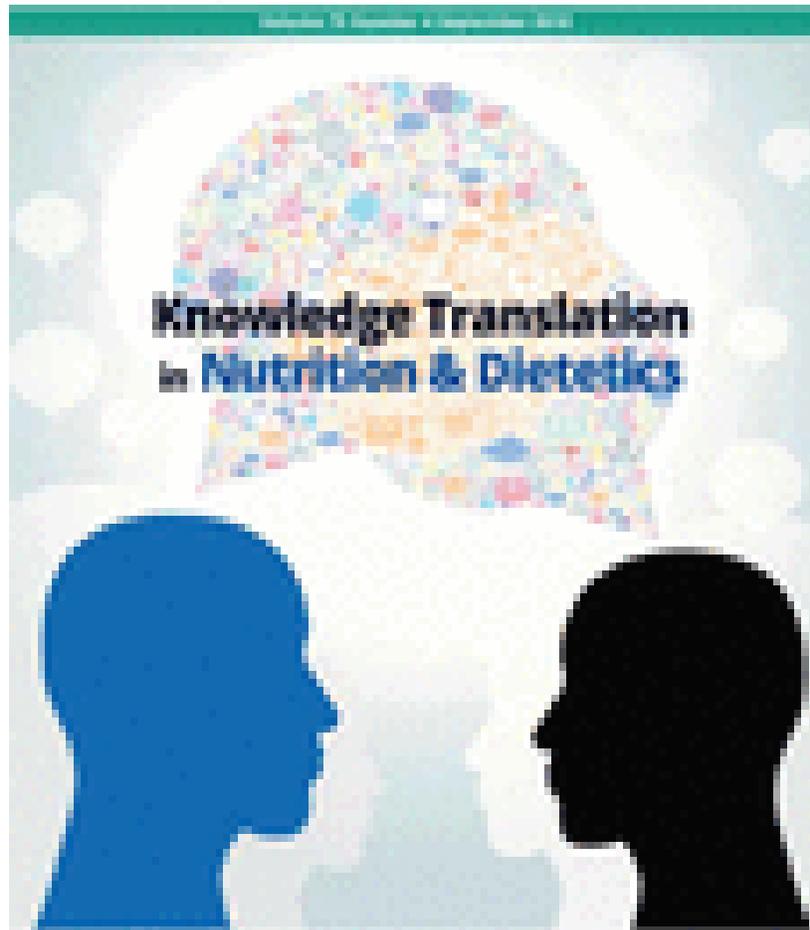


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EDITORIAL

Knowledge translation

Seventeen years. That is the often-quoted figure for approximately how long it takes to incorporate research discoveries into the practice of health-care providers.¹ This lag can be much longer, if at any point from bench or animal studies to human trials, the effects are smaller when tested in larger human trials or inconsistent findings are reported when the studies are replicated.²

Despite spending billions of dollars on clinical research, quality improvement initiatives, clinical practice guideline development, training of health-care professionals and risk assessments, effective interventions and programs do not always reach the patients that could benefit from them.³ The Canadian Institute of Health Research reported that one-third of patients do not receive treatments that are proven to be effective, and one-quarter of patients receive care that is not needed or is potentially harmful.⁴ In a similar analysis, the CareTrack study found that adults in Australia received appropriate care (according to relevant guidelines) only 57% of the time.⁵ In an examination of underuse of effective medical services around the world, failure of practitioners to know about or act upon evidence for a variety of reasons contributed to suffering, disability and loss of life in both low- and high-income countries 'regardless of payment model or health system, and in clinical settings ranging from rural clinics to tertiary hospitals'.⁶

With the current pressures both to deliver evidence-based practice and achieve cost-effective outcomes, dietitians, like the other health-care practitioners with whom they work, are expected to identify and incorporate best evidence into their practices in a timely way and monitor this impact on health outcomes. Addressing the gap between the creation of knowledge and its uptake by stakeholders to create efficiencies in care delivery and improve the health outcomes of individuals and populations has come to be known as knowledge translation (KT).

A more specific definition of KT was developed by the Canadian Institute of Health Research: Knowledge translation is 'a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of Canadians, provide more effective health services and products, and strengthen the health-care system'.⁷ In Europe, it may be referred to as implementation science and while translational research, continuing education and professional development can be part of the knowledge transfer process, they are not synonymous with it.⁸

Graham *et al.*'s Knowledge-to-Action (KTA) framework has been central to KT strategies since its publication in 2006.⁸ The Knowledge Creation component of the framework relates to distilling the vast amount of knowledge available in health care so that the most valid and useful is

accessible to stakeholders. This knowledge is derived from high-quality primary research (knowledge inquiry), the most relevant of which is then replicated, appraised and synthesised in the form of systematic reviews or meta analyses (knowledge synthesis), which are further refined into tools such as clinical practice guidelines, decision aids, care pathways and evidence summaries (tools and products). These final tools are meant to provide clear recommendations to inform and guide the actions of the various stakeholders such as health-care providers, patients and policy-makers. Experiential knowledge can and should be incorporated, as ideally creators of knowledge (researchers) collaborate throughout the process with end-users of the knowledge (stakeholders).

Simply creating evidence, evidence-based programs, policies and guidelines does not ensure their widespread use or adoption. The action part of the KTA framework guides the implementation of the knowledge that has been generated. It is grounded in a review of more than 30 'planned action theories' from social science, education, management and health sciences literature. Graham and Tetroe⁹ define planned action theory as: 'a set of logically interrelated concepts that explain, in a systematic way, the means by which planned change occurs'. They identified 10 action steps from the framework and further distilled them into eight steps:

- Identify a problem that needs addressing
- Identify, review and select the knowledge or research relevant to the problem, for example, practice guidelines or systematic reviews
- Adapt the identified knowledge or research to the local context
- Assess barriers to using the knowledge
- Select, tailor and implement interventions to promote the use of knowledge
- Monitor knowledge use
- Evaluate the outcomes of using the knowledge
- Sustain ongoing knowledge use

Grol remarked that 'evidence-based medicine should be complemented by evidence-based implementation'¹⁰ and while there are gaps in our knowledge about effective strategies for enhancing KT, there are a growing number of resources to inform KT activities. Cochrane has developed a KT framework¹¹ to ensure their reviews are relevant and follow stringent methodological processes and utilise reviews conducted by their Effective Practice and Care Group¹² and Consumer and Communications Review Group¹³ to ensure their KT activities are grounded in best practices for dissemination and uptake. The Appraisal of Guidelines for Research and Evaluation AGREE II Scorecard for rating the quality of clinical practice guidelines has

included ranking on domains relevant to improving their uptake (KT) since 2003.¹⁴

A scoping review by Wilson *et al.*¹⁵ identified that the steps in KT frameworks relating to adapting knowledge to the local context, assessing barriers to knowledge use and implementing interventions to promote knowledge use (referred to as dissemination in his review) were generally underpinned by at least one of the following theories: persuasive communication, diffusion of innovations theory or social marketing. Parks *et al.*¹⁶ provide a detailed methodology for enhancing the dissemination and update of programs and policies to enhance diabetes-related care in local health departments using some of these frameworks. Kastner and Straus illustrate how the knowledge to action framework was used to create a clinical support tool to enhance osteoporosis disease management by primary care providers.¹⁷ Both these examples illustrate KT strategies designed to consider the local practice settings in which the knowledge or innovation will be used.

Another key factor in a KT plan is the identification of barriers to knowledge uptake. Barriers can be individual such as lack of knowledge, skills, time, resistance to change or occur during the interaction between the practitioner and patient.¹⁸ This issue of *Nutrition & Dietetics* includes a report on a pilot study examining empathy scores of Malaysian dietitians using a validated survey tool.¹⁹ If the patient is the target for a particular KT intervention, examining the provider–patient relationship can enhance communication and improve outcomes, the ultimate goal of KT.

Replacing older knowledge with new evidence is another KT challenge.²⁰ Clinical practice guidelines that have been widely adopted into practice and reinforced by institutional care protocols can become resistant to newer evidence, and peer groups whose standards are inconsistent with best practices can make adoption of new knowledge or evidence challenging at an individual level.¹⁸ Mathews *et al.*²¹ explore these phenomena in their examination of dietitians' opinions regarding the prevalence, diagnosis and effective monitoring of refeeding syndrome in 11 countries. Their findings of variability in dietitians' assessment of prevalence of refeeding syndrome and differences in the role dietitians play in diagnosing and monitoring this condition lead them to recommend that updated, international, evidence-based clinical practice guidelines are needed.

Barriers can also arise from organisational, institutional or even environmental factors. Organisational barriers can result from staff turnover and a loss of momentum, lack of institutional support for evidence-based practices, incentives that do not support best practice and a disconnect between multidisciplinary team members or the researcher/educator and the end user of the knowledge or intervention. Young *et al.*²² described a quality improvement initiative designed to improve nutritional and functional outcomes in older patients with or at risk of malnutrition. Using a participatory research approach to engage the multidisciplinary care providers and patients, they conducted a feasibility study to examine local processes related to

discharge planning and follow up. Informed by this experience and enhanced by extensive consultations with stakeholders in the hospital and community environments, they then designed and implemented a dietitian-led discharge planning and follow-up program. While the improvements in nutritional or functional outcomes were modest, the improved communication, collaboration and discharge processes likely contributed to a shorter length of stay.

The introduction of the National Disability Insurance Scheme in Australia is an example of an environmental shift that has implications for dietetic practice, training and workforce planning. Butler *et al.*²³ surveyed course contacts from accredited dietetics programs to gain insight into how disability-related topics were addressed during dietitian undergraduate and postgraduate master's training. The development of policy documents such as role statements and core standards along with online learning modules can be key KT tools to ensure evidence-based practices are taught and practiced by those entering this emerging area of dietetic practice.

While much of the KT literature seeks to address the lag between knowledge generation and actual uptake into practice, Balas and Chapman outline several factors that contribute to situations where overzealous KT and implementation has also lead to harm.²⁰

Describing it as *impulsive adoption* they refer the 2001 clinical trial that concluded that intensive insulin therapy could reduce morbidity and mortality in patients in intensive care units (ICUs).²⁴ The practice was quickly and widely recommended, and its uptake enhanced in USA as some jurisdictions tied reimbursement to protocols advocating for tight control of serum glucose levels. Eight years later, a much larger trial found that intensive glucose control actually increased mortality in patients in the ICU.²⁵ Thousands of unnecessary deaths have been attributed to the overly quick adoption without adequate replication studies confirming the intervention was safe in the diverse patient population seen in the ICU.

*Misguided announcements*²⁰ are particularly problematic in today's social media landscape where unscientific advice, often amplified by celebrity endorsements, can lead to products and interventions being widely adopted or alternatively shunned irrespective of evidence.

*Information overload*²⁰ resulting from so many new studies being published and making headlines, makes it difficult for practitioners to quickly assess the really important ones and implement them in a timely manner. Studies with small sample sizes, large numbers of observational studies being published which are then refuted in subsequent observational studies or randomised control trials can also ultimately discourage the uptake of valuable research by consumers and create mistrust of credible nutrition guidelines.²⁶

Finally, there is a new phenomenon in the KT arena. FOAM or Free Open Access Medical education was named by an international group of emergency physicians and refers to any free online medical education including blogs, podcasts, videos, tweet threads, chats etc.²⁷ While these

reduce the time for research to reach practitioners, others worry that this rapid dissemination may avoid the replication step and lead to harm; that adequate critical appraisal, peer review or editorial oversight may be omitted, or that active, charismatic online practitioners may over-influence the adoption of knowledge, research or innovations into clinical practice.²⁸ FOAM proponents suggest that those concerns can be mitigated by ensuring that clinicians have adequate critical thinking skills and tools to evaluate these online knowledge offerings. They encourage educators and communications experts to work with scientists to utilise these online platforms as rapid dissemination vehicles and engagement platforms.

Dietitians around the world are active in social media and online platforms and are increasingly using them to inform their practice and to share their knowledge with others. Chan *et al.*²⁸ provide a toolkit for interested practitioners to explore how this once 'disruptive' form of knowledge exchange can be used effectively alongside other more traditional KT strategies to enhance the uptake and exchange of knowledge and support evidence-based practice.

Dietitians are both recipients and disseminators of research knowledge. Utilising effective and relevant KT strategies that are tailored to the local circumstances and the target audience can enhance the delivery of care and programs offered by dietitians and improve the health outcomes of those they serve.

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Conflict of interest

The author is Director of PEN: Practice-based Evidence in Nutrition.

Authorship

JT is the sole author of this manuscript.

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ORIGINAL RESEARCH

Early oral feeding after colorectal surgery: A mixed methods study of knowledge translation

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Abstract

Aim: Evidence-based guidelines recommend early oral feeding (EOF) as prescription of an unrestricted diet within 24 hours after colorectal surgery. The present study aimed to understand local postoperative feeding practices after colorectal surgery; identify barriers to EOF implementation; select, tailor and implement stakeholder engagement strategies to facilitate EOF uptake; and evaluate changes to practice.

Methods: A longitudinal, mixed methods study was undertaken, guided by the knowledge-to-action framework. Phase 1 assessed the nature of the problem using postoperative diet Audits 1 and 2. In Phase 2, staff interviews identified barriers to EOF implementation. Results from Phases 1 and 2 were fed back to inform Phase 3 strategies. Knowledge uptake was monitored in Audits 3 and 4. Phase 4 evaluated outcomes from Audit 5.

Results: In Phase 1, median time to commencement of full diet was postoperative Days 4 and 3 in Audits 1 and 2, respectively. Phase 2 identified EOF barriers, including disparities in diet upgrade practices and variable understanding of hospital diets. In Phase 3, planned strategies were implemented to improve EOF (i) educational session describing local hospital diets; (ii) consultant decision to prescribe a full diet on operation notes; and (iii) educational sessions with nursing staff describing changes to EOF practice. In Phase 4, median time to commencement of full diet improved to postoperative Day 0. Patients prescribed a full diet on operation notes increased from 0% to 82%.

Conclusions: The present study successfully identified and overcame local barriers to improve EOF practices to align with guideline recommendations.

Key words: early oral feeding, enhanced recovery after surgery, postoperative care.

Introduction

There is a well-established evidence to suggest that early oral feeding (EOF) within 24 hours of colorectal surgery is safe and well-tolerated.^{1, 2} EOF may also improve patient outcomes after colorectal surgery with a significant reduction in postoperative complications,^{3, 4} postoperative infection,⁵ length of hospital stay,^{4, 5} and mortality.⁶ As such, EOF recommendations have been incorporated into evidence-based guidelines that encourage the prescription

of an unrestricted diet within 24 hours after colorectal surgery.^{1, 2, 7}

Despite established guidelines, the translation of EOF evidence into clinical practice remains an ongoing challenge. Previous literature has described poor adherence to postoperative feeding recommendations, with a higher prevalence of delayed feeding following gastrointestinal procedures.^{8–10} Several reasons to explain this discrepancy have been proposed, including a lack of understanding of the potential benefits, a lack of emphasis on nutrition education within surgical training, and the long-standing unfounded dogma of awaiting return of bowel activity before feeding.^{11, 12}

Effective implementation of enhanced recovery programs requires cultural change to ensure improved communication, teamwork and organisational support. Programs should be adapted to the local context and deliver a data-driven approach highlighting local deficits, perceived barriers to knowledge uptake, and an opportunity to demonstrate effectiveness.^{13, 14} Ultimately, engagement of a multidisciplinary team including both front-line and senior staff is inherent to support structural changes for implementation success and sustainability.^{13–16}

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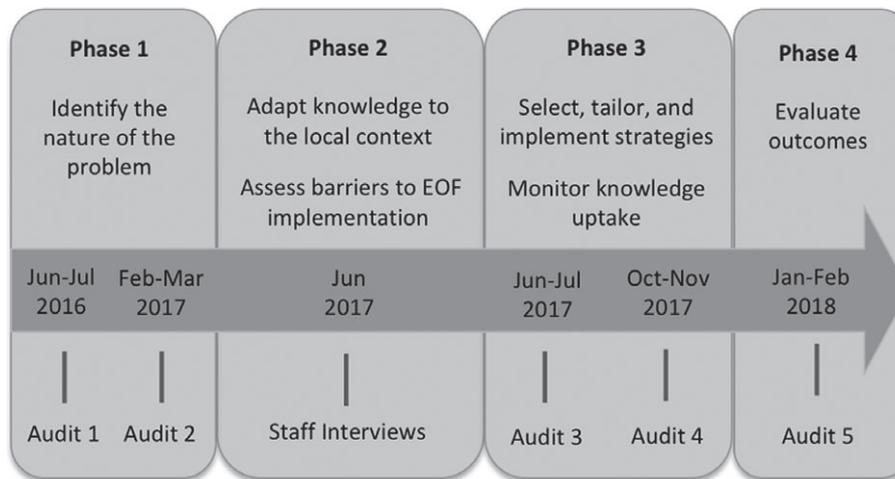


Figure 1 Schematic diagram of study design. Phases align with the action cycle of the knowledge-to-action (KTA) framework¹⁷: Phase 1 identified the nature of the problem; Phase 2 adapted knowledge to the local context and assessed barriers to early oral feeding (EOF) implementation; Phase 3 selected, tailored and implemented stakeholder engagement strategies to improve EOF and monitored knowledge uptake and Phase 4 evaluated outcomes.

The aims of the present study were to:

- 1 Understand local postoperative feeding practices after colorectal surgery
- 2 Identify barriers and enablers to implementation of EOF guideline recommendations
- 3 Select, tailor and implement stakeholder engagement strategies to facilitate EOF uptake
- 4 Evaluate changes to EOF practices

Methods

A longitudinal, mixed methods study, guided by the action cycle of the knowledge-to-action (KTA) framework,¹⁷ was undertaken to evaluate and improve postoperative feeding practices among patients undergoing elective colorectal surgery. The action cycle of the KTA framework represents a planned-action approach designed to deliberately and effectively translate knowledge into practice.¹⁷ Specifically, it entails: (i) identifying the problem and knowledge-to-action gaps; (ii) adapting knowledge to the local context; (iii) assessing barriers to knowledge use; (iv) selecting, tailoring and implementing interventions for knowledge uptake; (v) monitoring knowledge use; (vi) evaluating outcomes; and (vii) sustaining use of knowledge over time. Each phase of the action cycle is influenced by the phases that precede it, outlining a structured yet pragmatic approach used in the present study to design, deliver and evaluate EOF practices (see Figure 1).

The present study was undertaken on a colorectal ward in a large tertiary metropolitan teaching hospital located in Brisbane, Australia. Enhanced Recovery after Surgery (ERAS) guidelines were not formally in use, rather surgeons prescribed feeding and other postoperative decisions following clinical assessment and consultation. The initial postoperative diet was prescribed by the surgeon in the operation notes at completion of surgery, and changes

thereafter occurred during daily morning ward rounds. Integrated electronic medical records and an electronic foodservice management system (CBORD) were in operation at the hospital.

The established ward dietitian was assigned as an EOF champion in June 2016 and was responsible for undertaking the present study over the project timeline. De-identified audit data, which included access to hospital medical records, were collected as part of standard review practices within the hospital health service. The study was approved by the Gold Coast Hospital and Health Service Human Research Ethics Committee (FHREC/17/QGC/101).

Phase 1—Identifying the nature of the problem: Postoperative diet information was retrospectively audited on 2 occasions in June–July 2016 and February–March 2017 (Figure 1). During this period evidence-based practice guidelines were introduced to the colorectal ward, however, no organised intervention was implemented. Audits 1 and 2 were completed to assess any changes to practice within a real world clinical setting prior to commencement of staff engagement. All consecutive adult patients who underwent an elective bowel resection or stoma reversal were included. Patients were not included in the study if they underwent an emergent procedure or surgery for management of Pseudomyxoma Peritonei (PMP). Patients were excluded from data analysis because of: (i) postoperative ICU admission; (ii) return to theatre or (iii) complicated by prolonged postoperative ileus requiring nasogastric tube decompression.

Postoperative diets for each patient were monitored until a full diet was commenced. This included: (i) the initial diet prescribed by the surgeon in the operation notes at completion of surgery; (ii) the diet received on the ward on postoperative Day 0; (iii) the postoperative day the patient was commenced on a free fluid diet; and (iv) the postoperative day the patient was commenced on a full (i.e. unrestrictive) diet. Data were retrieved from online medical records and

Table 1 Key measures of early oral feeding practice across five audits over an 18-month period

| | Phase 1 | | Phase 3 | | Phase 4 |
|---|--|---|--|---|---|
| | Audit 1, June–July 2016 (n = 23) | Audit 2, February–March 2017 (n = 20) | Audit 3, June–July 2017 (n = 31) | Audit 4, October–November 2017 (n = 28) | Audit 5, February–March 2018 (n = 28) |
| Postoperative day commenced on a full diet, median (range) | 4 (2–7) | 3 (1–7) | 2 (0–5) | 1 (0–3) | 0 (0–5) |
| Number of patients prescribed a free fluid or clear fluid diet on the operation note, n (%) | 23 (100) | 20 (100) | 27 (87) | 11 (39) | 5 (18) |
| Number of patients prescribed a full diet on the operation note, n (%) | 0 (0) | 0 (0) | 4 (12) | 17 (61) | 23 (82) |
| Number of patients who received a full diet on postoperative Day 0, n (%) | 0 (0) | 0 (0) | 3 (10) | 12 (43) | 20 (71) |

the hospital electronic foodservice management system. To most accurately reflect dietary changes made during daily surgical ward rounds, the recorded diet code was that which was entered prior to midday each day. Quantitative data were input into Microsoft Office Excel 2003 and analysed using descriptive statistics. All continuous data were tested for normality using GraphPad Prism software (V5.03; GraphPad Software Inc., La Jolla, CA, USA), and presented as median (interquartile range).

