refeeding syndrome guidelines and patients' electrolyte levels and supplementation provided.

Dietitians with varying degrees of experience may consistently assess refeeding syndrome risk. Similar findings were noted previously among student and newly graduated dietitians.[4] Similar responses between student dietitians and experienced dietitians suggest that interpretation of refeeding guidelines may be uniform despite clinical experience. However the risk identification process may be further enhanced if refeeding guidelines[3] were based on higher level evidence.

Dietitians' responses were also consistent with London dietitians previously surveyed in Wagstaff[2] for two out of three enteral feeding case studies. In case study 13, more Australian and New Zealand dietitians reported high risk than London dietitians,[2] possibly as the patient was being fed enterally and the description of 'minimal [dietary] intake' is open to interpretation. Whereas case studies 11 and 12 both stated 'nil by mouth'. Dietitians in our study requested more detailed information regarding dietary intake in the comments, and are more likely to be concerned about refeeding risk when patients are being fed enterally or parenterally. Previous evidence suggests that these patients are at higher risk than orally fed patients.[11] Dietitians in our study also commented that their risk identification may be influenced by variations in medical support. Dietitians in Australian and New Zealand may be more likely to be conservative in their identification of refeeding risk if previous dietary intake and

medical management is uncertain when compared to London dietitians. We did not investigate how dietitians would then treat patients identified as at risk of refeeding syndrome. Differences between countries in the identification of refeeding syndrome may not result in differences in the nutrition treatment provided. Care should be taken not to unnecessarily delay treatment of malnutrition.

Clinical dietitians were more likely to report risk levels that agreed with the application of refeeding guidelines than dietitians working in non-clinical areas. As refeeding syndrome mainly occurs in the acute setting,[3] clinical dietitians may be more familiar with refeeding guidelines as it relates to their workload. Given that a high proportion of respondents (91%) were clinical dietitians, this might also explain why 51% of dietitians reported having read refeeding guidelines within the last two months. However, dietitians may have opted to read the refeeding guidelines just prior to completing the survey in order to improve their chances of getting the "correct" answer, as suggested by comments such as "I would be interested to know how I scored". This might also explain why dietitians' responses were generally consistent and similar to the risk level found after the application of refeeding guidelines. Students or newly graduated dietitians were more likely to report similar risk levels to those found with refeeding guidelines when they had reviewed a patient at risk of refeeding syndrome[4], suggesting that clinical exposure is still important. However, dietitians working in non-clinical areas also regularly selected risk levels that were similar to those found after the application of refeeding guidelines. All dietitians have clinical exposure as it is a requirement that they are trained in an acute setting.[6, 7]

Variation in dietitians' responses might be partly explained by a lack of definition of the 'some risk' category. Respondents also commented that a definition of 'some risk' was

not provided. Wagstaff[2] used the same risk categories to survey dietitians, along with 'extreme risk', however did not define these categories. NICE guidelines provide definitions for higher risk patients,[3] but currently do not provide guidance on moderate risk patients, including those solely receiving oral nutrition.

We also used short clinical case studies in our survey to maximise the number of complete responses received. However the limited case information provided may also explain variation in dietitians' responses. Dietitians commented that more information was needed in case studies to make an assessment, particularly regarding dietary intake, biochemistry and nutritional management. However in acute settings necessary patient information is not always available.[8, 9] Our case studies may therefore be generalisable to many clinical settings where patients may be poor historians or unable to provide the level of detail required, such as due to dementia.[10] Refeeding guidelines that provide guidance to assess refeeding risk when not all information is available to dietitians may be useful in acute care settings.

While evaluation of consistency of dietetic practise is not often published, dietitians requested feedback on their responses and reported that workshops and case-based learning may be beneficial. As a profession, accredited dietitians may value feedback about their practice due to the culture of continuing professional development regulated through dietetic associations.[7, 12] Future workshops or surveys could be valuable components of department or individual professional development practices in order to improve or maintain skills in identifying at-risk patients. Evaluation of practise also provides an avenue for valuable feedback, such as having a refeeding syndrome term in International Dietetics and Nutrition Terminology[13] to encourage consistent dietetic documentation of refeeding syndrome risk.

The strengths of this study include the larger sample size (n=299) compared with Wagstaff[2] (n=168) and Matthews et al[4] (n=53), and the survey of dietitians in different countries. As mentioned previously,[4] we compared dietitians' responses against both patient data and refeeding guidelines. This may be preferable as many clinical dietitians believe the NICE guidelines to be overcautious,[2] and are based on low levels of evidence. However, during the data collection period we advertised mainly to dietitians working within the clinical setting which reduces generalisability of results across the entire dietetics profession. Also, response rates of Australian and New Zealand dietitians was 5%, whereas 30.8% of London dietitians responded in Wagstaff[2]. Our response rate may have been higher if it was compared to only clinical dietitians; however these numbers were not available from dietetic associations when requested. The number of responses from Australian dietitians was also higher than New Zealand dietitians (n=259 vs. n=40), however a similar percentage of members responded to the survey (New Zealand: 7%, n=40/583; Australia: 5%, n=259/5172). Also, the classifications of refeeding risk based on subsequent electrolyte results should be interpreted with caution. Unrelated medical conditions not detailed in the case studies may explain the electrolyte levels and subsequent supplementation treatment observed, such as respiratory alkalosis, malabsorption and chronic kidney disease.[14]

Conclusion

Dietitians' identification of refeeding syndrome risk was generally consistent, and dietitians often reported similar levels of refeeding syndrome risk to those found after the application of refeeding guidelines and patient electrolytes and supplementation treatment. Evaluation of practice was valued by dietitians and suggestions were made for continued professional development in refeeding syndrome. Improving the evidence

that refeeding guidelines are based on and providing guidance when all necessary information may not be available to make an assessment may be beneficial. This may promote accurate and consistent identification of refeeding syndrome risk within the dietetics profession, improve translatability of guidelines to practice and ensure appropriate treatment of malnourished patients.

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Conflict of Interest: The authors have no conflicts of interest.

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