Phase 2—Adapting knowledge to the local context and assessing barriers to EOF implementation: Colorectal consultants, surgical trainees, junior medical doctors and nursing staff directly involved in the care of patients undergoing colorectal surgery at the study site during June 2017 were eligible to participate in semistructured interviews. Eligible participants were approached by the EOF champion and provided written consent in line with ethics approval. Within this key phase of the KTA cycle, the Theoretical Domains Framework (TDF) was used to develop a semistructured interview guide (Appendix 1) and gather a more comprehensive understanding of the barriers and enablers surrounding postoperative feeding practices. Consisting of 14 domains, the TDF is a validated, integrative framework that has been widely used to identify influences on health professional behaviour and barriers to practice change within translational research.¹⁸ Interviews were conducted individually on-site at a time convenient to participants, were audio recorded and later transcribed verbatim. There was no pre-conceived hypothesis for why EOF guidelines were not being met and so an exploratory approach to inductive thematic analysis¹⁹ was used to identify emergent themes and then categorise these themes as barriers or enablers to EOF. Themes were crosschecked by secondary analysts and triangulated for consistency and validation of interpretations. Alongside staff interviews, the EOF champion also attended colorectal ward rounds and weekly multidisciplinary team meetings from June 2017 onwards.

Phase 3—Selecting, tailoring, implementing stakeholder engagement strategies and monitoring knowledge use: The

content of Phase 3 methodology was informed by the results of Phases 1 and 2. Upon completion of Phases 1 and 2, the EOF champion facilitated a group feedback session with colorectal surgical staff and clinical nurse consultant (CNC) during a multidisciplinary team meeting. Phase 1 audit data identifying the nature of the problem were disseminated alongside barriers and enablers to EOF implementation identified from Phase 2 interview outcomes. The EOF champion facilitated discussion among participants, leading to the development of planned education and implementation strategies targeted to improve EOF practices. Knowledge use and practice change during Phase 3 strategies were monitored by Audits 3 and 4, completed in June–July 2017 and October–November 2017. Audits were conducted using the same methodology outlined in Phase 1.

Phase 4—Evaluating outcomes: Audit 5 was completed in January–February 2018 to evaluate outcomes upon completion of Phase 3 strategies, and likewise followed the audit methodology outlined in Phase 1.

Results

Data from 164 patients were included to the five study audits. Thirty-four patients were subsequently excluded from data analysis because of: (i) postoperative ICU admission (n = 13); (ii) return to theatre (n = 3); (iii) complicated by prolonged postoperative ileus requiring nasogastric tube decompression (n = 18). Audit data over the study timeline is summarised in Table 1.

Phase 1—Identifying the nature of the problem: During Phase 1, the median time to full diet was postoperative Day 4 (range 2–7 days) and postoperative Day 3 (range 1–7 days) in Audits 1 and 2, respectively, indicating sustained delay in commencing unrestricted eating after surgery. Patients returning from theatre were typically prescribed a clear fluid or free fluid diet, and upgraded accordingly. In neither audit were patients prescribed a full diet immediately after surgery or on postoperative Day 0.

Phase 2—Adapting knowledge to the local context and assessing barriers to EOF implementation: Sixteen staff participated in interviews, lasting 15–20 minutes each. Staff included six surgical consultants, one surgical fellow, two surgical trainees (Principal House Officer/Registrar), three junior medical doctors (two interns and one Junior House Officer), one CNC, one clinical nurse and two registered nurses. All colorectal consultants on staff completed interviews. Six key themes were identified from the interview results; two manifesting as enablers and four as barriers to EOF:

1 *Broad awareness and strong cultural acceptance of the benefit of EOF*

Among colorectal consultants, there was widespread awareness of changing historical practices and support for ERAS initiatives and similar fast track surgical pathways recommending EOF after surgery.

‘If it’s in those protocols then it must be safe... and with good evidence supporting it. So I’m a big fan of early oral feeding.’ (Consultant 1)

‘So early oral feeding is the way of ... when I was training it was the way of the future, and now it’s the way of the present because we know that early oral feeding leads to shorter length of stay, early physiological return to normal, and essentially providing the gut with its trophic feeding’. (Consultant 2)

2 *Wide acceptance of an elective surgery EOF pathway with ability to opt-out for complicated cases*

Consistent with practice guidelines, colorectal surgical staff were supportive of implementing EOF in uncomplicated elective colorectal patients as this was deemed best practice surgical care. Emphasis was placed on the education process surrounding patients and ward staff to ensure the implementation process was accurately communicated and any patients experiencing complications were identified and managed appropriately.

‘I think a pathway is a good idea ... but there has to be an education process ... it’s education of nursing staff and education of junior doctors.’ (Consultant 3)

‘I think it would be good, but we also need to recognise those who should be pulled back from the pathway ... so those showing signs of gastroparesis or ileus.’ (Consultant 4)

3 *Decision makers use a pragmatic approach to diet upgrades*

Current diet upgrade decisions were guided by a pragmatic approach based on the patient clinical assessment at the time of review. Nausea and vomiting were dominant symptoms influencing this decision-making process, as well as patient-reported factors such as ‘feeling well’ and ‘feeling hungry’. Greater caution was reported with elderly patients because of increased risk of aspiration pneumonia. Factors at the time of surgery, such as the amount of bowel handling and type and length of anaesthetic, were also considered. Historical clinical indicators influencing diet upgrade decisions, such as ‘bowel sounds’ and ‘bowels opening’, had been generally abandoned

by consultants, but consideration of these factors still remained with junior medical staff and nursing staff.

‘If you see them day one post-op and they’re nauseous and vomiting you don’t want to push them too hard. And especially in the elderly population, you don’t want them to aspirate.’ (Colorectal Fellow)

‘I find one of the most reliable things is when patients actually complain of being hungry and are interested in food. I think that’s usually a sign that ... you’re probably under-feeding them.’ (Consultant 5)

4 *Disparities exist in diet upgrade practices*

The speed of diet upgrades was often dependent on the individual surgeon’s training and education. While consultants remained the dominant influence on diet upgrade advice, the surgical fellow and registrars were more commonly the decision makers at the ward level and would often err on the side of caution. Junior medical staff were ill-equipped and lacked confidence to make decisions about diet upgrades in the absence of senior clinicians.

‘I’m sure the guys who are very reluctant to start oral feeding too early is just because that was the way they were taught and they haven’t had any issues with it, so why would they change.’ (Consultant 1)

‘When we do handover I ask “what diet is this guy on?” and the interns aren’t always sure ... that’s not something that’s mentally being flagged in their mind ... I guess when you’re a junior doctor it’s hard to be across every detail of the patient’ (Principal House Officer)

Consultants often perceived diet upgrades to occur faster than they do in practice. After documenting a postoperative diet in the operation notes, consultants were not typically involved in further diet upgrade decisions in uncomplicated patients. From their experience at a ward level, junior medical staff reported a traditional diet upgrade process from clear fluids to free fluids to a full diet.

‘My postoperative notes say they can start free fluids when they’re awake and alert ... and I upgrade to a normal diet the next day.’ (Consultant 6)

‘People tend to go straight to clear fluids, and then sort of stepwise up ... so clear fluids, free fluids, diet as tolerated.’ (Intern 1)

5 *Limited understanding of the nature and availability of different hospital diets*

There was confusion and a limited understanding of hospital diets, largely driven by non-standardised diet codes across different hospitals where surgical consultants were employed. While consultants correctly differentiated clear fluid from free fluid diets, there was no clear consensus on the rationale for using one diet code over another postoperatively. Some consultants reported a preference for a ‘light ward diet’, however, there was a lack of consensus regarding what a ‘light’ diet included and how it differed from a standard full diet.

‘I don’t know whether there’s just a bit of hocus pocus ... or whether there’s really any difference with giving someone clear fluids or free fluids.’ (Registrar)

'I don't use clear fluids very much because I don't think there's much difference between clear fluids and free fluids. Clinically for the patient it's going to be fairly liquid by the time the stomach deals with it, and so I don't think there's much use for clear fluids.' (Fellow)

'I suppose you should have a 'not that rich' diet ... not spicy ... that's I suppose what I mean by a light ward diet.' (Consultant 5)

6 Diet upgrades are not systematically tracked and are vulnerable to communication breakdown

'Current diet' appeared to be a greater influence than 'total days on diet' when determining diet upgrades during ward rounds. Staff relied on memory, previous ward round notes, or team lists to identify current patient diets, and the number of days on fluid only diets was not documented as a standard component of this process. There was a lack of consistency regarding the nursing role in diet advocacy.

'They don't really [track diet upgrades] ... you just follow the notes. And things do get missed because the last note you've read said this and then they meant to say upgrade but haven't.' (Registered Nurse 1)

'It's all very well for you to see the patient and make a decision, but then that has to be communicated to nursing staff who have to understand it, not be on a break, and then they might forget, or the message gets changed.' (Consultant 3)

Phase 3—Selecting, tailoring, implementing stakeholder engagement strategies and monitoring knowledge use: As described previously, Phase 3 strategies were informed by results from Phases 1 and 2. Following discussion facilitated by the EOF champion, three planned education and implementation strategies were developed to improve EOF practices.

The first strategy was an educational session with colorectal surgical staff and CNC about the nature and availability of different hospital diet codes, as this was identified from interview outcomes as a limitation and potential barrier to implementing EOF guideline recommendations. The EOF champion presented a summary of the common diet codes available at the hospital, including clear fluid, free fluid, full and high protein high energy diets. A pictorial guide, examples of meal trays, and taste testing accompanied the education.

The second approach was to change the wording of surgical operation notes to prescribe a full diet on postoperative Day 0 for all uncomplicated elective colorectal patients. This was decided among five of the six consultants during the group feedback session as it was deemed best practice surgical care and an uncomplicated strategy to implement.

Thirdly, educational sessions were carried out with ward nursing staff, facilitated by the EOF champion, colorectal CNC and colorectal ward clinical facilitator. Over three consecutive weeks, >80% of nursing staff on the colorectal ward attended educational sessions. Similar to feedback provided to surgical staff, sessions included: a summary of practice guideline recommendations of an unrestricted diet

within 24 hours postoperatively; and Phase 1 audit data identifying a discrepancy between guidelines and current practice. Communicating the surgical team's decision for elective colorectal patients to be prescribed a full diet on postoperative Day 0 on surgical notes was also included in the nursing education session. Nursing staff were educated to encourage patients to eat meals as tolerated and escalate any concerns of increasing nausea or vomiting to the surgical staff.

Audits 3 and 4 monitored knowledge use and practice change. The median time to full diet was postoperative Day 2 (range 0–5 days) and postoperative Day 1 (range 0–3 days) in Audits 3 and 4, respectively. The number of patients prescribed a full diet on the surgical operation notes was 12% in Audit 3 and 61% in Audit 4 (Table 1).

Phase 4—Evaluating outcomes: In Audit 5, the median time to full diet was postoperative Day 0 (range 0–5 days), with 82% of patients prescribed a full diet on the surgical operation notes (Table 1).

Discussion

The present study utilised the action cycle of the KTA framework to: understand local postoperative feeding practices; identify barriers and enablers to implementation of EOF guideline recommendations; select, tailor and implement stakeholder engagement strategies to facilitate EOF uptake; and evaluate changes to EOF practices. Over the study timeline, there was a consistent and sustained improvement in median time to full diet prescription, improving from postoperative Day 4 to postoperative Day 0. This change in practice can be attributed to application of the KTA framework to design and deliver strategies specifically targeted to overcome barriers and translate knowledge into practice within a real world clinical setting.

A key component of the present study included staff interviews, which identified pre-existing decision-making processes and local barriers to EOF implementation. While consultants were typically responsible for prescribing postoperative diets in the operation notes at the time of surgery, the surgical fellow or registrar-guided subsequent diet upgrades thereafter. Diet upgrade decisions typically followed a pragmatic approach based on clinical assessment, however, were usually influenced by the individual surgeon's training and education. Staff interviews also identified a limited understanding of the diet codes available at the hospital, and lack of consensus among surgical staff on the rationale for prescribing particular diets. Collectively, these barriers highlighted a need to address EOF education and available diet codes as a necessary component of the implementation strategy. This was consistent with previous literature that has emphasised the importance of staff-related education to facilitate initiation of change and transition of practice prior to implementation of enhanced recovery programs.^{11–16, 20} As such, the present study included education sessions that described EOF guideline recommendations and descriptions of the nature and availability of local hospital diet codes.

Another recurring theme evident in previous literature was the need for communication and collaboration throughout the surgical staff hierarchy and multidisciplinary team.^{13, 15} Interestingly, initial improvements in median time to commencement of full diet were noted when the EOF champion began attending colorectal ward rounds and weekly multidisciplinary team meetings, as well as commencing staff interviews. This process of engagement was another important catalyst to instigate practice change, which relayed an initial positive effect onto EOF improvements as illustrated in Audit 3. The role of staff engagement and effective team communication has also been previously described as a necessary enabler for successful implementation of enhanced recovery programs.^{11–16, 20}

Stakeholder engagement strategies within Phase 3 of the study were designed and implemented at the consultant level to drive effective and sustainable change. Consultant decision to prescribe a full diet on postoperative Day 0 for all uncomplicated elective patients reflected a pragmatic approach to practice previously identified from interview results. While the decision was not unanimous across the whole surgical team (5 of 6 consultants agreed), it indicates that positive change can occur while maintaining flexibility in case-by-case decision-making for individual surgeons. Revisiting this issue with the whole surgical team when longer-term outcome and complication data is available will be of interest. Overall efficacy of EOF uptake among consultants was evident from audit results where the number of patients prescribed a full diet on operation notes increased progressively from 0% to 82%. The importance of type of dietary provision has been described previously, where postoperative patients receiving a fluid only diet were significantly more likely to consume <50% of their estimated energy requirements compared to those receiving a non-fluid (full or similar) diet.²¹ Implementing system strategies such as this was designed to elicit organisational change and overcome sustainability limitations commonly reported when champions withdraw from a project.²²

Two key limitations were identified within the current study. Firstly, no strategy was established to ensure diet upgrades were systematically tracked. While this was a barrier identified in staff interviews, the decision to prescribe patients a full diet on postoperative Day 0 negated the need for tracking postoperative diet upgrades. Despite this, systematic tracking of diets is recommended to ensure patients with emergency surgeries or postoperative complications are upgraded to a nutritionally adequate diet in a timely manner. Secondly, the high level of evidence supporting EOF after colorectal surgery may have supported cultural change to a greater extent than what may be experienced for other acute conditions and therefore limit the generalisability of the present study design in the absence of similar high quality literature to support the implementation. Despite this, the methodology reported in the present study remains applicable for use in other facilities with colorectal surgical units. While the exact content of Phase 3 strategies may be site-specific, the methodology process developed from the action cycle of the KTA framework can be replicated to improved EOF practices within other facilities.

Finally, there is well-established literature to suggest that an ongoing process of audit and feedback can increase compliance with guideline recommendations and improve project sustainability.^{17, 23} A future direction of the present study is to develop a plan for annual audit and feedback, including multidisciplinary accountability for outcome measures and audit dissemination. Consistent with the KTA cycle, knowledge sustainability may present new barriers different to those encountered at the time of initial knowledge use. Project sustainability should hence continue to cycle through the KTA feedback loop as new barriers emerge.

In conclusion, the present study has successfully identified and overcome local barriers to improve EOF practices to align with guideline recommendations. Consistent with the KTA implementation framework, future long-term audit and feedback strategies are recommended to sustain knowledge use.

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Conflict of interest

The authors have no conflicts of interest to declare.

Authorship

All authors were involved in project design. TR and IH were responsible for data collection and interpretation. All authors were involved in manuscript development and critical review prior to submission for publication. All authors are in agreement with the final manuscript and declare that the content has not been published elsewhere.

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Appendix I

Staff interview guide

'Before we start the interview, can I check that you have around 10 to 15 minutes to talk to me today and that you are happy for the interview to be audio recorded? The focus of this interview is on your perspectives of and experience with early oral feeding after surgery. Your answers will remain confidential and will be anonymous if used in reporting.'

Early oral feeding (EOF) is defined as the provision of nutritionally significant oral or enteral nutrition given within 24 hours postoperatively

| Domain | Core questions |
|---------------------------------------|---|
| Knowledge | Can you tell me what you know about EOF after surgery? |
| Motivation and goals | <ul style="list-style-type: none"> • When should patients re-commence feeding after surgery? |
| Beliefs about consequences | <ul style="list-style-type: none"> • Do you think there are any advantages/disadvantages to EOF? |
| Behavioural regulation | <ul style="list-style-type: none"> • Do you know of any ward guidelines/policies about EOF? |
| Professional role and identity | |
| Skills | Can you tell me about the usual process for upgrading diets after surgery? |
| Environmental context and resources | <ul style="list-style-type: none"> • Does the type of surgery influence the process of diet upgrades? Why? |
| Memory, attention, decision processes | <ul style="list-style-type: none"> • How do you judge when a patient needs a diet upgrade/downgrade? |
| Social influences | <ul style="list-style-type: none"> • Are patients involved in the decision to upgrade diets? Do you think they should be? |
| Emotion | |
| | In your practice, what are the circumstances in which you put in a nasogastric tube perioperatively or postoperatively? |
| | Can you tell me about your understanding of different hospital diets? |
| | <ul style="list-style-type: none"> • What is the difference between nil by mouth/clear fluids/free fluids/full/high protein high energy diets? • When is a clear fluid diet used over an free fluid diet? Or a soft diet used over a full diet? Why? |
| | In your practice, who is the major decision maker when it comes to upgrading patient diets? Are there circumstances when it is upgraded by someone else? |
| | <ul style="list-style-type: none"> • Residents/Registrar: What is your role in this process of diet upgrades? • Consultants: In what circumstances would you expect your team to upgrade/downgrade diets? • When making diet upgrades, do you seek advice from others? (e.g. consultant, fellow, registrar, dietitian, speech pathologist) |
| | How do you usually keep track of a patient's fasting time and diet upgrades? |
| | <ul style="list-style-type: none"> • Do you think this is an effective system? Can you suggest an alternative? • Are there systems on the ward that delay the updating of patient diet upgrades? |
| | How would you describe the culture towards EOF on this ward? |
| | <ul style="list-style-type: none"> • What are the historic practices of diet upgrades? • Do your peers have particularly strong feelings about EOF? • Do the views or behaviours of your peers influence how you think about EOF after surgery? |
| | What are your thoughts on a standardised EOF pathway for all postoperative colorectal patients (excluding PMP)? |
| | <ul style="list-style-type: none"> • What would you expect such a pathway to include? |

Conclusion: 'We have come to the end of my questions, thank you very much for your time. Please do not hesitate to contact me if you have any further questions'.

ORIGINAL RESEARCH**Prospective application of an implementation framework to improve postoperative nutrition care processes: Evaluation of a mixed methods implementation study**

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Abstract

Aim: To describe prospective application of an implementation framework to guide and evaluate a quality improvement (QI) project to improve adherence to evidence-based postoperative diet guidelines (consistent with Enhanced Recovery After Surgery, ERAS) in older surgical patients.

Methods: A hybrid mixed methods study guided by the integrated Promoting Action on Research Implementation in Health Services (i-PARIHS) framework was used. A pre-implementation audit identified gaps in nutrition-related care practices against ERAS guidelines for older surgical patients. Qualitative interviews explored barriers to practice change, informing development of the facilitated implementation strategy. Iterative facilitation interventions were identified by field notes and classified using i-PARIHS facilitator's tool-kit. Post-implementation audit measured implementation outcomes, and clinical processes and outcomes using controlled before–after comparative study.

Results: Implementation involved 17 discrete facilitation activities. Early postoperative diet upgrade was acceptable, well adopted (79%) and appropriate for 89% of patients. Fidelity (i.e. protocol delivered as intended) was 59%, with loss of fidelity primarily because of incorrect diet codes. Clinical processes and outcome evaluation (n = 155) compared data pre-implementation (intervention: n = 45, control: n = 27; mean age 73 (SD 6) years, 60% male) and post-implementation (intervention: n = 47, control: n = 36; mean age 74 (SD 6) years, 57% male). Patients on the intervention ward had higher odds of receiving early nutrition post-implementation (adjusted odds ratio [95% CI]: 6.5 [1.9–22.4], P = 0.01).

Conclusions: Prospective application of an implementation framework supported planning and successful implementation in this QI project. Multi-level evaluation of facilitation strategies, implementation outcomes, and clinical processes and outcomes helps to understand areas of success and continuing challenges.

Key words: evaluation studies, evidence-based practice, facilitation, implementation, knowledge translation, postoperative care.

Introduction

It is well established that knowledge generation through research does not necessarily change practice; nor does increasing clinician knowledge and skills through education and training necessarily lead to the desired change in practice.^{1–3} Despite evidence that increasing adherence to up-to-date evidence-based practices can improve quality of care and patient outcomes,^{4,5} considerable literature exists documenting the 'knowledge-practice gap' in health care.⁶ The diverse field of nutrition and dietetics in Australia is not immune to limited translation of knowledge into

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practice, resulting in gaps in dietetics practice.^{7,8} Achieving practice change is difficult, which in part explains why implementing complex interventions (defined as ‘interventions that contain several interacting components’)⁹ within the complex health-care environment is so challenging.

One example of a complex intervention is implementation of the Enhanced Recovery After Surgery (ERAS) perioperative care protocol in the surgical setting. Despite the well-established evidence base underpinning these protocols, ERAS principles have not been adopted by all surgical units.¹⁰ Like other complex interventions, ERAS protocols are challenging to implement and sustain, with multiple barriers to change depending on the local context.^{11,12} Implementation of some individual care practices is easier than others,¹³ and adherence is typically lowest for postoperative elements occurring in the complex ward environment.¹⁴ This may reflect greater challenges in changing practice across the multiple disciplines involved.¹⁵

Implementation science has emerged as a scientific approach to translating knowledge into practice, with the goal of improving health services.¹⁶ Such approaches have been shown to be effective for implementing practice change initiatives across health systems,¹⁴ and implementation frameworks provide a tool for planning and evaluating implementation strategies that may help to ensure that ineffective implementation is not at fault when practice change initiatives fail to demonstrate improvements inpatient outcomes.¹⁷ However, few ERAS studies report prospective use of appropriate theory to plan implementation strategies.¹⁵

Increasing number of older patients are undergoing surgery,¹⁸ and they are vulnerable to deleterious effects of hospitalisation such as malnutrition, functional decline and reduced quality of life.^{19–21} Local audit identified poor adherence to the nutrition-related aspects of the ERAS guidelines in older patients on general surgical wards, including prolonged preoperative fasting and delays in postoperative diet upgrade (i.e. greater than 24 hours as recommended in ERAS²² and other international consensus guidelines^{23,24}).²⁵ The anaesthetic department was actively undertaking a quality improvement (QI) project aimed at reducing preoperative fasting times, therefore a QI project to

improve local adherence to early postoperative diet upgrades was planned. The integrated Promoting Action on Research Implementation in Health Services (i-PARIHS) framework²⁶ was selected for this project as it is a conceptual framework intended to support implementation of research evidence into practice. The framework highlights the complexity of change and holds the domains of innovation, recipients and context at multiple levels (local, organisational, outer) at its core, with the central tenet that facilitation is the driving force behind successful implementation of evidence into practice. The i-PARIHS Facilitation Guide²⁶ informed the facilitative approach to implementation used in this project, and the constructs of the i-PARIHS framework were used prospectively in the development of the interview guide for clinician interviews and as a *priori* themes for coding data from these interviews.²⁷

The aim of the present study is to provide a case example of prospective application of an implementation framework to guide and evaluate a QI project. Specifically, it aims to describe a theory-informed, facilitated implementation process to improve adherence to evidence-based postoperative diet upgrade guidelines (i.e. in line with ERAS guidelines) in older general surgical patients. Secondary aims are to assess implementation outcomes²⁸ and changes in clinical processes and outcomes, using a before–after comparative study with concurrent control ward.

Methods

This mixed methods study used an explanatory-sequential design (pre-implementation audit data, complemented by qualitative interview data) and involved a before–after comparative study (i.e. pre-/post-implementation) with a concurrent control ward (see Figure 1). A concurrent control ward was studied both pre- and post-implementation to ascertain whether changes in practice were likely because of local efforts as opposed to influences at the organisational or outer context levels.

The present study has been reported following the Standards for Reporting Implementation Studies statement.²⁹

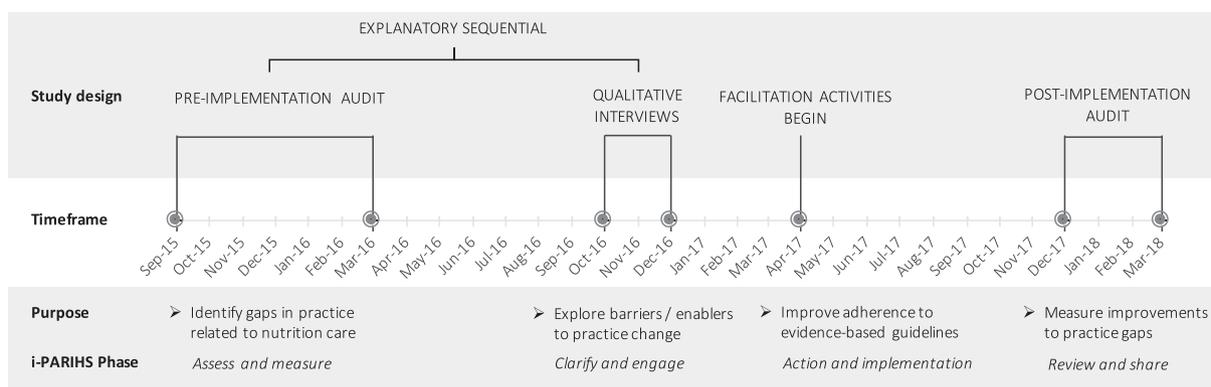


Figure 1 Study timeline from pre-implementation audit (2015–2016) to post-implementation audit (2017–2018), with corresponding phase from the i-PARIHS facilitator’s tool-kit²⁶.

Table 1 Summary of facilitation activities, mapped to the facilitator activities identified by the i-PARIHS Facilitation Guide²⁶

| <i>Barrier [corresponding i-PARIHS construct]</i> | <i>Implemented intervention</i> | <i>Facilitation activity [corresponding i-PARIHS domain]</i> |
|---|--|---|
| Inconsistent practice across surgeons [clinical consensus] and multiple levels of decision-making [power and authority] | <ul style="list-style-type: none"> • Identified and summarised background literature supporting change • Use data to demonstrate areas for improvement in process • Preliminary consultation with ASU surgeon and ASU surgical coordinator (gate keeper) to gauge interest • Preliminary consultation with CR surgeon to gauge interest and engage as leader • Utilised hierarchical structure: • CR surgery team consultation process lead by surgical leader to negotiate acceptable upgrade process and achieve support from other consultants • Discussion with other senior surgical staff (fellows and registrars) by facilitator and ward DTNs, with visible support of surgical leader • Formal and informal education of junior surgical staff by facilitator/ward DTNs, with visible support of senior surgical staff | <ul style="list-style-type: none"> Acquiring/appraising evidence [I] Audit and feedback [ICL] Consensus building [R] Identifying a formal leader [ICL] Engaging stakeholders [R] Structuring learning [ICL] Project management [ICL] |
| NS/junior medical staff rely on direct orders from more senior staff [power and authority] | <ul style="list-style-type: none"> • Development of Guideline by facilitator through iterative process of stakeholder consultation (nursing staff, surgical staff, dietitians and pharmacy) • In conjunction with ward DTN, use MDT meetings to: <ul style="list-style-type: none"> ◦ educate surgical teams ◦ elicit info reissues arising ◦ identify potential solutions (PDSA cycles) • In conjunction with ward DTN, undertake in-services (with ward NS and at CN-specific meetings, identified as thought leaders) to: <ul style="list-style-type: none"> ◦ educate NS ◦ use as two-way communication to problem solve unforeseen barriers/practical issues and identify potential solutions (PDSA cycles) • Display of laminated pathway and Guideline on ward as reminder • Use of DA clinical time to undertake interim audits • Feedback results to teams and NS at EWE meetings, in-services, MDT meetings | <ul style="list-style-type: none"> Consensus building [R] Engaging stakeholders [R] Policies and procedures [ICL] Communication and feedback [ICL] Using improvement methods [R] Ongoing local context assessment [ICL] Structuring learning [ICL] Audit and feedback [R] Communication and feedback [ICL] |
| Low NS engagement in practice change initiatives [collaboration and teamwork] | <ul style="list-style-type: none"> • Consultation with NS across all levels (NUM, CNs, RNs) at each stage: <ul style="list-style-type: none"> ◦ Feedback of baseline audit to NUM ◦ Inclusion of NS (at all levels) in qualitative interviews to identify barriers/enablers | <ul style="list-style-type: none"> Engaging stakeholders [R] Baseline context and boundary assessment [I] |

Table 1 Continued

| <i>Barrier [corresponding i-PARIHS construct]</i> | <i>Implemented intervention</i> | <i>Facilitation activity [corresponding i-PARIHS domain]</i> |
|---|---|--|
| | <ul style="list-style-type: none"> ○ Sought feedback from NS on draft Guideline prior to implementation (info provided during in-services and anonymous feedback forms left; informal conversations on ward) ○ Ongoing engagement through in-services, informal conversations | |
| High turnover of staff (especially RMOs) [systems and processes] | <ul style="list-style-type: none"> • Creating formalised document that can be referred to by all staff • Including Guideline in RMO handover document | Policies and procedures [ICL] Embedding the innovation [ICL] |
| Poor communication [systems and processes] | <ul style="list-style-type: none"> • More regular MDT catch ups, for example, group 'huddle' on a Friday implemented via EWE meeting • Facilitator attendance at EWE and MDT meetings to encourage communication about postoperative diet upgrades • Act as liaison and transfer information | Team building [R] Boundary spanning [ICL] Networking [ICL] |
| Limited availability of food outside of meal times [systems and processes] | <ul style="list-style-type: none"> • Shelf-stable breakfast packs to be stocked in ward cupboard • Taste-testing of shelf-stable main meals by NS to demonstrate palatability • Educate NS relate meal ordering procedure | Negotiating and influencing [ICL] Structuring learning [ICL] |
| Patient poor tolerance (e.g. nausea/vomiting, drowsiness, pain) [degree of fit] | <ul style="list-style-type: none"> • Inclusion of antiemetic instructions in Guideline re-timing with meals • Pharmacy in-services to educate NS | Negotiating and influencing [ICL] Structuring learning [ICL] |

ASU, acute surgical unit; CN, clinical nurse; CR, colorectal; DA, dietetic assistant; DTN, dietitian; I, innovation domain; i-PARIHS, integrated Promoting Action on Research Implementation in Health Services; ICL, inner context (local); EWE, Eat Walk Engage; MDT, multidisciplinary team; NS, nursing staff; NUM, nurse unit manager; PDSA, Plan Do Study Act cycles; R, recipients domain; RMO, registered medical officer; RN, registered nurse.

'Guideline' refers to a locally developed consensus document outlining processes for postoperative diet upgrades.

The study setting was two general surgical wards at a metropolitan tertiary teaching hospital in Australia. Patients admitted to these wards typically undergo surgery for upper gastrointestinal, lower gastrointestinal/colorectal, hepatopancreaticobiliary or thoracic disease, trauma or cancer, and include elective and unplanned admissions. The intervention ward was the home ward for the colorectal surgery, acute surgery and gastroenterology units and the control ward was the home ward for the hepatopancreaticobiliary surgery, upper gastrointestinal surgery and liver units. Other QI initiatives were proceeding concurrently on these wards including an anaesthetist-led project to reduce preoperative fasting time using 'fasting clocks' and, on the intervention ward, a multidisciplinary intervention to reduce delirium which included attention to mealtime encouragement and assistance ('Eat Walk Engage'³⁰).

Qualitative interviews with clinicians involved in delivering care to patients were undertaken to better understand the context, with an emphasis on barriers and enablers to translating perioperative nutrition guidelines into practice.³¹

This identified a number of barriers to practice change, with those relevant to postoperative diet upgrade processes including: inconsistent practice across surgeons and multiple levels of decision-making; nursing staff and junior medical staff reliance on direct orders from more senior staff; low nursing staff engagement in practice change initiatives; high turnover of staff; poor communication; limited availability of food outside of meal times; and perceived patient poor tolerance.

The implementation strategy used a facilitative approach, acknowledging that facilitation itself is both a process and an implementation intervention.³² The facilitator used an iterative process of reviewing barriers to change identified during clinician interviews and tailoring local solutions with extensive stakeholder consultation. Facilitation was undertaken by a novice implementation researcher not currently working on the study wards, who assumed the role of clinical facilitator,³³ supported by a facilitator network including a facilitator buddy (i.e. Eat Walk Engage facilitator), experienced facilitator and expert facilitator, who provided

Table 2 Summary of implementation outcomes as per the taxonomy of implementation outcomes identified by Proctor *et al.*²⁸

| Implementation outcome | Measure description/definition | Outcome |
|------------------------|--|--|
| Acceptability | Acceptability of an early diet upgrade procedure as outlined by the <i>Guideline</i> to recipients at the individual provider level (i.e. surgeons and surgical teams, nursing staff and dietitians), defined as willingness to implement standardised procedure | <ul style="list-style-type: none"> Qualitative interview data suggested early diet upgrades were acceptable to all disciplines, with recognition from surgical teams that some patients may not be appropriate Early stakeholder engagement achieved preliminary ASU buy-in, however, consensus was not achieved, indicating poor acceptability Ongoing discussions and feedback (formal and informal), with NS and DTNs indicate good acceptability Patient perspective is identified as a gap in assessing acceptability |
| Adoption | Acceptability of an early diet upgrade procedure as outlined by the <i>Guideline</i> to recipients at the individual patient level Implementation of early diet upgrade among CR surgeons (i.e. individual provider level), defined as initiating standardised procedure in postoperative surgeon instructions | <ul style="list-style-type: none"> Of 34 patients under the CR surgical team, standardised procedure or straight to diet was requested for 27 (79%) patients |
| Appropriateness | Whether early diet upgrade was appropriate at the individual patient level once appropriateness was determined (i.e. adoption) at the individual provider level. Any deviation from the standardised procedure (i.e. delayed upgrade or diet downgrade between DOS and POD3) because of <i>poor patient tolerance</i> was considered lack of appropriateness | <ul style="list-style-type: none"> Qualitative interview data suggested CR surgeons and DTNs were aware of strong evidence supporting safety of early diet upgrade and therefore believed were appropriate Of 27 patients for which early diet upgrades were initiated, this was appropriate for 24 (89%) patients Of three patients that did not tolerate upgrade, all required nasogastric tube insertion and were downgraded to nil by mouth (vomiting, n = 2; suspected anastomotic leak, n = 1) |
| Feasibility | Whether early diet upgrade was practical at the organisational level, defined as ability to obtain appropriate meals for patients | <ul style="list-style-type: none"> Poor availability of food outside of meal times reduced feasibility (i.e. difficult for NS to provide food during this time). This was partially addressed (see Table 1). At post-implementation data collection, NS continued to report poor access to appropriate food options outside of meals times. Efforts to address this are ongoing |
| Fidelity | Whether early diet upgrade procedure delivered as intended once adoption demonstrated at the individual provider level. Any deviation from the standardised procedure because of <i>process or communication issues</i> , defined as delayed diet upgrades or incorrect diet codes in electronic meal monitoring system (i.e. not because of patient tolerance), was considered lack of fidelity | <ul style="list-style-type: none"> Of 27 patients for which early diet upgrades were initiated, this was delivered as intended in 16 (59%) cases Reasons for lack of fidelity included: inappropriate use of clear fluids, n = 5; incorrect diet code (full or surgical soft, instead of high energy, high protein), n = 5; not upgraded because of poor communication, n = 1 No standardised upgrade was appropriately documented inpatient chart |

ASU, acute surgical unit; CR, colorectal; DOS, day of surgery; DTN, dietitian; NS, nursing staff; POD, postoperative day. 'Guideline' refers to a locally developed consensus document outlining processes for postoperative diet upgrades.

Table 3 Demographic, clinical and surgical characteristics of patients in intervention and control groups, pre- and post-implementation¹

| Characteristic | Intervention ward | | P-value | Control ward | | P-value |
|---|--------------------------------|---------------------------------|---------|--------------------------------|---------------------------------|---------|
| | Pre-implementation (n = 45) | Post-implementation (n = 47) | | Pre-implementation (n = 27) | Post-implementation (n = 36) | |
| Age (years), mean (SD) | 74 (6) | 74 (7) | 0.83 | 72 (5) | 73 (5) | 0.23 |
| Gender (female) | 16 (36) | 24 (51) | 0.13 | 13 (48) | 12 (33) | 0.23 |
| CCI, mean (SD) | 3 (1) | 2 (2) | 0.20 | 4 (3) | 3 (2) | 0.18 |
| Weight (kg) ² , mean (SD) | 79 (18) | 78 (14) | 0.62 | 82 (21) | 83 (21) | 0.79 |
| BMI ³ , n (%) | | | 0.09 | | | 0.82 |
| Underweight | 7 (16) | 6 (13) | | 3 (11) | 5 (15) | |
| Normal weight | 23 (51) | 14 (31) | | 10 (37) | 14 (41) | |
| Overweight | 15 (33) | 25 (56) | | 15 (52) | 15 (44) | |
| Nutrition risk screening ⁴ , n (%) | | | 0.21 | | | 0.28 |
| Not at risk | 18 (42) | 25 (55) | | 9 (33) | 20 (56) | |
| At risk | 7 (16) | 2 (4) | | 2 (7) | 3 (8) | |
| Not screened/ incomplete | 18 (42) | 19 (40) | | 16 (59) | 13 (36) | |
| Primary diagnosis, n (%) | | | 0.01 | | | 0.83 |
| Malignancy | 26 (58) | 14 (30) | | 15 (56) | 19 (53) | |
| Non-malignancy | 19 (42) | 33 (70) | | 12 (44) | 17 (47) | |
| Type of surgery, n (%) | | | 0.03 | | | 0.63 |
| Elective | 37 (82) | 29 (62) | | 18 (67) | 26 (72) | |
| Emergent | 8 (18) | 18 (38) | | 9 (33) | 10 (28) | |
| ASA score, n (%) | | | 0.60 | | | 0.68 |
| <3 | 13 (29) | 16 (34) | | 8 (30) | 9 (25) | |
| ≥3 | 32 (71) | 31 (66) | | 19 (70) | 27 (75) | |
| Duration of anaesthesia (minutes), n (%) | | | 0.26 | | | 0.82 |
| <120 | 8 (18) | 13 (28) | | 9 (33) | 13 (36) | |
| ≥120 | 37 (82) | 34 (72) | | 18 (67) | 23 (64) | |
| Surgical approach, n (%) | | | 0.64 | | | 0.57 |
| Open/converted | 14 (31) | 11 (23) | | 12 (44) | 13 (36) | |
| Minimally invasive | 31 (69) | 36 (77) | | 15 (56) | 23 (64) | |
| Surgery site, n (%) | | | 0.49 | | | 0.38 |
| Upper GI | 3 (7) | 1 (2) | | 5 (19) | 5 (14) | |
| Hepatopancreaticobiliary | 1 (2) | 4 (9) | | 10 (37) | 9 (25) | |
| Lower GI/colorectal | 39 (87) | 39 (83) | | 6 (22) | 5 (14) | |
| Thoracic | 0 (0) | 0 (0) | | 4 (15) | 12 (33) | |
| Other | 2 (4) | 3 (6) | | 2 (7) | 5 (14) | |
| New stoma formed, n (%) | 13 (29) | 11 (23) | 0.55 | 1 (4) | 0 (0) | 0.24 |
| Anastomosis formed, n (%) | 31 (69) | 22 (47) | 0.03 | 5 (19) | 6 (17) | 0.85 |

ASA, American Society of Anaesthesiologists; BMI, body mass index; CCI, Charlson comorbidity index (age-unadjusted); GI, gastrointestinal.

¹ Bivariate analysis was undertaken using chi-square test for categorical variables and independent samples *t*-test for continuous variables.

² Based on available data (n = 154).

³ Based on available data (n = 151); underweight: <22.0 kg/m², normal weight: 22.0–27.0 kg/m², overweight/obese: >27.0 kg/m².

⁴ As per the malnutrition screening tool; Score: <2 = not at risk, ≥2 = at risk.

mentoring support to the novice facilitator as recommended by the i-PARIHS facilitator's tool-kit.²⁶ The implementation team consisted of the facilitator, senior dietitian, two consultant surgeons, a surgical coordinator and nurse unit manager of the intervention ward. The consultant surgeons also served as content experts and surgical opinion leaders, and clinical nurses acted as discipline-specific opinion leaders, helping to inform solutions and model behaviour changes.

Patients ≥65 years admitted to the study wards for ≥72 hours who underwent a surgical procedure (excluding bariatric procedures) during the study period were eligible for inclusion. Length of stay of ≥72 hours was selected to preclude short-stay patients and patients undergoing day surgery. Bariatric surgery patients were excluded as other standardised diet procedures exist for this patient group. Patients with a postoperative admission to the intensive care unit of ≥3 days were excluded.

This hybrid study examined multilevel measures including the implementation process, implementation outcomes, and clinical processes and outcomes. The implementation process was captured by field notes and meeting minutes collated by the facilitator, and summarised using the facilitation activities described in the i-PARIHS Facilitation Guide.²⁶

Implementation outcomes (acceptability: view that the practice is satisfactory; adoption: intention or action to try the practice; appropriateness: perceived 'fit', or compatibility of the practice to patients within the local context; feasibility: degree to which the practice can be enacted within the local context; and fidelity: whether the practice is delivered as intended)²⁸ were defined *a priori* and included in post-implementation data collection to describe the extent of implementation on the intervention ward.

In relation to clinical processes and outcomes, the primary measure of intervention success was proportion of patients receiving early nutrition, defined as upgrade to full ward diet (or appropriate texture modified diet) or initiation of enteral or parenteral nutrition as indicated day of surgery or postoperative day 1. Clinical outcome measures collected as balancing measures included: antiemetic therapy requirements to postoperative day 3; vomiting, nasogastric tube (NGT) insertion and diet downgrade to postoperative day 3; and postoperative surgical complications. Complications were based on documentation by any medical officer in the chart or discharge summary and included surgical site infection, ileus, anastomotic leak and reoperation. All data were recorded by a single researcher by chart review using a structured chart abstraction tool. Participant descriptors including demographic information, clinical characteristics and surgical details were recorded.

Bivariate analysis of patient characteristics and process and clinical outcomes was undertaken using chi-square test for categorical variables and independent samples *t*-test for continuous variables. In view of pre- and post-implementation differences in intervention ward groups, logistic regression modelling was used to adjust for covariates potentially predictive of receiving early nutrition support in the intervention group. Variables of interest included age, gender, American Society of Anaesthesiologist score, type of surgery (elective vs emergent), surgical site (lower gastrointestinal/colorectal vs other), surgical approach (open vs laparoscopic) and anastomosis formation. Direct comparison of clinical processes and outcomes between the intervention and control wards was not made due to different case-mix and patient groups admitted to these wards. Statistical analyses were undertaken using IBM SPSS Statistics v23 for Macintosh (IBM Corp., Chicago, IL). Statistical significance was established at $P < 0.05$.

Power calculations were undertaken based on a sample size of 46 patients on the intervention ward pre-/post-implementation; at this number, the study was powered to detect an increase in proportion of patients receiving diet upgrades by postoperative day 1 from 52% to 79% with 80% power, 5% type I error and two-tailed hypothesis. Previous studies have reported that 80% adherence

to postoperative diet upgrade recommendations is achievable.¹³

This research was reviewed and approved for ethics exemption under the definition of Quality Assurance and Evaluation Activities by the Royal Brisbane and Women's Hospital Human Research Ethics Committee (Ref No: HREC/16/QRBW/649).

Results

Implementation processes including facilitation activities, interventions and the corresponding barriers to change are summarised in Table 1. Seventeen discrete facilitation activities were identified, over half of which related to the i-PARIHS *Inner Context (Local)* domain and a quarter to the *Recipients* domain. Activities included task focused (e.g. arranging audits and education sessions, formatting guidelines) and enabling activities (e.g. consultation, problem-solving), underpinned by support of the facilitator network including at least twice weekly informal debriefing sessions.

A summary of implementation outcomes is included as Table 2. The intervention was acceptable to the Colorectal Surgical Unit, nursing staff and dietitians. Although early stakeholder engagement achieved preliminary buy-in from the Acute Surgical Unit, consensus could not be reached for standardised diet upgrade, indicating poor acceptability of the proposed intervention to this unit. The intervention was adopted among colorectal surgeons (79%) and appropriate in 89% of patients with nil adverse events. The intervention was delivered as intended in 59% ($n/N = 16/27$) of instances where adoption was demonstrated (fidelity), with loss of fidelity primarily occurring because of incorrect diet codes (i.e. inappropriate use of clear fluid or non-fortified diets). Feasibility was impacted by poor access to appropriate food options outside of meal times which was not able to be resolved in the implementation period.

Clinical processes and outcomes were measured in a total of 155 patients; this corresponds to 72 patients pre-implementation (intervention ward: $n = 45$, control ward: $n = 27$; mean age 73 (SD 6) years, 60% male) and 83 patients post-implementation (intervention ward: $n = 47$, control ward: $n = 36$; mean age 74 (SD 6) years, 57% male). For more detailed patient characteristics, see Table 3. Differences were observed between the pre- and post-implementation cohorts on the intervention ward: a smaller proportion of patients had a primary diagnosis of malignancy (58% vs 30%, $P = 0.01$); a greater proportion of patients underwent emergent procedures (18% vs 38%, $P = 0.03$) and a smaller proportion required an anastomosis (69% vs 47%, $P = 0.03$). No differences were observed between patient cohorts on the control ward.

The clinical processes and outcomes are summarised in Table 4. The proportion of patients receiving early nutrition increased by 26% (from 53% pre-implementation to 79% post-implementation, $P = 0.01$) on the intervention ward (unadjusted odds ratio 3.2, 95% CI 1.3–8.1). Following adjustment for potential confounders, this difference

Table 4 Process and patient outcomes in intervention and control groups, pre- and post-implementation¹

| Outcome, n (%) | Intervention ward | | P-value | Control ward | | P-value |
|---|--------------------------------|---------------------------------|---------|--------------------------------|---------------------------------|---------|
| | Pre-implementation (n = 45) | Post-implementation (n = 47) | | Pre-implementation (n = 27) | Post-implementation (n = 36) | |
| Early nutrition (DOS/POD1) | 24 (53) | 37 (79) | 0.01 | 17 (63) | 29 (81) | 0.12 |
| Antiemetic therapy DOS-POD3 ² | 29 (67) | 30 (65) | 0.82 | 17 (63) | 18 (51) | 0.44 |
| Vomit DOS-POD3 | 19 (42) | 10 (21) | 0.03 | 4 (15) | 7 (19) | 0.75 |
| NGT insertion DOS-POD3 | 8 (18) | 6 (13) | 0.50 | 2 (7) | 1 (3) | 0.57 |
| Diet downgrade DOS-POD3 | 11 (24) | 8 (17) | 0.38 | 2 (7) | 2 (6) | 1.00 |
| Surgical complications | | | | | | |
| Surgical site infection | 6 (13) | 1 (2) | 0.06 | 2 (7) | 1 (3) | 0.57 |
| Ileus | 8 (18) | 8 (17) | 1.00 | 2 (7) | 2 (6) | 1.00 |
| Anastomotic leak | 2 (4) | 0 (0) | 0.24 | 1 (4) | 1 (3) | 1.00 |
| Reoperation | 6 (13) | 2 (4) | 0.15 | 1 (4) | 0 (0) | 0.43 |

DOS, day of surgery; NGT, nasogastric tube; POD, postoperative day.

¹ Bivariate analysis of pre-/post-implementation process and clinical outcome measures was undertaken using chi-square test for categorical variables and independent samples *t*-test for continuous variables.

² Based on available data (n = 151) as medication chart missing from electronic medical record.

remained significant (adjusted odds ratio 6.5, 95% CI 1.9–22.4, *P* = 0.01). There was no increase in vomiting, antiemetic therapy or NGT reinsertion on the intervention ward; indeed, vomiting decreased pre- to post-implementation (42% vs 21%, *P* = 0.03).

Surgery type (elective vs emergent) was the only other significant independent predictor of early nutrition in the adjusted model. On the control ward, early nutrition also increased somewhat (from 63% pre-implementation to 81%), but this difference was not statistically significant (*P* = 0.12).

Discussion

This manuscript describes a theory-informed implementation strategy which improved adherence to evidence-based postoperative diet upgrades. Prospective application of an implementation framework allowed structured examination of the context and development of tailored facilitation interventions. Multilevel evaluation including implementation and clinical outcomes helped to elucidate successful improvements to process outcomes and identify areas requiring further attention.

The intervention (early postoperative diet upgrade) was mostly acceptable, well adopted and appropriate in the majority of cases, however, barriers contributing to reduced feasibility and fidelity highlighted in the evaluation will need to be addressed if the change is to be maintained in the mid- to long-term. Further investigation is required to explore contextual barriers contributing to reduced feasibility and fidelity, such as lack of clarity (*Innovation* domain) or knowledge (*Recipient* domain) related to appropriate diet codes and documentation. Interventions addressing issues in the *Inner context (organisation)* and *Outer context* domains

were not explored, consistent with the novice facilitator status,²⁶ but may have to be addressed to achieve further improvements and sustainability.

Facilitation typically involves a wide range of processes, ranging from task-focussed to enabling activities, which are iterative and overlapping, and are different to typical project management roles.³³ The support of a facilitator network was key in building the novice facilitator's skills in this role. The introduction of a postoperative feeding guideline is not novel per se, but it is likely that the facilitated process of collaboratively developing a guideline, achieving buy-in and agreeing on an action plan (i.e. processes that require regular communication and enhanced teamwork) may increase the likelihood of a successful outcome.

The context in which change is to occur can significantly impact whether the implementation strategy is successful.^{6,26,34} Factors such as culture and leadership at both the ward (*Inner context (local)* domain) and organisational (*Inner context (organisation)* domain) level, can produce a context that is resistant to or supportive of change. For example, concurrent QI projects on the ward may have contributed to familiarity with change, making the context and recipients more receptive to the implementation strategy, or might have contributed to 'change fatigue'³⁵ and a sense of competing priorities, making the context and recipients more resistant to change. This complexity of interaction between context and intervention may explain in part why similar interventions achieve differing success across contexts.³⁴

The present study aligns with other literature whereby early implementation success is achieved,³⁶ however, sustainability of practice change in the post-implementation period presents a unique set of challenges.^{12,37} While some interventions were implemented with sustainability in mind

(e.g. inclusion of the postoperative diet upgrade process in the colorectal surgery junior doctor handover document), barriers and enablers to sustainability may differ to those for initial implementation.³⁷ Implementation frameworks such as i-PARIHS offer limited guidance in terms of sustainability, however, theories such as *Normalisation Process Theory*, which aims to explain the social processes through which new practices are implemented, embedded and integrated into everyday activities to become the new norm,³⁸ may be useful to inform further efforts to embed practice change.

There are several limitations to the present study. Evaluation was undertaken by the facilitator, possibly introducing bias. The small sample size and multiple comparisons inherent in a multilevel evaluation limit confidence in the findings. It is unclear whether the smaller improvement seen on the control ward was because of contamination or unrelated organisational factors. Reliance on chart review has known limitations, predominantly the propensity for inaccurate records and missing data. Strengths of the present study include prospective use of theory, multilevel evaluation, and *a priori* definition of implementation and clinical outcomes.

The present study supports the prospective application of an implementation framework and facilitation approach to practice change initiatives in the complex ward environment. This manuscript describes application of a theory-informed approach that clinicians may find useful when planning, developing and implementing practice change initiatives. Further studies investigating the sustainability of practice change initiatives following early implementation success are warranted to help elucidate implementation factors associated with sustained change.

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Conflict of interest

The authors declare they have no conflicts of interest to disclose.

Authorship

All authors contributed to study design. AB collected, analysed and reported data, and also prepared the manuscript. All authors critically reviewed the manuscript. All authors are in agreement with the manuscript and declare that the content has not been published elsewhere.

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ORIGINAL RESEARCH

Process of knowledge translation within routine clinical care: Implementing best practice in weight management

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Abstract

Aim: Failure to translate research into practice is common. The present study implemented an evidence-based model of care to address identified evidence-practice gaps in our department's weight management service.

Methods: Implementation science frameworks were used to identify barriers to best practice and determine appropriate strategies to overcome them. No practice change occurred pre-implementation. The new model of care incorporated evidence-based interventions into a flowchart, supported by written resources, and integrated routine data collection into clinic processes. Alignment with a statewide telephone counselling program enhanced service capacity. Data were collected for adult patients whose primary intervention was weight management at a South-East Queensland hospital and included service attendance metrics, anthropometry, diet quality, and interventions delivered, and were compared with guidelines. Change in outcomes was calculated at 3 months after initial appointments.

Results: Pre-implementation, 69.2% (n = 91) of patients referred were seen by a dietitian. During the new model of care (n = 60), over half (63.3%) were referred to telephone counselling. The remainder were triaged according to the flowchart with 100% attendance. Guideline adherence for reviews significantly increased over time (4.4%–50%, $P < 0.001$). Follow-up data were available for 31.3% and 54.5% of the pre-implementation and new model of care patients, respectively. No significant differences were observed between outcomes.

Conclusions: The present study demonstrated successful implementation of weight management guidelines within routine clinical care. Following a systematic assessment of existing evidence-practice gaps resulted in a pragmatic evidence-based model of care that could be delivered within service capacity.

Key words: evidence-based practice, health services research, implementation, knowledge translation, model of care, weight management.

Introduction

Definitions of evidence-based practice (EBP) emphasise the importance of accessing the best research evidence, drawing on clinical expertise, and attending to clients' values and circumstances.¹ EBP is fundamental to ensuring patient outcomes. However, failure to routinely translate research findings into clinical practice is common in health services.²

In 2015, our large, South-East Queensland hospital's Nutrition & Dietetics department chose to participate in the Queensland Dietetics Research Translation Awards and have done so every year since.³ These annual awards showcase and celebrate research translation in clinical dietetic practice with the event encouraging clinical dietitians to critique existing research and translate findings into a clinical application within an Australian health-care sector.

The department-wide preparation for the awards involved a strategic and systematic process of: (i) mapping each clinical service area; (ii) collating the best available evidence for each area in the Nutrition Care Process Terminology 'ADIME' (assessment, diagnosis, intervention, monitoring and evaluation) format;⁴ (iii) identifying and defining evidence-practice gaps and (iv) prioritising and defining implementation projects from the identified evidence-practice gaps. This broad, inclusive approach to embedding evidence into practice ensured projects aligned with organisational and departmental priorities to maintain and support staff's engagement and the delivery of an effective and efficient service.⁵ The present

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study describes the service assessment, development, implementation and evaluation undertaken in the department's weight management service.

Adults who are overweight or obese are recommended to undertake lifestyle changes which include reduced energy intake, increased physical activity and measures to support behaviour change.^{6,7} It is recommended that patients receive fortnightly reviews for the initial 3 months, and ongoing monitoring up to a year.^{6,7} Current Australian Dietary Guidelines form the basis of nutrition advice for weight management patients and programs need to be tailored to the dietary preferences of individuals.⁷ Successful approaches to support energy deficit include behaviour change strategies of goal setting and self-monitoring of dietary and exercise behaviours.⁷

Evidence supporting tailored weight loss strategies based on patients' history of dieting, urgency of weight loss and nutrition knowledge has recently been presented⁸ that operationalise the recommendations from the National Health and Medical Research Council's guidelines.⁷ This innovative body of work⁸ suggests that weight management patients can be categorised into one of four kilojoule restriction groups according to defining characteristics: weight loss urgency, nutrition knowledge and dieting history. The groups are: 1. 'Australian Dietary Guidelines' (ADG), 2. 'Reduced energy diet' (RED), 3. 'Low energy diet' (LED) and 4. 'Very low energy diet' (VLED)⁸ (Table 1). Evidence also supports the inclusion of strategies to address and strengthen patients' relationships with food, exercise and body image using psychological strategies of mindfulness to enhance intuitive eating behaviours.⁹⁻¹²

Our aim was to assess the evidence-practice gaps in our current weight management service and implement and evaluate an evidence-based model of care (MOC) for adult weight management patients in our Nutrition and Dietetic department. Successful implementation was defined as correct content being delivered by the dietitian, appropriate review timeframes offered, and that appropriate anthropometric measurements were taken.

Methods

The present study used a pre-post study design. No change to dietetic practice occurred during pre-implementation, while a new MOC was adopted during the implementation period. The project was managed by department dietitians involved in treating weight management patients (clinicians, their team leaders and the department's clinician-researcher).

Three months were dedicated to each phase of data collection, with patients being followed up 3 months after their initial appointment. Pre-implementation data were collected from March to May 2016, with data collection occurring from June to August 2016. Following pre-implementation, all dietitians involved in treating weight management patients participated in a working group to develop the MOC based on the identified evidence-practice gaps. Adoption of the new MOC occurred during July to September 2017, with follow up of these patients occurring from October to December 2017. No patient who attended

in the pre-implementation phase attended for weight loss counselling in the post-implementation phase.

Pre-implementation, weight management patients were seen in 2 × 4-hour 'general' clinics with new (60 minutes) and review (30 minutes) slots and/or one group ('Nutrition Coaching'¹³ comprising of 4 weekly × 1 hour sessions, then 1 × 1 hour 'recharge' a month (information refresher and weigh in, as required)). Patients were triaged by the senior dietitian from the medical team or by the senior orthopaedic physiotherapy screening clinic clinician. One 'healthy eating and lifestyle tips to lose weight' diet sheet was available to use; its content included the health benefits of weight loss, aiming for your most comfortable or healthy weight, tracking progress, non-hungry eating, the five food groups, a sample meal plan, being active, goal setting, a weekly action plan and a template to track intake against recommended serves. Numerous dietitians worked in and covered the general clinics and all dietitians had the potential to be referred patients for weight loss as inpatients. No documented processes existed regarding service delivery. Referrals were received from hospital and external parties and were triaged based on clinical severity/need. Reviews were booked based on clinician judgement as well as clinic capacity.

The MOC was developed between the two periods. An implementation science approach was followed to identify barriers to best practice and determine appropriate strategies to overcome them. We applied the integrative Theoretical Domains Framework (TDF)¹⁴ and Behaviour Change Wheel (BCW),¹⁵ an eloquent system for characterising and designing behaviour change interventions based on the barriers that exist to desired behaviours or processes being undertaken. Using these two tools allowed us to identify barriers and potential behaviour change interventions using decision mapping tools.^{15,16}

The barriers identified prior to implementation were resourcing and time (clinic capacity), lack of clinical governance (no departmental processes to systematically manage this patient group; no service monitoring process in place), knowledge (of the guidelines^{6,7} by relevant dietitians) and memory (clinicians not remembering to deliver care as per guideline recommendations^{6,7}). Using this systematic approach to address the barriers, meant that these TDF domains of 'Environmental context and resources', 'Knowledge', 'Memory attention and decision processes', and 'Behavioural regulation' could be aligned with the BCW elements of 'Physical opportunity' and 'Psychological capability' to select appropriate interventions to address the barriers.^{11,12}

Strategies identified to address these barriers included: developing local consensus processes, strategies to self-monitor clinician behaviour, prompts and cues, and adjusting/reorganising the clinic environment. The identified strategies were further operationalised as follows: the development of the MOC involved a group consensus process of firstly incorporating the interventions described in Table 1 into a flowchart to ensure a systematic, guided application of the evidence (Figure 1). This took into account patient's defining characteristics mentioned in Table 1, next we developed a resource to help guide

Table 1 Comparison of suggested nutrition interventions for different patient groups and their defining characteristics⁸

| <i>Patient group</i> | <i>Defining characteristics</i> | <i>Suggested nutrition interventions</i> |
|-------------------------------|---|---|
| Australian Dietary Guidelines | <ul style="list-style-type: none"> • Current poor eating habits • No previous attempts to improve diet quality • Limited nutrition knowledge | <ul style="list-style-type: none"> • Australian Dietary Guidelines resources • Eat for health website • Healthy Eating quiz • Food Switch app |
| Reduced energy diet | <ul style="list-style-type: none"> • No previous attempt to diet/previous 'strict' diets did not work • Some nutrition knowledge • Non-urgent weight loss | <ul style="list-style-type: none"> • Swap discretionary foods for low kJ alternatives • Discretionary intake target (max 1000 kJ/day) • Manage portion sizes • Low glycaemic index/lower carbohydrate/ lower fat/protein modified/high fibre • Healthy plate model • Reduced alcohol • Use one formulated meal replacement |
| Low energy diet | <ul style="list-style-type: none"> • Multiple previous attempts to diet • Never been 'strict' • Some nutrition knowledge • Weight affecting health and well-being | <ul style="list-style-type: none"> • Provide a 'prescribed' diet plan/daily kJ targets, for example, individualised plan, Healthy Weight Week 7-day meal plan, Weight Watchers, Lite n' Easy, Calorie King etc. |
| Very low energy diet | <ul style="list-style-type: none"> • Always trying to diet • Some nutrition knowledge • Weight is seriously affecting health • Requirement for surgery or other procedure | <ul style="list-style-type: none"> • Use formulated meal replacements—select a product that offers a support program |

dietitians to work through the flowchart (not illustrated). We then developed written information resources for ADG, RED, LED and VLED interventions incorporating the strategies from Table 1 to easily and systematically deliver the recommendations. Finally, we incorporated mindfulness/intuitive eating strategies (e.g. identifying and managing non-hungry eating; self-monitoring speed of eating, hunger-fullness ratings; 'the questioning approach' and 'The Law of Diminishing Pleasure')^{17,18} to complement each intervention.

Following preliminary piloting, the flowchart was refined to account for service capacity and triaging processes (Figure 1). The flowchart considered patient type, eligibility for the MOC and triaging processes. Ineligible patients were referred externally to statewide telephone counselling services, Get Healthy¹⁹ and The COACH Program.²⁰ Contact with the telephone counselling services were unable to be determined. Clinic capacity remained at 2 × 4-hour clinics per week, plus the Nutrition Coaching group.

Data were collected for patients whose primary intervention was weight management (excluding bariatric surgery) as an inpatient or outpatient in publically funded and private wards and outpatients of a South-East Queensland tertiary hospital. Data collected pre- and post-implementation of the new MOC included referral source, date of appointment, location of service provision, appointment type (new or

review), failure to attend or cancellation. Anthropometry collected included weight, height, body mass index (BMI) and waist circumference (if BMI <35 kg/m²). During pre-implementation, weight management interventions were decided and recorded by the consulting dietitian. Interventions were grouped by JR and SW through consensus discussion. Following the implementation of the new MOC, interventions were also categorised and this was performed by JR and SW. All outpatients seen by a dietitian at the hospital completed a 71-item diet quality (DQ) survey at their initial appointment and at 3 months post-dietetic intervention, with higher scores indicating better DQ.²¹

Pre-implementation, data were collated at the end of each month with one dietitian responsible for requesting and entering the data. This included all weight management dietitians recording patient's information in a table on an A4 piece of paper in free text (Appendix I, top image). Data collation was laborious and considered a burden by the clinicians. During the new MOC, data collection processes were altered to collect the same data on individual slips of paper (one-third of an A4 size) after each patient and then given to the collating dietitian (Appendix I, bottom image). This form was completed at patient appointments and answers were coded to allow efficient and timely data entry. Patients who had cancelled or did not attend ongoing

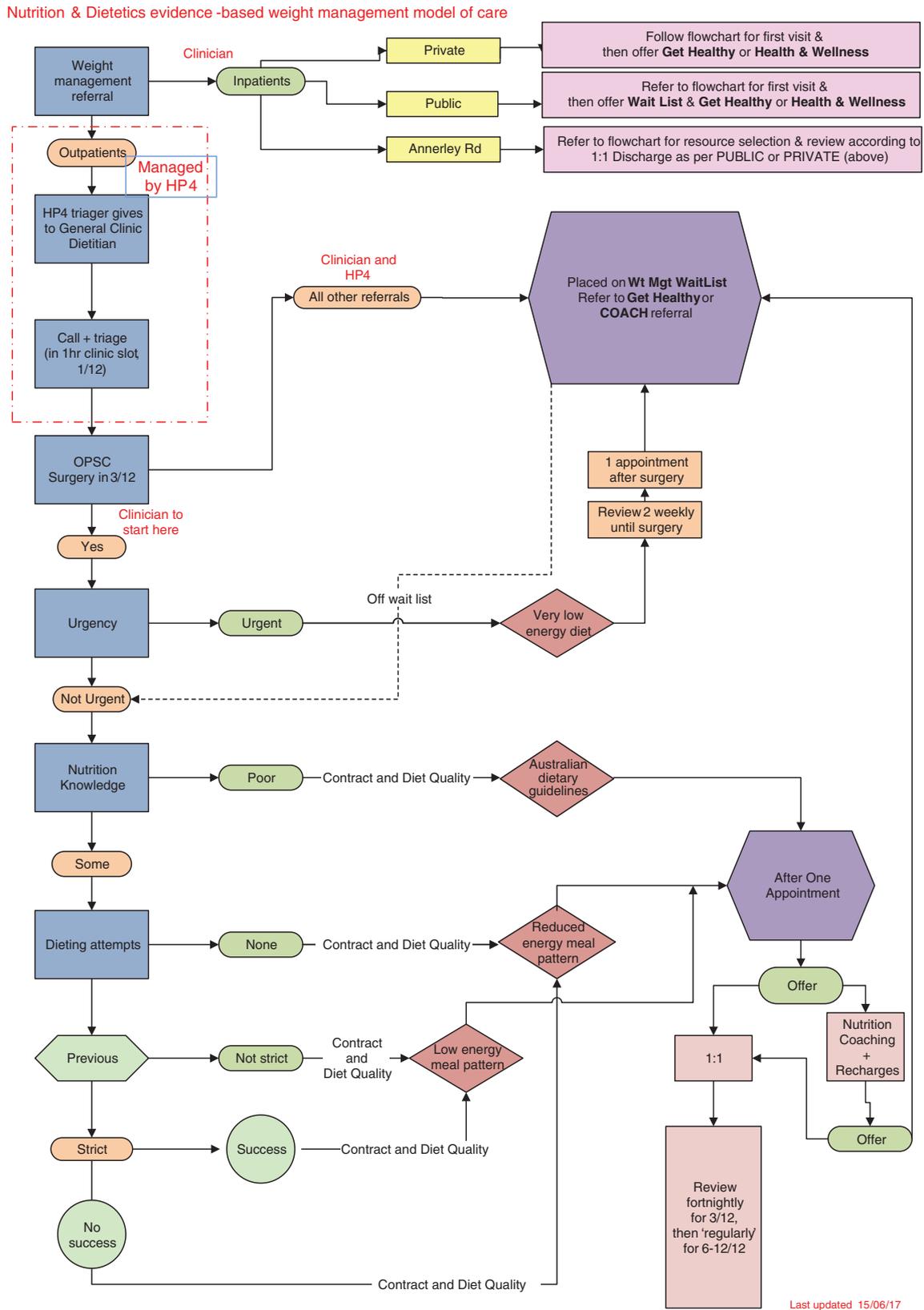


Figure 1 Flowchart operationalising evidence for best practice weight management care within service requirements. (HP4, health professional level 4 pay scale; OPSC, orthopaedic screening clinic; Wt Mgt, weight management; 1/12, 1 month; 3/12, 3 months; 6–12/12, 6–12 months).

appointments were telephoned at 3 months to obtain their weight and DQ score, where possible.

Data were routinely entered into Excel and transferred to IBM SPSS statistics version 24.0 (Armonk, New York, IBM Corp.) for analysis. Patient flow (referrals, attendances) and review appointment timing data were presented as frequencies. Anthropometry and DQ was described with means and standard deviations (all were normally distributed) and change variables were calculated from baseline to 3 months for weight, percentage weight lost, waist circumference and BMI. Between group differences were assessed with independent group *t*-tests (continuous variables) and independent group Chi-squared tests. Statistical significance was set at $P < 0.05$.

The present study received exemption from ethical approval from the hospital's Human Research Ethics Committee (HREC/18/MHS/7).

Results

Pre-implementation, only 69.2% of patients referred ($n = 91$) were seen by a dietitian, with losses to non-attendance ('did not attend', DNA) (5.5%), cancellation (2.2%) and declined/did not respond to invitation appointments (15.4%) (Figure 2). During the new MOC ($n = 60$), over half (63.3%) were referred to Get Healthy/The COACH Program with a high proportion accepting the external referral (94.7%). The rest were triaged according to the flowchart into outpatients with 100% attendance at the initial appointment, however, a small number who were seen in outpatients could have been referred to Get Healthy upon review of the referral reason (data not shown) (Figure 2). All patients included in the new MOC data analysis were from outpatient services as no inpatients were referred or seen for weight loss advice during the time of data collection.

Guideline adherence, as defined by patients' return for first-review appointment, was significantly increased from pre-implementation to implementation of the new MOC (4.4%–50%, $P < 0.001$) (Table 2); all patients were offered a follow-up appointment at 2 weeks, however, some booked later because of personal preference. During the new MOC, five patients declined follow up, two did not attend any review appointments and the remainder attended an average of 3.7 (range of attended: 1–6) and of 4.1 (range of offered appointments 1–7). Compared with pre-implementation, interventions during the new MOC aligned with the two-week review recommendation.

The weight management interventions provided by dietitians pre-implementation included: Australian Guide to Healthy Eating; plate proportions; non-dieting strategies; exercise; kilojoule restriction; meal structure; VLED; self-monitoring strategies; food swaps; goal setting; and/or practical strategies and/or delivery of department's Nutrition Coaching (group) program.¹³ Those delivered during the new MOC included interventions that targeted lifestyle change, energy deficits and were supported by behaviour change in a structured and targeted process: ADG, RED, LED, VLED, with behavioural approaches, including goal

setting, self-monitoring, contract writing, mindfulness, if not dieting, or referral to Get Healthy or The COACH Program.

Service entry weight, BMI and DQ were similar pre-implementation compared to the new MOC, but waist measurements were significantly higher in the new MOC group (Table 3). There were three times as many patients seen by the service pre-implementation compared with the new MOC, because of 38 referrals being sent to Get Healthy or The COACH Program. Follow-up data were available for 31.3% and 54.5% of the pre-implementation and new MOC patients respectively, except for waist measurements and DQ scores (Table 3). No significant differences were observed between any anthropometric or DQ measure. However, the study was not sufficiently powered to detect changes.

Discussion

This project successfully implemented an evidence-based MOC for weight management following a pre-implementation period of monitoring which identified a lack of adherence to weight management best practice recommendations and a lack of consistency in service delivery. Following the new MOC's implementation, all patients received (or were offered) evidence-based care with a large proportion of eligible patients referred to external evidence-based services (Get Healthy/The COACH Program).^{19,20} Those who remained within the service received tailored advice and timely review appointments because of improved service capacity. While not sufficiently powered to detect changes in the outcomes measured, the potential effectiveness of the service is also reflected in the trends in the anthropometric changes documented.

The documented gap between research (or guidelines) and practice that was observed in our study's pre-implementation period (e.g. not meeting recommended time frame for reviews, inconsistent delivery of interventions, lack of consistent behaviour modification strategies to support dietary interventions) is not a new occurrence, despite being a long standing problem. Glasgow *et al.* acknowledge that issues exist because of the flawed assumption that effectiveness (real-world application) of research is a natural and logical progression from efficacy (e.g. randomised controlled trial/clinical trial) research.²² Our weight management service, while incorporating some effective elements pre-implementation, was not providing care that was systematically effective at supporting patients' weight loss goals. Glasgow *et al.* reports that the general barriers to overcoming this evidence-practice gap include limited time and resources of practitioners, insufficient training, lack of feedback and incentives for use of evidence in practice, as well as inadequate infrastructure to support translation.²²

Interestingly, two studies were published in the early 2000s documenting the lack of adoption of guidelines for the management of overweight and obesity by Australian dietitians,^{23,24} with Collins²³ reporting only 13% of respondents surveyed adopting clinical guidelines for obesity management, and no studies into this area have since been

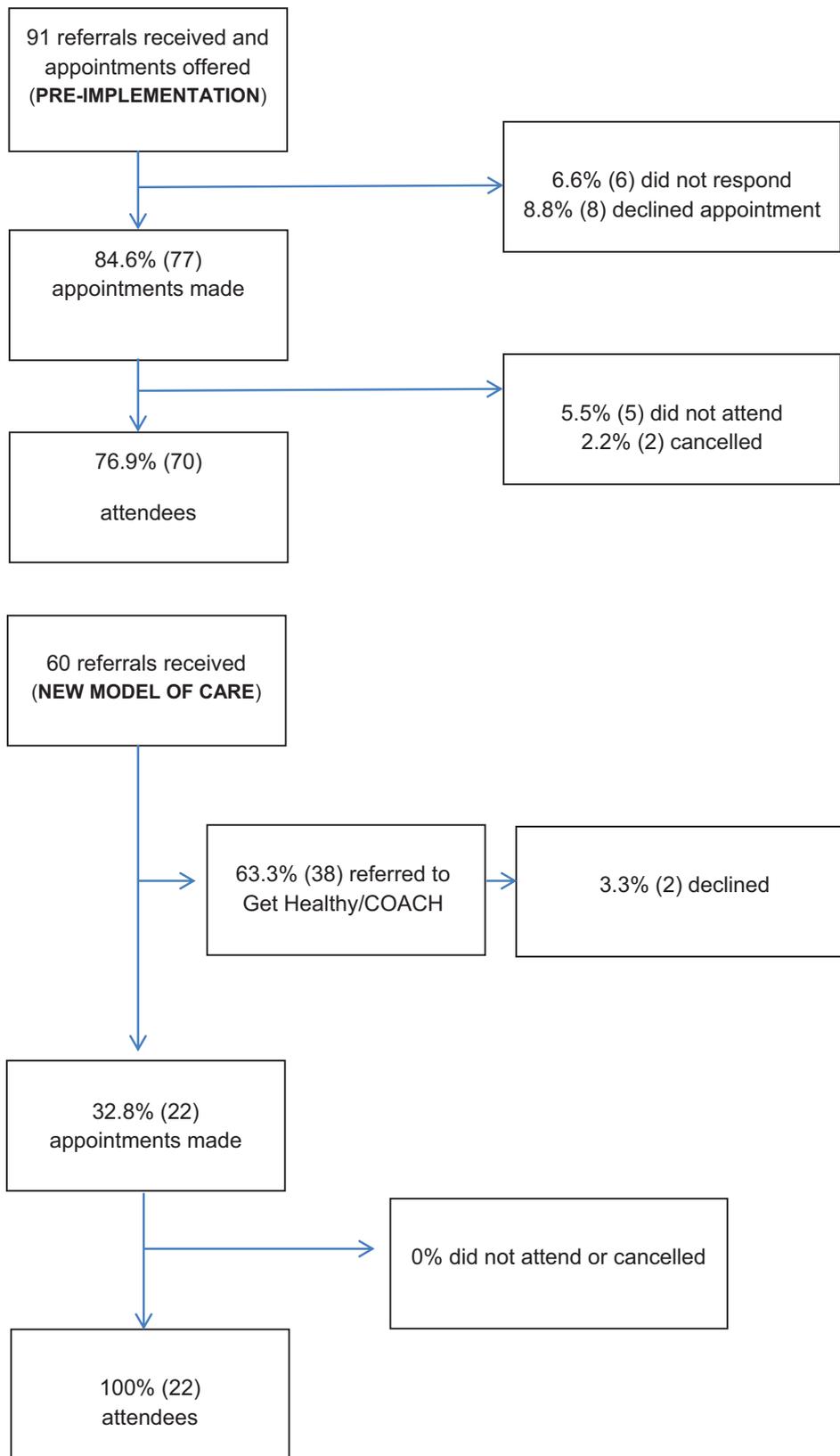


Figure 2 Flowchart illustrating referral outcomes of pre-implementation and post-implementation of the new model of care.

Table 2 Proportion of patients reviewed versus time to first review

| First review scheduled | Pre-implementation (% (n)) | New model of care (% (n)) (P < 0.001) |
|------------------------|----------------------------|---------------------------------------|
| 2 weeks | 4.4 (3) | 50.0 (11) |
| 2–4 weeks | 40.3 (27) | 22.7 (5) |
| 1–2 months | 11.9 (8) | 0.0 (0) |
| 2 months | 17.9 (12) | 4.5 (1) |
| 2–3 months | 1.5 (1) | 13.6 (3) |
| >3 months | 17.9 (12) | 9.0 (2) |
| Nil | 5.9 (4) | 0.0 (0) |

Pre-implementation: n = 67 patients seen for initial appointment; New model of care: n = 22.

published. Campbell and Crawford noted that dietitians saw themselves as potential leaders in this area, but felt pessimistic about interventions and outcomes.²⁴ Gaps in the skills reported by dietitians included: lack of confidence to provide a range of management interventions and promote self-monitoring of diet and exercise, promoting opportunities for social support²⁴ and counselling for behaviour change, strategies for implementing best practice guidelines into a variety of settings.²³ Additional barriers of time, funding, staffing, management support, resources, and lack of long-term follow up of these patients was also noted.²³

While our pre-implementation service was providing many appropriate interventions and did incorporate self-monitoring processes, a systematic approach to implementing best practice, including capacity and adherence to follow up guidelines was absent. Campbell and Crawford and Collins' studies both call for formal studies evaluating models of care and their longer-term impact on lifestyle changes and clinical outcomes, such as the one in the present study.^{23,24} Our changes were only brought about through a department-wide process of addressing evidence-practice gaps. This aligns with small group EBP projects as being one of the only documented effective strategies of clinician and management, that is, protected time out of clinical care or managing patient flow for EBP.⁵ Using the small-group project approach more broadly is a potential strategy to address barriers identified broadly by Glasgow *et al.*²² and more specifically by Campbell and

Crawford and Collins, particularly when decisions need to be made about changing resources and infrastructure to overcome barriers.^{23–25}

In our process of addressing time, resources and infrastructure, we had to acknowledge Australia's prevalence of overweight and obesity. With 63.4% of adult Australians overweight or obese (11.2 million people) (35.5% overweight; 27.9% obese)²⁶ many hospital services do not have the capacity to deliver best practice care without partnerships such as those utilised in the present study. Recently, Australian researchers have documented a lack of engagement with a government delivered telephone counselling service called Get Healthy²⁷ (that would potentially provide a suitable, accessible, evidence-based and effective method to address the burden on public health and hospital services). Get Healthy participants receive 10 telephone calls with a dietitian or exercise physiologist over a 6-month period and has been shown to result in a mean weight loss of ~3.6 kg after 6 months with significant improvements in dietary intake and physical activity.²⁷ In their study it was identified that few clinicians or decision-makers were aware of this service.²⁷

Participation in the Dietetic research translation awards was a catalyst for implementation of the new MOC. Following a systematic approach to assessing and overcoming an EBP gap in a clinical setting means that these changes are likely to be sustained beyond the original motivation for (service) change. This process was strengthened by the involvement of clinicians, team leaders and researchers who provided a variety of perspectives into the planning, development and evaluation of the MOC and its content strengthening the embedding of the MOC as usual practice. Additionally, this investigated the real-world applicability of evidence-based guidelines. Despite the study only having a small sample size, trends in reduction in weight and BMI were observed. Fewer measures were obtained for waist (because of many BMIs >35 kg/m²).

Reflections on study limitations lead to suggestions for future improvements. Ongoing service monitoring will be integrated into usual departmental practice to evaluate the effectiveness of the MOC, including the adherence to subsequent review visit guidelines. As this was a health service

Table 3 Comparison of patient anthropometry, change variables, and diet quality scores at baseline and during the new model of care

| | Pre-implementation | | New model of care | | P-value Difference between change variables |
|---|-------------------------|------------------------|-------------------------|------------------------|---|
| | Service entry | Change at ~3 months | Service entry | Change at ~3 months | |
| Number of patients | 67 | 21 (31.3%) | 22 | 12 (54.5%) | — |
| Weight (mean ± SD) (kg) | 105.5 ± 23.6 | -1.2 ± 3.0 | 103.3 ± 25.9 | -2.9 ± 4.1 | 0.2 |
| Weight (mean ± SD) (%) | — | -0.9 ± 2.4 | — | -2.7 ± 4.3 | 0.1 |
| Waist (mean ± SD) (cm) | 73.1 ± 47.8 (n = 20) | -0.5 ± 1.1 | 108.2 ± 16.0 (n = 7) | -5.0 (n = 1) | — |
| Body mass index (mean ± SD) (kg/m ²) | 38.3 ± 8.4 | -0.4 ± 1.0 | 37.6 ± 7.8 | -1.1 ± 1.6 | 0.1 |
| Diet Quality score (mean ± SD) | 28.7 ± 8.9 | +4.8 ± 6.4 | 28.8 ± 8.5 | -1.0 ± 1.1 (n = 4) | 0.1 |

research project (effectiveness) rather than a tightly regulated randomised controlled trial (efficacy), potential variation would have existed in anthropometric measurements and interventions, such as the patients all being offered 2-week reviews but some opting to return at a mutually convenient time that may not have aligned with guidelines. This reflects the pragmatic nature of implementation research in real-life settings. Furthermore, the lack of guidelines given to clinicians in documenting the interventions they provided in the pre-implementation, leading to difficulty in classifying and clearly identifying interventions, was a shortcoming that was rectified during the implementation period. Ease of data collection and management is an important consideration for all departments attempting similar work in the future, including ours. In addition to the improved data collection template, the lower than desirable return rate for the DQ surveys and the lack of change despite improved anthropometric measures suggests a shorter DQ may be required, for example, the Fat and Fibre Barometer.²⁸ An additional measure, for example, an intuitive eating scale^{29,30} or a self-efficacy measure^{31,32} could be a valuable addition to the evaluation process to determine if eating behaviours and attitudes changed, resulting in the anthropometric changes. Further investigations will be undertaken to see if patients are being seen for weight loss as inpatients as only outpatient data were collected in this project. It is unclear whether nil patients were seen, data were not collected, or they had another primary referral reason. We were unable to directly measure if patients do engage with the telephone counselling services, limiting evaluation of the actual uptake of this referred service. However, we have contacted the statewide service and as they provide aggregate service-use data, they will be disseminating this information to our facility regularly.

In conclusion, the present study has demonstrated successful implementation of weight management guidelines within routine clinical care; provision of tailored content in appropriate timeframes evaluated with appropriate measures. Improvements in processes reflect the successful strategies of implementation and key learnings from the methods undertaken. Following a systematic assessment of the existing evidence-practice gaps, wide and ongoing stakeholder engagement resulted in the development of a pragmatic evidence-based MOC that could be delivered and evaluated within service capacity.

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Conflict of interest

The authors have no conflicts of interest to declare.

Authorship

All authors have participated sufficiently in the article to take public responsibility for the content. Dr SW (corresponding author) was involved in the planning of this project, the analysis, interpretation of data, and the writing of the paper. EH and JM both participated in analysis and interpretation of the data and had critical input into the manuscript. CJ and AA participated in project planning, assisted in data interpretation, and had critical input into the manuscript. Thanks also to the dietitians who participated as stakeholders in the project development—Renee Krikowa, Stephanie Brown & Sarah Mackay.

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APPENDIX I

Data collection templates from baseline (top) and new model of care (bottom) phases.

Baseline data collection from extract

| Name | M F | DOB | UR | Referral | | Inpt Outpt | Date seen | New/ Review/ DNA | Ht (m) | Wt (kg) | Waist (cm) if BMI <35 | Diet quality score | Intervention | Follow up plan* | R/v date |
|------------|-----|----------|---------|----------|----------------|------------|-----------|------------------|--------|---------|-----------------------|--------------------|--------------|-----------------|----------|
| | | | | Source* | Public Private | | | | | | | | | | |
| Bill Smith | M | 20/11/45 | 1234567 | OPSC | Public | Outpt | 20/12/15 | New | 1.75 | 101 | 120 | 40 | | Outpts | 4/52 |

Model of care data collection form

Weight management MOC data collection form

| | |
|--|--|
| PLEASE AFFIX PATIENT LABEL HERE OR INSERT PATIENT INFORMATION NAME: _____ UR: _____ | Public ₍₁₎ / Private ₍₂₎ Inpatient ₍₁₎ /Outpatient ₍₂₎ Date: _____ New / Review (Review number _____) Intervention: <input type="checkbox"/> ADG ₍₁₎ <input type="checkbox"/> RED ₍₂₎ <input type="checkbox"/> LED ₍₃₎ <input type="checkbox"/> VLED ₍₄₎ Follow Up: <input type="checkbox"/> Rebooked in: _____(wks) <input type="checkbox"/> Individual ₍₂₎ <input type="checkbox"/> Nutrition Coaching ₍₆₎ <input type="checkbox"/> Get Healthy ₍₇₎ <input type="checkbox"/> Coach ₍₈₎ |
| Referral from: <input type="checkbox"/> OPSC ₍₁₎ <input type="checkbox"/> Endo ₍₂₎ <input type="checkbox"/> Self ₍₃₎ <input type="checkbox"/> Gynae/Onc ₍₄₎ <input type="checkbox"/> Onc/MCCC ₍₅₎ <input type="checkbox"/> CPEX ₍₆₎ <input type="checkbox"/> Gastro ₍₇₎ <input type="checkbox"/> Surg ₍₁₂₎ <input type="checkbox"/> Neuro ₍₁₃₎ <input type="checkbox"/> GP ₍₁₀₎ <input type="checkbox"/> Dietitian ₍₁₄₎ <input type="checkbox"/> Other: _____(see codes) Clinician: _____ | Anthropometry: Weight: _____kg Height: _____cm Waist: _____cm IES: ____ FFB: ____ |

ORIGINAL RESEARCH

Re-evaluating the nutritional awareness, knowledge and eating behaviours of women attending a tertiary maternity hospital following iterative service redesign

Shelley A. WILKINSON ^{1,2}, Elin DONALDSON¹ and Sally J. MCCRAY ¹¹Department of Nutrition and Dietetics, Mater Group and ²Mater Research Institute, University of Queensland, Brisbane, Queensland, Australia**Abstract****Aim:** Since the opening of the new Mater Mothers' Hospital in 2008, innovative initiatives were developed, implemented and evaluated to meet women's nutritional needs. This study evaluated changes in women's nutritional awareness, knowledge and behaviours and compared these data with our baseline survey.**Methods:** During 2014–2017, 421 postnatal women were surveyed across nine survey periods. Results were compared with those from our 2008 survey (n = 102). Surveys assessed nutrition knowledge, attitudes, behaviour, education preferences, and dietetic service awareness and were distributed on meal trays.**Results:** A greater proportion of women accessed the nutrition services in 2014–2017 compared with 2008 (19.7% vs 9.9%) and rated the resources favourably (≥ 3.5 out of 5). A similar proportion rated the importance of eating well postnatally (83.1% vs 92.1%) and returning to their pre-pregnancy weight (62.4% vs 68.3%) as important/very important. In both periods, women had poor diet quality, despite identifying healthy eating as a high priority. A reduction in median gestational weight gain (GWG) approached significance, 13.0 kg (2014–2017) versus 14.0 kg (2008), $P = 0.055$. There was a significant association between GWG and cohort with an increase in the proportion of women gaining within their correct guidelines (by 15.4%), a reduction of excessive gain (by 24.7%, $P < 0.001$) over time.**Conclusions:** Evidence-based service changes made since 2008 have effected positive change in women's GWG, service preferences, and access. However, women still require awareness-raising and behaviour change programs to improve diet quality and GWG to ensure optimal pregnancy outcomes.**Key words:** diet, gestational weight gain, health services research, maternal health, nutrition, pregnancy.**Introduction**

Unhealthy pregnancy lifestyle behaviours and excessive gestational weight gain (GWG) are associated with negative pregnancy-related and long-term health outcomes for both mother and infant, including increased risk of Caesarean sections,^{1,2} preterm birth,^{1,2} and infant's risk of chronic disease in adult life.^{1,3–5} In Queensland (Australia), 30–100% (per body mass index (BMI) category) of women gain more weight than recommended during pregnancy.^{6–8} Thirty to

fifty per cent of women are overweight or obese at the beginning of pregnancy, placing them at increased risk of excessive GWG, with its associated complications.^{1,6–10} Very few women meet pregnancy fruit and vegetable guidelines (~10% and ~5%, respectively) or undertake sufficient physical activity (40%).^{7,11} A high BMI and a poor lifestyle also increase a woman's risk of developing gestational diabetes mellitus (GDM).¹²

Since the opening of the new Mater Mothers' Hospital (MMH), South-East Queensland, in 2008 a number of service delivery initiatives have been developed, implemented, and evaluated to meet the identified nutrition needs of women attending the publicly funded service. Due to a lack of effective whole of maternity service models of care in the literature, we developed and tested our own⁷ using a Knowledge-to-Action (KTA) Framework, employing both the Knowledge Creation and Action Cycle.¹³ Initiatives were informed by a survey of our postnatal patients in 2008⁷ as well as evidence and published literature regarding nutrition requirements during pregnancy,^{14–16} effective delivery of medical nutrition therapy for women with GDM,¹⁷ effective methods of education and methods of

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supporting behaviour change,^{18–20} translating research into practice,²¹ evidence-based methods of producing written health education material,^{22–24} and the most recent Institute of Medicine GWG recommendations.¹⁵ Our iterative process of health service redevelopment acknowledged that service improvements required a multi-strategy approach beyond attempting to solely obtain more resources for more dietitians. Short-, medium- and long-term service development goals were set based on clinical priority areas. A pragmatic approach was used to achieve a balance between innovation, consumer needs, service practicalities, resource limitations and clinical expertise in the initial existing 1.0 full time equivalent (FTE) service.

Since 2008, the capacity and capability of the nutrition and dietetic department has grown through dedicated externally joint funded research positions, via partnerships and collaborations and subsequent re-orientation of existing resources to areas with demonstrated improvements in guideline adherence and subsequent health outcomes, as well as the acquisition of new resources and development of new patient tools in response to these outcomes. The current dietetic maternity team consists of 1.5 FTE delivering clinical care and an externally funded grant/fellowship supported clinician-researcher (50–70% of FTE covered by grant) with a strategic development and evaluation role. The progressively evolving MMH nutrition and dietetic service has included a series of strategies and initiatives implemented and refined since 2008. These have included:

- Improved promotion of the dietetic services and education around nutrition issues facing pregnant women to hospital staff and general practitioners who share maternity care with the MMH (commenced 2008)⁷
- A new nutrition in pregnancy booklet for midwives to distribute to all women at first booking visit ('Healthy eating during pregnancy', commenced 2008)⁷
- An early pregnancy nutrition education workshop for patients ('Healthy Start to Pregnancy' (HSP) workshop)²⁵ (from 2011 initially as an evening group then from 2013 delivered within antenatal clinic, most days of the week)
- An outpatient postnatal program to support women's awareness of and ability to adopt healthy postnatal nutrition behaviours, 'Nutrition for New Mums' (commenced 2012)²⁶
- The translation of GDM nutrition practice guidelines into the antenatal clinic (from 2012)^{27,28}
- Integration of the dietitian into the antenatal clinic on each day of the week, providing one on one appointments and the HSP group education sessions (from 2014)
- A service-wide implementation of GWG guidelines via addressing evidence-practice gaps in staff knowledge^{29,30} and including staff training, scale placement in every room and a change to weight recording practice in the hospital's maternity database 'Matrix'³¹ (from 2014)
- An integration of GWG management tool 'The Personalised Pregnancy Weight Tracker'³² (from 2008)
- The development and implementation of 'Nine months of nutrition' resource as part of the addition to the suite

of education and communication methods (from 2014) which is a series of seven web-based and USB-delivered, voice-over PowerPoint presentations disseminated via television screens throughout the MMH clinic waiting areas and also hosted on the hospital's website^{32,33}

The aim of this study was to evaluate changes in the nutritional awareness, knowledge and eating behaviours of women who were inpatients in the MMH postnatal ward following these service improvements and education initiatives within the MMH nutrition and dietetics maternity service. Specifically, we aimed to: (i) evaluate women's levels of awareness of the dietetic services available at the MMH; (ii) evaluate women's perceptions of nutritional information available; (iii) compare women's dietary behaviours; and (iv) compare the GWG patterns with women who were surveyed as postnatal inpatients during 2008 to further assist with designing and planning future nutrition and dietetic services.

Methods

The population surveyed was a convenience sample of eligible women over the age of 18 years who were receiving postnatal care in the MMH public postnatal ward. Survey periods ran for approximately 2 weeks every 4 months from 2014 to 2017, commencing June 2014.

The survey was distributed daily on meal trays of women admitted to the MMH postnatal ward. Surveys were returned to Food Services in sealed envelopes that were collected by the dietitian. This distribution procedure differed from the 2008 procedure where surveys were distributed for a 7-week period on 1 or 2 days across the week to prevent women being offered the survey more than once on account of the median length of stay being 2.0 days.

Approximately, 5000 women attend the MMH each year (~100 women admitted to the postnatal ward each week). Based on an anticipated response rate of 25–50%, we aimed to collect approximately 400 patient surveys per year (50–100 each survey period). The 2008 response rate was 17.4%.^{7,8} The current response rate was calculated from the number of women admitted to the postnatal ward during the survey periods.

The 3-page postnatal survey was based on the 2008 survey and took approximately 5 minutes to complete. The survey was self-report and collected women's demographics, anthropometric data (height, pre-pregnancy weight, current weight and GWG), relevant pregnancy history, current breastfeeding behaviour, days since delivery and history of GDM. Other data collected included dietary quality, opinions and knowledge, as well as women's awareness of, use of, and other needs that could be met by the MMH dietetic services. Dietary quality was assessed with a valid tool measuring number of serves of fruit, vegetables and dairy products consumed per day.³⁴ Importance of healthy eating (during pregnancy; in the postnatal period) and returning to pre-pregnancy weight was rated on a Likert scale, with 1 being 'not important' to 5 being 'very important'. Surveys only differed in data gathered

around service needs (2008) and service opinions (2014–2017).

Completed surveys were scanned using 'Remark' services, producing raw data in Excel that was transferred to SPSS version 21 (IBM Corp., Armonk, NY, USA) for analysis. STATA 15 (StataCorp., College Station, TX, USA) was used for weight gain association analyses. Patient characteristics were summarised using frequencies and percentages for categorical variables and means and SDs (normal distributions) or medians and interquartile ranges (IQRs, skewed) for continuous variables. Institute of Medicine GWG guidelines (2009) were used in analyses,¹⁵ including for multiple gestations. Postnatal women were considered to have similar diets as they had in late pregnancy, and therefore when assessing diet quality, the Australian Guide to Healthy Eating¹⁴ recommendations for pregnancy were used. Between group differences were assessed with independent group *t*-tests (continuous variables) and independent group χ^2 tests (categorical variables). BMI and GWG between two cohorts (2008 and 2014–2017) were compared using a Mann–Whitney *U*-test. Association between categorical variable (BMI, GWG) and cohort was examined using Pearson's χ^2 test or Fisher's exact test where appropriate. The level of statistical significance was set at 0.05. The reporting of this study conforms to the STrengthening the Reporting of OBservational studies in Epidemiology (cross-sectional studies) statement.

Ethical approval was obtained from the hospital's Human Research Ethics Committee (HREC/14/MHS/89).

Results

A total of 421 surveys were returned from 1080 surveys distributed (response rate, RR: 39.0%). During this period, 2080 women were postnatal inpatients. The response rates from the individual survey periods were 46.7% (6/2014), 40.7% (10/2014), 41.7% (3/2015), 35.8% (7/2015), 40.8% (10/2015), 38.3% (3/2016), 33.3% (6/2016), 30.0% (10/2016), and 41.4% (6/2017). In 2008, 101 postnatal surveys (17.4%) were collected.⁷

The study population in 2008 was a similar age to the hospital population and was slightly younger in 2014–2017, but had similar mean pre-pregnancy BMI (ppBMI). No differences in age or pre-pregnancy weight were found between the two survey periods. However, there was a greater proportion of women in the healthy weight range in the 2014–2017 period and overweight in 2008⁷ (Table 1). Approximately, half of the women had delivered their first baby (during the survey period) and over 92% were breastfeeding at both survey periods. One multiple pregnancy (triplets) was included in the cohort in 2008, two sets of triplets and four sets of twins were in the 2014–2017 cohort.

In 2008, 54.5% (55) of postnatal women knew of the dietetic services, and of these women, 9.9% (*n* = 10) accessed them. As shown in Table 2 there is now greater awareness of and engagement with the dietetic services. Across the different resources or services, between 47.0%

and 88.8% of women received a resource or saw a dietitian. Furthermore of the women surveyed, 13.3% of women attended an individual appointment, 6.4% attended a group (HSP) and 90.9% of the women with GDM (10.5% of survey cohort) attended an individual appointment with a dietitian. Approximately 20% would have liked to have seen a dietitian but did not know the service was available.

Postnatal women were not surveyed about the resources in 2008. In 2014–2017, between 40% and 70% of women surveyed were aware of the healthy eating in pregnancy booklet, weight tracker and the new 9 months of nutrition resources (Table 2). A quarter to 40% rated them as useful/very useful, with ratings 3.5 or above out of 5 given. Only six women commented about extra services about which they would like information; five requested information about diet and breastfeeding, one requested information about weight loss postpartum and two commented they did not receive any dietary information. In addition to those who indicated they did not/would have liked to have received dietary information during pregnancy in Table 2, an additional two women noted they would have liked to have received information and support about healthy eating and weight gain during pregnancy.

Similar proportions of women reported having GDM at both survey periods (8.9% (2008) and 10.5% (2014–2017)). No questions were asked of women about the GDM service and resources in 2008 due to a minimal service being offered. In 2014–2017 of the women who reported having GDM (*n* = 44), 40 of them reported having an individual appointment with a dietitian (3 missing). Most women with GDM (79%, 35) rated the booklet provided³⁵ as useful/very useful with a rating of 4.6 ± 0.7 out of 5. Only 9.1% (4) reported not receiving a booklet. The voice-over introductory GDM PowerPoint³³ was rated as useful/very useful by 50% (22) of the women, with 29.5% (13) reporting not having seen it. Women rated it 4.0 ± 1.1 out of 5.

A similar proportion rated the importance of eating well now as important or very important and this approached significance, being 9% less than in 2008 (92.1% (90) vs 83.1% (350), *P* = 0.055). Similar proportions of women rated returning to their pre-pregnancy weight as important or very important at both survey periods (68.3% (69) in 2008 vs 62.4% (263) in 2014–2017, *P* = 0.5). A large proportion of women rated eating well in pregnancy as important or very important to them in 2014–2017 (80.1% (337)), with this question not asked in 2008.

No significant difference over time was observed in intake of fruit, vegetables or dairy products (Table 3). However, this approached significance for mean daily fruit intake (increase) and mean dairy intake per day (decrease). Hoerr *et al.* demonstrated in the US population that these food groups predict 62% of the variance of a person's diet.³⁴ Significantly more women met fruit guidelines in the second survey cohort; in 2008 women were recommended to consume 4 serves per day compared with 2 per day in 2014–2017.^{14,16} The 9.5% increase in the proportion of

Table 1 Demographic, anthropometric and pregnancy profile of the study populations

| | Study sample | | | Hospital population | |
|---|---------------------------------|---------------------------------------|----------|---------------------|---------------|
| | 2008 n = 101/580; RR = 17.4% | 2014–2017 n = 421/1080; RR = 39.0% | P-values | 2008 | 2014–2017 |
| Age (% , n) | | | | | |
| <20 years | 2.0 (2) ^a | 1.4 (6) | 0.09 | 7.2 (54) | 1.1 (444) |
| 20–30 years | 56.4 (57) ^a | 49.9 (210) | | 57.1 (430) | 34.7 (13 856) |
| 31–40 years | 36.6 (37) | 47.0 (198) | | 34.4 (259) | 51.4 (20 518) |
| >40 years | 5.0 (5) | 1.7 (7) | | 1.3 (10) | 2.7 (1079) |
| Missing | 0 (0) | 0 (0) | | | |
| Education level (% , n) | | | | | |
| <12 years | Not asked | 5.9 (25) | — | — | — |
| 12 years | | 14.7 (62) | | | |
| Certificate/TAFE | | 31.6 (133) | | | |
| Bachelor/higher degree | | 46.6 (196) | | | |
| Missing | | 1.2 (5) | | | |
| Pre-pregnancy weight (kg) | | | | | |
| Mean ± SD | 68.0 ± 15.5 | 65.6 ± 17.6 | 0.2 | — | — |
| Range | (42–123) | (39–170) | | | |
| Missing | 3.9 (4) | 5.2 (22) | | | |
| Pre-pregnancy BMI (kg/m ²) | | | | | |
| Median (IQR) | 24.1 (21.0–27.8) | 22.3 (20.6–26.6) | 0.055 | 24.7 ± 6.3 | 24.5 ± 6.4 |
| Range | (16.4–42.6) | (14.7–58.1) | | | (10.0–76.5) |
| % (n) | | | | 11.2 (80) | |
| <18.5 | 5.6 (5) | 7.1 (27) | 0.037 | 53.5 (383) | 13.1 (4994) |
| 18.5–24.9 | 50.0 (45) | 60.3 (229) | | 18.9 (135) | 49.3 (18839) |
| 25–29.9 | 28.9 (26) | 15.8 (60) | | 16.5 (118) | 20.2 (7745) |
| >30 | 15.6 (14) | 16.8 (64) | | 4.9 (12) | 15.5 (5941) |
| Missing | 10.9 (11) | 9.7 (41) | | | 1.9 (729) |
| Mean gestational weight gain (kg) | | | | | |
| Median (IQR) | 14 (10.0–19.0) | 13 (10.0–16.0) | | — | — |
| Range | (–9 to 28) | (–30 to 46) | 0.057 | | |
| Missing | 18.8 (19) | 13.5 (57) | | | |
| Gestational weight gain (three categories), % (n) | | | | | |
| Insufficient | 19.5 (16) | 28.8 (105) | <0.001 | — | — |
| Correct | 23.2 (19) | 38.6 (141) | | | |
| Excess | 57.3 (47) | 32.6 (119) | | | |
| Gestational weight gain (two categories), % (n) | | | 0.008 | | |
| Insufficient/excess | 76.8 (63) | 61.4 (224) | | | |
| Correct | 23.2 (19) | 38.6 (141) | | | |
| First baby? (yes) | 51.5 | 45.4 | 0.3 | — | — |
| Multiple pregnancy | n = 1 (triplets) | n = 6 (4 twins, 2 triplets) | n/a | — | — |
| Breast feeding | 92.1 = yes | 93.3 = yes | 0.6 | — | — |

^a Age ranges for postnatal were <19 years and 19–30 years, instead of <20 year and 20–30 years; 2008: one set of triplets; gained within IOM guidelines; 2014–2017: two sets of triplets and four sets of twins; one women with triplets with no GWG data, one gained within IOM guidelines; GWG only recorded for two of the four women with twins, one GWG was insufficient and the other did not record her BMI so unable to assess.

BMI, body mass index; IQR, interquartile range; RR, response rate; TAFE, Technical and Further Education.

women meeting dairy serves per day approached significance, $P = 0.09$.

Median and IQR of GWG was 13.0 (10.0–16.0) in 2014–2017 and 14.0 (10.0–19.0) in 2008; the difference approached significance, $P = 0.055$ (Table 1). Of patients with GWG and BMI available ($n = 447$), there was a significant association between GWG and cohort ($P < 0.001$) (three categories i.e. correct vs insufficient vs excessive),

$P = 0.008$ (two categories, correct vs outside guidelines) where a greater proportion of women had the correct weight gain in 2014–2017 (23.2% vs 38.6%) (Table 1). Subgroup analyses suggested a significant association between GWG and cohort among women with pre-pregnancy BMI 18.5–24.9 kg/m² (2008 vs 2014–2017: Insufficient 33.3% vs 34.7%, Correct 21.4% vs 42.8%, Excessive 45.4% vs 22.5%, $P = 0.004$). There was no

Table 2 Summary of women’s Mater Mothers’ Hospital dietetic service access and ratings (2014–2017 survey cohort)

| | Yes (n) | Rated useful/ very useful (% , n) | Rating out of 5 | Did not receive or see | Would have liked to have seen/received |
|--|------------|--------------------------------------|--------------------|---------------------------|--|
| Saw a dietitian for an individual appointment | 13.3 (56) | Not asked | Not asked | 12.4 (52) | 8.1 (34) |
| Attended healthy start to pregnancy | 6.4 (27) | Not asked | Not asked | 11.2 (47) | 6.9 (29) |
| Healthy eating during pregnancy booklet | 70.8 (298) | 42.6 (179) | 3.8 ± 1.1 | 24.5 (103) | 0 (0) |
| Personalised pregnancy weight tracker | 59.9 (252) | 30.9 (130) | 3.5 ± 1.3 | 34.7 (146) | 0 (0) |
| Nine months of nutrition voice-over PowerPoints | 39.9 (168) | 24.0 (101) | 3.8 ± 1.2 | 53.0 (223) | 0 (0) |
| Saw a dietitian for GDM appointment ^a | 90.9 (40) | Not asked | Not asked | 0 (0) | 0 (0) |
| GDM booklet ^a | 88.6 (39) | 79.0 (35) | 4.6 ± 0.7 | 9.1 (4) | 0 (0) |
| GDM voice-over PowerPoint ^a | 65.9 (29) | 50 (22) | 4.0 ± 1.1 | 29.5 (13) | 0 (0) |

Likert scale: 1 (not very useful) to 5 (very useful).

^aOf the women who reported having gestational diabetes mellitus (GDM).

Table 3 Women’s dietary behaviours in the two survey periods

| | 2008 | 2014–2017 | P-values |
|--|-----------------|-----------------|----------|
| Diet quality ³⁴ | | | |
| Daily serves of fruit; mean ± SD (n) | 1.9 ± 1.1 (100) | 2.1 ± 1.0 (418) | 0.09 |
| Daily serves of vegetables; mean ± SD (n) | 2.2 ± 1.2 (100) | 2.4 ± 1.3 (418) | 0.15 |
| Daily serves of dairy; mean ± SD (n) | 2.0 ± 1.0 (98) | 1.8 ± 1.0 (413) | 0.08 |
| Proportion of women meeting guidelines (% , n) | | | |
| Fruit (% , n) | 5.0 (5) | 62.7 (262) | <0.001 |
| Vegetables (% , n) | 4.0 (4) | 5.5 (23) | 0.8 |
| Dairy (% , n) | 45.9 (45) | 55.4 (229) | 0.092 |

significant association between GWG and cohort among women with each of the other ppBMI categories (Figure 1).

Discussion

This study has demonstrated greater nutritional service and resource awareness and ratings, as well as improved GWG patterns among MMH inpatients with nutrition and dietetics service improvements and education initiatives implemented in the MMH since the 2008 survey. However, only slight improvements have been observed in dietary patterns in women attending the MMH for maternity care.

Improvements in women’s level of service awareness and access are potentially explained by the increased service capacity and the integration of this service into the antenatal clinic, the ongoing service promotion with women and staff, and the variety of resources available in numerous educational formats (booklet, videos, tracking resources). Over two-thirds of the women surveyed were aware of these resources and a quarter had seen a dietitian in an individual or group setting, compared with less than 10% in 2008.⁷ Around one-fifth would like to have seen a dietitian but did not. Despite the importance of good dietary behaviours in pregnancy, particularly due to the effects of epigenetics on long-term chronic disease,³⁶

not all women will be able to, will want to or will prioritise seeing a dietitian during pregnancy. Multiple, effective and accessible resources to inform and influence behaviour change are required in an effective maternity service. Referral pathways and prompts, ongoing service promotion, and service capacity should also be explored

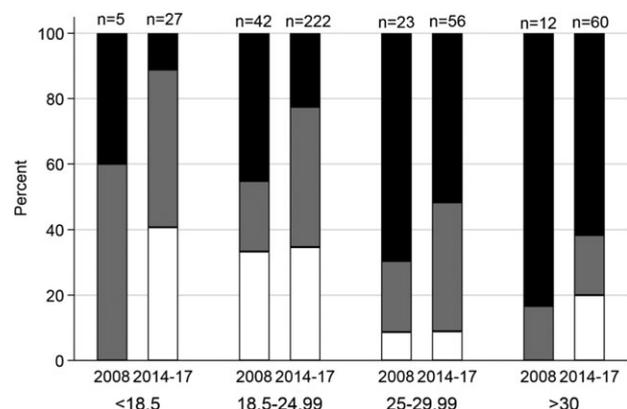


Figure 1 Comparison of gestational weight gain patterns between two cohorts within women per pre-pregnancy body mass index category. (□) Insufficient; (■) correct; (■) excessive.

to ensure that women who do want to see a dietitian benefit from this service.

While no measure of the proportion of postnatal women receiving written information was documented in 2008, less than two-thirds of women surveyed during the antenatal period at the same time recorded having received written information. This shows our information distribution processes have improved.⁷ Between a quarter and just under a half of women rated the resources useful or very useful, and a large proportion of women rated GDM resources highly. While we did not examine the differences in ratings between women who were seen by a dietitian with those who were not, this might suggest women who had more passive exposure to the healthy eating booklet, weight tracker and the voice-over PowerPoints (9 months of nutrition) provided lower ratings. Bookari *et al.* demonstrated that while women predominantly prefer written information during pregnancy and almost all look for information as soon as they find out they are pregnant, they can become overwhelmed and confused and want constructive and interactive engagement from (all) health-care professionals to support good nutrition behaviours.³⁷ Lucas *et al.* also highlighted that many health professionals cite barriers of time, resources and relevant training (lack of confidence) in providing or supporting nutritional changes in women.³⁸ The 9 months of nutrition resource was constructed to act as an evidence-based tool that staff could direct women to when nutritional advice was required beyond their scope of practice. Similarly, the healthy eating booklet is a stand-alone, evidence-based content and behaviour change resource that midwives distribute at women's first visit. Potentially, more work needs to be done to flag women who would benefit from nutrition input and to improve staff's confidence in the use of these resources.

The importance of eating well in both pregnancy and the postnatal period received high scores in both cohorts. This has been documented in the literature with Szwajcer *et al.* showing that women prioritise the understanding and achieving of good nutrition in pregnancy compared with other times of their lives.³⁹ Surprisingly, fewer women in both cohorts rated returning to their pre-pregnancy weight as important to them (around two-thirds) compared with the ratings for eating well. Christensen *et al.* has noted that women perceived that their maternity health professionals seem unconcerned about their weight and postpartum weight loss, with little or no guidance being provided.⁴⁰ Women also had little knowledge of the risks of postpartum weight retention.⁴⁰ It has also been shown that the primary influence on women's pregnancy and postpartum attitudes towards weight is their pre-pregnancy orientation towards body weight;⁴¹ this lower rating may reflect an underlying dissatisfaction with their pre-pregnancy weight. However, women's responses also need to be interpreted within the timeframe of questioning. This may not be of priority immediately after birth, but may be considered important once they feel they have some mastery over the many

other new matters they need to deal with (lack of sleep, breastfeeding, new baby, etc.).

Despite no significant changes in women's dietary intake, reflected by reported daily intake of fruit, vegetables or dairy products and the overall percentage of women meeting dietary guidelines for these food groups, women's intake in the 2014–2017 cohort were higher than most recent Australian studies of dietary intake in pregnancy (note: proportion of women meeting fruit intake guidelines to be excluded due to change in guidelines from 4 to 2 serves per day).^{25,42–46} While this may be an artefact of measurement, a number of the studies used identical methodology.^{45,46}

Many barriers to consuming a healthy diet in pregnancy have been documented, including lack of availability of fruit and vegetables, convenience/time and effort to prepare fruit and vegetables,⁴⁷ and preference of other foods.⁴⁸ Few studies exist in the literature focused on improving diet quality during pregnancy, generally focusing on more specific conditions such as GDM or primarily influencing GWG.³⁹ When appropriate approaches are taken that provide information and strategies to support behaviour change/overcome barriers, significant improvements are observed in dietary behaviours as illustrated in our 'HSP' low-intensity, dietitian-led behaviour change workshop.²⁵ Attendance at this workshop resulted in significantly more women increasing their consumption of serves of fruit (+0.4 serves/day, $P = 0.004$), vegetables (+0.4 serves/day, $P = 0.006$), met fruit guidelines (+11.9%, $P < 0.001$), and had a higher diet quality score ($P = 0.027$) to those who only received our healthy eating in pregnancy booklet.²⁵ With less than 10% of women surveyed attending this program (Table 2) investigation into barriers to service access will be undertaken.

The significant increase in women gaining weight within the recommended IOM guideline ranges is a very promising outcome with only around 30% of women experiencing excessive GWG in the 2014–2017 cohort. While this is still a concern due to links with poor maternal and infant pregnancy and long-term outcomes^{1,2} this is lower than many recent studies (e.g. 38%,⁶ 39%,⁴⁶ 42%,⁴⁵ 47%² and 52%⁴⁹). It has been clearly demonstrated that interventions which include dietary advice, and physical activity, supported by ongoing weight monitoring can prevent excessive GWG and result in more women across all BMI categories achieving weight gain within correct ranges.^{50–53} It may be suggested that this increase in appropriate GWG is a result of service wide changes and support, including guidance provided by dietitians.³¹

Study strengths included the use of an implementation science framework (KTA Framework¹³) to guide service development and evaluation and our use of the same survey for both cohorts. The recruitment method and response rate are both a strength and a limitation. The recruitment rate was higher in 2014–2017 (overall and at each collection point), potentially a reflection of shorter, more targeted data collection periods. The overall number of women surveyed was also much larger, providing greater confidence

in observations. The smaller sample size in 2008 may have reduced statistical power in comparisons undertaken. However, the cohorts' characteristics were similar to those of the wider hospital's population. The cross-sectional design provides data on health behaviours at two time points, rather than providing longitudinal information, although this was attempted to be circumvented by 'pulse' surveys over the longer time period for the second cohort. The dietary measures reported are subjective rather than objectively measured and the use of a longer dietary quality tool could be considered preferable, but the lack of availability of an affordable tool of a suitable length when the 2008 survey was distributed was a limitation. Physical activity data would also have added more information about women's lifestyle behaviours.

Priority areas for service redesign focus will continue to promote awareness and access to the suite of dietetic services, as well as strategies to improve diet quality and decrease excessive GWG. Exploration of the potential of broad reach/low intensity methods of delivery, for example, mHealth (mobile Health) approaches, such as the effective txt4two program⁵⁴ is planned, which may be able to integrate existing resources, and could be adapted to deliver our previously developed postnatal program to decrease postpartum weight retention.²⁶ This will also increase the capacity of the dietitian's clinic to accommodate women needing greater assistance and contact. Development and evaluation of mHealth programs that are embedded in a maternity service, with functionality for tailoring 'push' messages that provide information and resources to facilitate knowledge acquisition and behaviour change may help to overcome the complexity resulting from the 'noise' of social and traditional media with the trusted (but less accessible) health service evidence.^{37,55}

Other maternity services can learn from the processes undertaken and results obtained in this body of work⁷. Locally applying the KTA Framework¹³ would help to ensure a systematic approach to service assessment and redesign. This would begin with an understanding of the service and the women who use it, such as number of births, the proportion of women with higher needs (e.g. GDM, women with a ppBMI above 25 kg/m², patterns of weight gain compared with guidelines, etc.), to define the evidence-practice gap. Additionally, an assessment of barriers and enablers to delivering best practice care should be undertaken to allow prioritisation of changes required.^{21,56} It is widely recognised that translating research findings into clinical practice is a challenge for in health services and that many clinicians do not have the capacity, confidence or expertise to realise change in their local settings. Parker *et al.* suggest a collaborative approach (a 'hybrid' model of facilitated implementation) to overcome such a problem.⁵⁷ This allows opportunities of 'local fit' and 'maximised buy-in' from sites to be balanced with tactical implementation decision and expertise from external facilitators from other clinical settings, health departments and/or research institutes.⁵⁷ Benefits could also be realised with co-funded (through external grants or partnerships)

embedded clinician-researchers, such as in this body of work.

In conclusion, this maternity service review has demonstrated that the iterative, multi-strategy, evidence-based service changes made since 2008 have effected positive change in women's GWG, service preferences and service access. However, it is also apparent that pregnant women require programs that provide greater awareness-raising and behaviour change support through targeted, tailored and frequent interventions to improve diet quality and manage GWG to ensure optimal pregnancy outcomes.

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Conflict of interest

No conflict of interest exists for any author.

Authorship

All authors have participated sufficiently in the article to take public responsibility for the content. SAW was involved in the planning of this project, the analysis, interpretation of data and the writing of the paper. ED was involved in data collection, and ED and SJM were involved in analysis and interpretation, as well as contributing to and reviewing the manuscript.

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ORIGINAL RESEARCH

Engaging food service providers to change food service practices in aged care facilities

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Abstract

Aim: The present study describes the impact of a novel education program for food service staff from Australian aged care facilities (ACF) to facilitate improvements in food service practices. The purpose was to explore; (i) the impact of the intervention (ii) barriers and facilitators of the program from food service providers' perspectives and (iii) make program planning and practice recommendations.

Methods: Participants completed pre- and post-program questionnaires, attended two focus groups on program process and impact and 4 months later reported through individual interviews on changes they had implemented. Results were triangulated between the questionnaires, focus groups and interviews and impacts and outcomes identified through directed content analysis.

Results: Thirty senior-level chefs and a cook participated from 27 ACF from Victoria, Australia. Participation impacted on the menu, dining experiences and food service practices. All of the participants were enacting changes in their workplace 4 months later as change agents. A focus on skilling the participants as 'change agents', brokering ongoing peer-support and the celebrity and/or expert status of the facilitators were attributed to the success of the intervention.

Conclusions: This novel intervention empowered Victorian food service providers to make positive changes in ACF. Further research is required to measure if these self-reported changes are sustainable and relevant to other facilities and to establish the effect on food experience, satisfaction and well-being of residents.

Key words: focus groups, food services, personal satisfaction, qualitative research, quality of life, workforce.

Introduction

With changing demographics and increases in life expectancy, the older population who require support are growing at unprecedented rates in many countries.¹ In Australia, 15% of the population is aged 65 years and over and by 2054 this will increase to 21%.² By 2050 between 3 and 9% of the population will be aged 85 years or more.³ This 'older old' group is increasing the most rapidly with numbers projected to double by 2032.² Government policy is to focus on 'ageing in place' with support made available to assist people at home.² However, with increasing frailty and loss of independence, 7.8% of Australian people older than

65 years moved into one of 2700 aged care facilities (ACF) for their care and this will increase.³

Protein-energy malnutrition, Vitamin D deficiency, Vitamin B deficiency and to a lesser extent other micronutrients have been found to be significant dietary challenges for residents of ACF.^{4,5} Adequate nutrition is essential for older adults' health^{6,7} and it is necessary to optimise the food service system in ACF as residents are dependent on these services for the provision of their meals.^{8,9} Barriers to food service include a lack of prioritisation of food service at a funding level, a lack of well-trained knowledgeable professionals and food service staff and a lack of national food and nutrition regulation, while juggling the variety of special dietary needs of residents.¹⁰

As well as nutritional adequacy, food provided in ACF is a key determinant of residents' quality of life.^{11–13} Food service staff, therefore, plays a significant role in the day to day lives of residents through the preparation and provision of 'good food'^{9,12} but also residents' satisfaction with living.^{9,11,13} 'Good food' defined by residents is food which is familiar or home-style, cooked with fresh ingredients and easily recognisable on the plate.¹¹ Residents experience of 'good food' is not always positive,^{9,11} a view supported by a strong public reaction through the social media when a

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national non-profit organisation, the Maggie Beer Foundation (Foundation) announced that they would transform the food experience for older people in Australia 'by challenging community attitudes, changing institutional food preparation practice and shifting best practice expectations'.¹⁴

Despite their crucial role there is paucity in the literature of interventions which have empowered food service staff in aged care settings to strengthen food service and mealtime practices. In response to this and public support for change, a 14-hour nutrition education program was developed by the Foundation to empower key food service staff in ACF to change foodservice practices and become 'change agents' in their workplace. The three core concepts of social cognitive theory (SCT), commonly used in education, were used to shape the program.^{15,16} According to SCT, participants will reproduce the observed behaviours by program facilitators because they will believe in their ability to effect change, they will have many opportunities to successfully perform the learned behaviours, and ongoing support from other participants and materials will improve their self-efficacy.¹⁷

The aim of the program was 'to provide new understanding, skills and knowledge to ACF chefs and cooks, to deliver greater nutrition and enhanced food experience from all meals' (p.3).¹⁴ Outcomes sought were changes in ACF food provision and mealtime practices and empowering chefs and cooks to facilitate change in their workplace. Educational programs by themselves can be ineffectual and translating evidence-based knowledge into practice is problematic.¹⁸ Novel to this program was that it was celebrity-led with expert support, with an emphasis on facilitating peer-support and behaviour change, rather than knowledge and skills.

The purpose of the present study was to conduct a process, impact and outcome evaluation of a novel nutrition education intervention developed for food service providers in aged care settings. Process, impact and outcomes were evaluated from the food service providers' perspectives and included: program satisfaction, changes to knowledge and skills, participants' intention to change and what changes they had made 4 months post-program in their facility. These insights were used to improve nutrition education program planning and to propose recommendations for supporting aged care food service providers.

Methods

Approval for the study was granted by the Social and Behavioural Research Ethics Committee at Flinders University SA (Project No. 6890). A convenience sample of 30 management-level chefs and cooks from 27 ACF in the state of Victoria (including one affiliated from Canberra), applied and were selected to participate in a three-day program in South Australia following promotion of the program and invitations to submit expressions of interest to attend. The program was promoted widely through the aged care networks and participants from the state of Victoria were invited by a phone call using a list of facilities on a national database

(n = 730 ACF, 387 contacted). Applicants submitted online and were asked to address selection criteria relating to their role and interest. Due to funding and space limitations, invitations were restricted to 30 participants. Facilities paid a registration fee that covered flights and accommodation in June 2015 and 12 of the 30 participants received a grant from the program developers to cover registration. The program did not have a direct cost to participants attending. Once participants confirmed their attendance, an information pack with consent forms for participation in the study was posted.

The program was developed by a team working with the Foundation and included a national celebrity cook known for her philanthropic work and recognised by the Federal Government as 'Senior Australian of the Year'. The program was reviewed by the Foundation's Board and food service experts, including three accredited practicing dietitians and the changes suggested made. A needs assessment included an analysis of unsolicited social media responses (available on the Foundation's website) and interviews consulting ACF senior food service staff in six facilities in SA. This feedback as well as best practice guidelines,^{7,8,10,11,19} and peer-reviewed evidence^{4,5,9,13,15,16,20,21} was used to inform the program's development. Unique to this program was that it was co-facilitated throughout by a national celebrity cook with other experts including chefs known nationally for their innovative work with older adults, often while performing cooking demonstrations. Formative research identified participants' needs and expectations and this was used to tailor the program throughout the program.

The program content (Table S1) was underpinned by adult learning theories²² and a multi-theories model²³ assuming adults have a repertoire of experiences to draw upon, are internally motivated, are self-directed learners and learn best through doing, problem-solving and immediate use. The 10 sessions which were 60–90 minutes in duration were mostly discussion-based with a mixture of experiential, 'hands-on' activities and demonstrations in a kitchen-setting. Throughout the program, newly developed recipes for ACF were cooked as part of the sessions and served for meals and mid-meals. Recipes and written information were provided for the workplace, including recipes' nutritional composition. Recipes were developed to be nutritious, flavoursome, seasonal with locally available produce, at a consistency manageable by older people and cooked from minimally processed ingredients.

The evaluation was conducted independently to the facilitators running the program and the evaluation team was not known to the participants until the program started. To evaluate the program's process, impact and outcomes qualitative research and questionnaires were used during the program, immediately post-program and at follow-up, 4 months later. Participants completed a self-administered questionnaire pre-program and immediately on program completion as well as at the end of each day. The questionnaire was co-developed by the authors in consultation with the program developers with reference to SCT.¹⁷ It was reviewed by the steering team made up of the program

developers and industry leaders and piloted with four food service providers. Questions were developed to gauge participants' satisfaction with the process of the program including perceived usefulness, relevance and delivery. Additional questions were designed to capture perceived changes in confidence to effect change. Responses to the questions were formatted as a 5-point Likert-scale with the responses *strongly disagree*, *disagree*, *neutral*, *agree* and *strongly agree*. Moreover, three concurrent focus groups of 9–10 participants were held on the first day and three more on the last day and explored participants' expectations, perceptions of the meaningfulness of the program and intention to change. These were undertaken by four authors (LM, OF, GO, RR) and data were collected using semi-structured questions and piloted with members of the steering team and food service providers from two ACF. Focus groups took between 25 and 50 minutes. Four months post-program, a phone interview was undertaken with individual participants in their workplace by the same four authors to evaluate the impact and outcomes of the program. Semi-structured questions explored participants' perception of the program, what changes they had made in their facility and what were the enablers and barriers. The quantitative questionnaire completed after the program was also repeated. The interviews ranged from 16 to 55 minutes in duration.

Data from the self-administered questionnaire were entered into Survey Monkey and scores automatically summarised. Focus groups and the phone interviews were recorded, transcribed and coded manually. After reading the transcripts several times, two researchers independently coded the focus group and individual interviews, categorised and identified emerging themes (LM, GB) using recognised methods for directed content analysis.^{24,25} A summary of the results was member checked and quotes typical of the themes and subthemes identified for reporting. Qualitative methods were used to gain an in-depth understanding of the meaningfulness of the program,²⁶ what needed improving and the feasibility of making changes in the workplace.²¹ Results from the questionnaires, focus groups and individual interviews were triangulated to identify consistent responses and to gain a clearer understanding.²⁴ The qualitative research was reported according to COREQ guidelines.

Results

Of the 30 participants involved in the program, most described themselves as in a management role with a chef background (n = 24) or as chefs (n = 5) and one as a cook. Of the 27 facilities, 14 were based in a rural area. Places in the facilities ranged from 40 to 220, with four facilities providing meals for residents and for community dwelling populations. Most facilities cooked fresh on site (n = 20), and selected characteristics of the participants and facilities are listed in Table 1.

Most of the participants participated in the survey, focus groups and follow-up interviews 4 months later (Figure 1).

Table 1 Selected characteristics of Australian aged care facilities (ACF n = 27) and senior ACF food service chefs and cook (n = 30) participating in the 'Creating an Appetite for Life' education program, October 2015

| <i>Gender</i> | | |
|--|----|-----|
| Males | 14 | 47% |
| Females | 16 | 53% |
| <i>Job Title</i> | | |
| Food services manager/catering Manager/chef manager | 14 | 47% |
| Service support manager | 4 | 13% |
| Head chef | 6 | 20% |
| Chef | 5 | 17% |
| Cook | 1 | 3% |
| <i>Faculty size (number of places)</i> | | |
| 30 or less | 1 | 5% |
| 40–60 | 6 | 29% |
| 61–80 | 2 | 9% |
| 81–125 | 3 | 14% |
| 200–220 | 3 | 14% |
| Multiple sites (50–100 places per site) | 6 | 29% |
| <i>Faculty type</i> | | |
| Not-for-profit | 11 | 41% |
| Private | 16 | 59% |
| <i>Faculty location</i> | | |
| Multiple sites (4–8 sites each, metropolitan and regional towns) | 7 | 33% |
| Metropolitan | 5 | 24% |
| Regional town or rural | 9 | 43% |
| <i>Food service type</i> | | |
| Fresh-cooked on site | 15 | 71% |
| Cook-chill | 1 | 5% |
| Fresh-cooked on site + cook-chill | 5 | 24% |

Results are summarised in Table 2 and how the data from different methods were triangulated, summarised in Table 3. The majority reported pre-program that they believed their workplace needed to make changes (n = 23/27, 85%). Participants' main expectations included: improved food service skills, being able to contribute to the increased quality of life for residents, improved dining experiences, and meeting special dietary needs of residents. Improved food service was an umbrella theme, which included increased skills in menu management, food preparation skills, greater variety on menus, learning new ideas for food modification and new recipes.

Immediately post-program, 80% strongly agreed that their expectations had been met (n = 21/25). This was supported by the focus group responses. Although participants started the program *confident* (n = 14/28, 50%) or *very confident* (n = 10/28, 37%) to make changes, by the end of the program and at follow-up 4 months later the majority felt *very confident* to make changes (n = 14/20, 70%, n = 15/23, 70%).

With regards to program processes, the majority of the participants (n = 23/25, 92%) 'strongly agreed' post-program

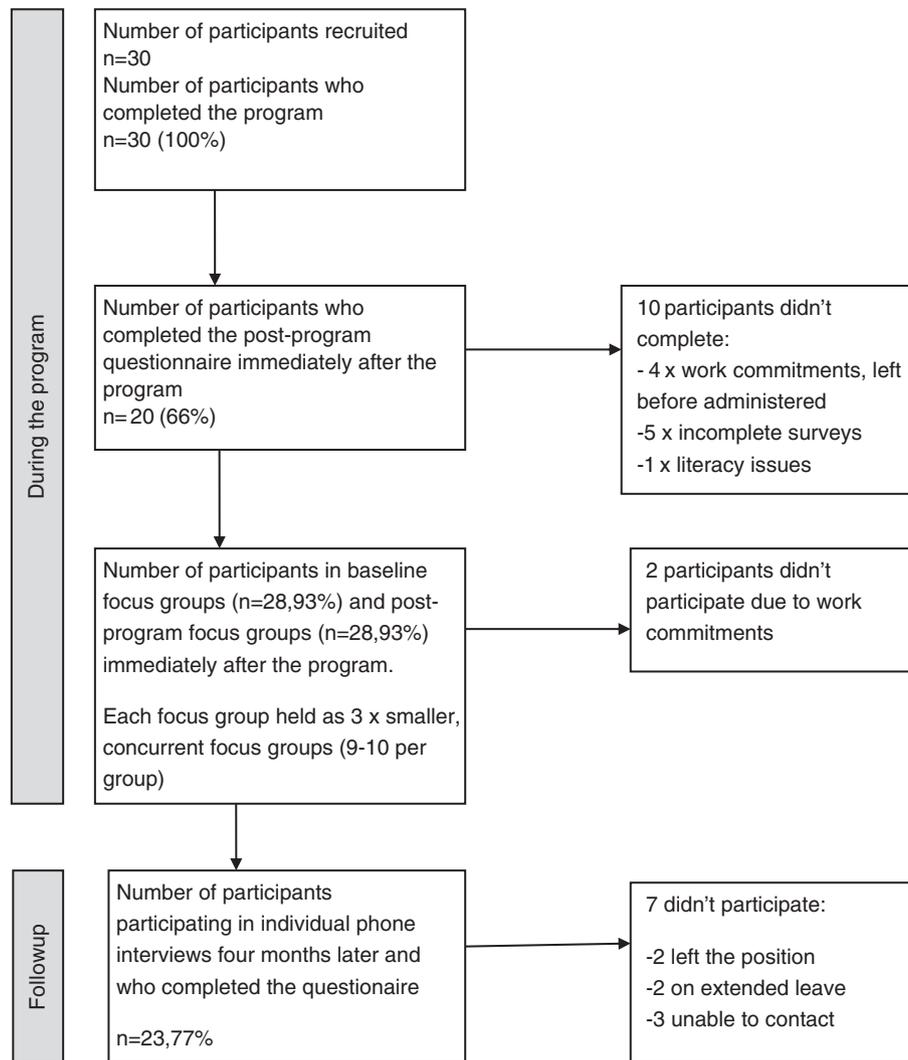


Figure 1 Flow diagram of the number of senior foodservice providers from 27 aged care facilities who participated in the nutrition education program and in each evaluation stage.

that sessions were relevant, useful, effectively delivered and of immediate use. One of the most effective strategies reported by most participants in the focus groups and questionnaires was the ‘hands on’ activities where, for example, participants were challenged to prepare modified textured foods using mystery ingredients.

In the focus groups and questionnaires, participants reported that members from their organisation’s executive management team would benefit from participating in the program. Participants also wanted more advice on how to work within budget and food safety regulation constraints and wanted more on the unique nutritional needs of residents from dietitians. Participants’ used the ACF recipes implemented in the program to varying degrees but with some modification on their part (n = 20/23, 87%). Budget constraints, limitations to accessing ingredients because of procurement procedures, quantities specified for small ACF only and unfamiliar ingredients to the residents were some

of the reasons participants reported to justify some changes with the recipes.

All participants reported post-program and 4 months later that they had a better understanding of ‘good food’, increased knowledge of food preparation skills and increased skills in modifying menus for adding variety and special diets (Table 2). From the focus group and individual interviews undertaken, three outcomes identified from the program included positive changes to food provision, changes to dining experience consistent with the learnings of the program and positive changes in participants’ perception to enact change (Table S2; Codes, categories and themes describing the impact of a national education program for ACF foodservice providers [https://doi.org/10.1111/1747-0080.12442]).

Everyone (n = 23/23, 100%) had incorporated recipes featured in the program into their existing menu and eight had introduced a new menu (n = 4) or had a new menu

Table 2 Results from self-administered questionnaires by senior ACF food service chefs and a cook participating in the 'Creating an Appetite for Life' nutrition education program, 2015 (n = 30)^a

| | Baseline (n = 27) | | | Post-program (n = 20) | | | Follow-up ^b (n = 23) | | |
|---|-------------------|----------|----------------|-----------------------|----------|----------------|---------------------------------|----------|----------------|
| | Unsure | Agree | Strongly agree | Neutral | Agree | Strongly agree | Neutral | Agree | Strongly agree |
| I have a better understanding of what is 'good food' in aged care facilities | 0 | 10 (50%) | 10 (50%) | 0 | 10 (50%) | 10 (50%) | 4 (17%) | 9 (33%) | 10 (37%) |
| I have increased my knowledge in preparing appealing food in the aged care setting. | 0 | 8 (40%) | 12 (60%) | 0 | 8 (40%) | 12 (60%) | 4 (17%) | 11 (41%) | 8 (42%) |
| I have increased my ability to prepare menus with 'good food' | 0 | 7 (35%) | 13 (65%) | 0 | 7 (35%) | 13 (65%) | 7 (26%) | 12 (44%) | 4 (15%) |
| I feel confident in modifying the menu in my workplace | 1 (5%) | 8 (40%) | 11 (55%) | 1 (5%) | 8 (40%) | 11 (55%) | 1 (37%) | 6 (22%) | 15 (55%) |
| I believe I can make a change in my workplace | 3 (11%) | 14 (52%) | 10 (37%) | 0 | 6 (30%) | 14 (70%) | 0 | 8 (30%) | 15 (70%) |

^a Responses were measured using a 5-point Likert scale: strongly disagree, disagree, neutral, agree and strongly agree. Pre-program, unsure was used instead of neutral.

^b Perceived improvements 4 months since the program.

ready to start (n = 4) based upon the learnings from the program. Although 20 facilities cooked from fresh foods on site, several participants changed from using pre-prepared processed foods to freshly prepared foods, such as fresh stock, fruit and vegetables, kitchen-garden herbs and Australian fish. Two participants replaced all of the frozen foods (except peas and corn) with fresh. Most participants described strategies to increase the calorie content of the meals (n = 13/23, 76%) for underweight residents. Residents were enjoying food and in one facility, supplements were replaced with calorie-fortified foods.

Participants reported the need to be considerate of residents' receptiveness to changing familiar meals. New recipes were introduced one at a time, ingredients swapped in a familiar recipe or new recipes featured in a monthly special event. Some participants (n = 6/23, 26%) experimented with texture modified foods, some with positive results.

'...when I started it [modified texture foods] was just whatever you had that day for lunch whizzed up in the vitamiser and slopped onto the plate and stuff like that. Now we are serving up meals that we can recognise and can actually look like chicken or beef instead of a pile of green slop and sort of stuff like that.' (Focus Group Participant)

Half of the participants (n = 11/23, 49%) reported at 4 months making changes to the dining experience. Some participants (n = 5/23, 22%) introduced themed dinners for residents, building upon what other participants shared that they have been doing. Other participants (n = 3/23, 13%) reported structural changes to the dining room to facilitate a better dining experience. Other changes to the residents' dining experience included changing the table settings, adding flowers and music, and putting the slow cookers in the dining room. Two participants reported that their facilities changed the timing of the kitchen operations so that food service staff could engage with the residents in the dining room during lunchtime. Participants reported that as a result, more residents visited the dining room, gave feedback on the food and stayed longer.

'Yea, with that little bit of music and an extra drink they are coming down and staying longer.' (Interview Participant)

The majority of participants 'strongly agreed' at 4 months that they believed they could make a change in their workplace (n = 19/23, 82%), whilst four 'agreed'. To enact change, participants reported that they needed to have the support of management, their food services team and other ACF staff. All of the participants reported support from their management for changes post-program (n = 23/23, 100%). Strategies described to facilitate this included inviting the Chief Executive to eat lunch in the kitchen once a week, attending monthly staff meetings or presenting proposed menu changes and involving management in the menu decisions.

Some of the participants reported already having a strong working relationship with upper management and reported

Table 3 Data collection methods and how the results were triangulated for a national nutrition education program for aged care facility food service providers, 2015 (n = 30)

| <i>Purpose of evaluation</i> | <i>Pre-program</i> | <i>During the program</i> | <i>Follow-up, 4 months later</i> |
|------------------------------|---|--|---|
| Process | Online survey clarifying expectations (n = 27, 90%) | Questionnaire evaluating process for each session after each day. 5-point Likert scale scored for: increase in knowledge, session relevance, engagement, organisation and satisfaction. 1 or 2 additional questions tailored to the session e.g.: 'I felt comfortable contributing to the discussion'. 3 open-ended questions: what were done well, what could be improved, any other comments (n = 20, 66%). Focus groups in the last session exploring whether expectations were met, satisfaction with program content and delivery, what could be improved (n = 28, 93%). | Individual interviews using semi-structure questions exploring to what extent the program met expectations, satisfaction with the program and what could be improved (n = 23, 77%). |
| Impact | Online survey question asking how confident participant is making workplace changes using a 5-point Likert scale (n = 27, 90%). | Questionnaire immediately after the program evaluating self-reported impact using a 5-point Likert scale for changes in: understanding of 'good food', knowledge and skills preparing foods and menus, confidence modifying menus and confidence making workplace changes (n = 20, 66%). | Repeated post-program questionnaire evaluating self-reported impact using a 5-point Likert scale for changes in: understanding of 'good food', knowledge and skills preparing foods and menus, confidence modifying menus and confidence making workplace changes (n = 23, 77%). |
| Outcomes | | | Individual interviews using semi-structure questions exploring perceived changes in knowledge, skills and confidence (n = 23, 77%). Individual interviews using semi-structure questions exploring (1) to what extent participants' made changes to the food provided including menus and to the food service environment including the dining environment and (2) what constrained or facilitated these changes. (n = 23, 77%). |

managers being further enthused by the participant's prestige of working with the Foundation (n = 5/23, 22%).

'Oh they have been fabulous!...they have been very supportive with anything I suggest. I came back with a lot of ideas and it was all very well received.' (Interview Participant)

All of the participants (n = 23/23, 100%) reported food practice changes by other food service staff but there was a mixed response to food service staffs' willingness to change within some facilities.

'Yea the biggest problem is motivating other staff members to see why it is good idea to make changes because a lot of people think everything is going ok, so what is the problem? They don't really care about the added bonus I suppose of doing it better. So I think really the biggest change, and I said this at the program, is motivating staff.' (Interview Participant)

An impact strongly acknowledged by participants was the support created between participants and the opportunity to observe, network, share ideas and problem-solve with other motivated participants.

'...it was a very valuable program and I got a lot out of it, I thought it was fantastic and it taught me a lot that I wouldn't even have thought about just speaking to the other chefs and cooks that attended.' (Interview Participant)

This peer-support network started with participants immersed together in the program and continued 4 months later. This was facilitated post-program by a closed social media group which involved exchanging recipes, experiences and tips and problem-solving.

'I think that out of the 30, I probably talk to about 18-20 of them, quite regularly on Facebook and talking about friends and sharing ideas and helping out with fundraisers.' (Interview Participant)

Participants were unanimous in the focus groups and phone interviews that the development and delivery of the program by nationally recognised experts and celebrities increased their confidence and ability to make changes.

'I think the passion from Maggie is very inspiring. I mean so many people feel devalued in the whole hospitality industry and when you work in aged care. She has put aged care as the pinnacle, I mean that's her focus, and that's exciting to think that's there is so much, a big push behind it. Who was behind aged care before?' (Focus Group Participant)

Participants started the program confident in their abilities and one of the main impacts of the program reported by participants was the program being the catalyst for change.

'I have been inspired by the whole thing. I did not necessarily learn new techniques. But I have learnt about the possibilities.' (Interview Participant)

Discussion

This is a novel intervention that describes the process and impacts of an educational program and what aspects facilitated change from the food service providers' perspectives. According to the process evaluation the program meet the needs of participants and was delivered effectively. Moreover, the impact evaluation suggested that the program impacted perceived knowledge, skills and confidence post-program and at 4 months follow-up. Changes to practices and the food service environment were made and these changes to self-efficacy were attributed to the celebrity and expert-led nature of the program and ongoing peer-support.

During the program ongoing feedback from the participants was used to tailor the program to meet participants' needs and 4 months later was used to strengthen the relevance of subsequent programs' content and recipes. The program's usefulness, relevance and satisfaction were credited to the input and status of celebrities and experts, the discussion-based and experiential delivery of the material and the fostering of peer-support which extended beyond the program. Participants were resourceful in modifying the provided ACF recipes to better suit their workplace and recommended that content be added to problem solve system-wide constraints such as a limited food budget and the inconsistent interpretation of food safety regulations. Participants also recommended inviting ACF management to sessions and providing a dietetic session on residents' nutritional needs.

Impacts participants reported post-program included a better understanding of 'good food' and increased knowledge and skills in food preparation, texture-modified foods and modifying menus. Four months later, all of the participants also described enacting change and achieving results through their management team, food service team and others within the ACF. According to SCT, participants need to feel confident to make changes and enabled to do this.¹⁷ Participants started relatively confident with a belief in their ability to make changes and this strengthened post-program. Key to increasing their self-efficacy appeared to be input by celebrity chefs and high profile experts who were perceived as giving this group inspiration and influential standing. The popularity of celebrity chefs in food programming with the public is well known.²⁷ In this program, the celebrity facilitators shared their expertise but also their belief in and tacit approval of food service providers to transform aged care food services.

Participants had many opportunities to successfully perform their learned behaviours in the workplace and ongoing peer-support from other participants was emphasised as very enabling. Peer-support is well known as an enabler²⁸ but there are very few published examples in aged care food services. As well as strengthening perceived knowledge and skills, an impact of this program was to increase participants' confidence and empower participants to effect change and continue post-program with support from each other.

Reported outcomes included changes made to existing menus by adding new recipes, more variety, more fortified foods, more fresh ingredients and more nutrition. Some facilities had introduced new menus. Changes to the dining experience included making it more home-like or changing the schedule so food service staff could attend to residents while dining. Examples of similar programs are absent from the literature, however, studies suggest that simple changes to mealtime practices and mealtime environments comparable to the ones promoted in this program improve nutritional outcomes in ACF.^{9,20} Similarly, studies enhancing residents dining experience have reported changes to residents' food intake and quality of life (QOL) and attributed this to the participation of food service staff.^{9,12} In a systematic review of mealtime interventions in ACF significant changes to residents' nutritional status because of dining environment changes were also found.²⁰ Moreover, studies in older people have shown that food-based fortifications similar to those advocated for in this program were a low-cost and enjoyable dietary modification with positive results for malnourished recipients.²¹

To further enable change, participants recognised the need for concurrent system changes. The meal budget, food regulations, management support and staff attitudes were all identified as local constraints. Other authors have reported similar views by chefs and cooks in ACF²⁹ and advocate for similar system-wide changes.¹⁰ The agency of foodservice providers to enact change is impacted upon by multiple levels of influence, including those at the personal, social and environmental level.³⁰ This intervention provides examples of how behaviours at the personal and social level can result in changes, however for sustainable changes system-wide changes are needed³⁰ such as easier procurement processes at the state-level, national benchmarking for cost per meals and national policy directives. Given that the qualities of the food service is associated with residents satisfaction, which in turn is correlated with residents' QOL,^{9,13} a tool measuring food service staffs' satisfaction with the food service would also be useful.

Strengths of this evaluation included the four-month follow-up post-program, independent administration of the evaluation, triangulation of the results, the inclusion of qualitative methods as well as quantitative questionnaires and exploration of participants' perspectives. The questionnaires however were not validated or tested for reliability and there was no control group. It is likely too that the participants were early innovators ($n = 27$ from 387 ACF contacted). The use of qualitative methods and the participation of Victorian ACF also limits the ability to detect intervention effects and generalise the findings interstate or internationally.

Program results found meaningful changes in food service providers' self-reported knowledge and skills and ability to act as change agents and influence local ACF food service practices. This novel program is being repeated across Australia with the aim to create a critical mass of 'champions' and empower ACF food service providers to transform older adults experience of food in Australian ACF

and strengthen best practice expectations. Further research is needed to measure if these self-reported changes are sustainable and relevant to other ACF. Potential outcomes also need to be investigated by measuring for changes in food service providers' satisfaction and self-efficacy, and residents' satisfaction, improved food intake and QOL.

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Conflict of interest

The authors wish to acknowledge the collaboration with the not-for-profit Maggie Beer Foundation (MBF), particularly the philanthropist Maggie Beer, who engaged Flinders University to evaluate their national educational program. The MBF team developed and delivered the 'Creating an Appetite for Life' programs.

Authorship

LM developed the qualitative questions, undertook the interviews, coded and analysed and led the synthesis and discussion of the outcomes. LM drafted the initial manuscript and led the process. RR and GO undertook the interviews. GB independently coded and analysed. LN worked with MM to develop the quantitative questions and piloted these. MM was the third researcher who resolved differences from the coding and analysis and oversaw the study. All of the authors contributed to the drafting of the manuscript with comments, editing and proof-reading.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Table S1 Summarised content and mode of delivery of the 14-hour program for Aged Care Facility foodservice providers

Table S2 Codes, categories and themes describing the impact of a national education program for ACF foodservice providers, 2015

ORIGINAL RESEARCH

Predictors of weight reduction and maintenance in a large cohort of overweight and obese adults in a community setting

Adina BACHAR,^{1,2,3} Gregory LIVSHITS¹ and Ruth BIRK¹ ¹Human Population Biology Research Unit, Department of Anatomy and Anthropology, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, ²Unit of Research, Clalit Health Services, Sharon – Shomron District, Netanya and³Department of Nutrition, Faculty of Health Sciences, Ariel University, Ariel, Israel**Abstract**

Aim: In overweight/obese individuals, modest 5% weight loss and its maintenance promotes health; however, it is challenging and typically unachievable, especially in community settings. Established predictors of weight loss outcome in a community setting are lacking, hindering the development of practical interventions and prevention tools. Our aim was to identify predictors associated with 5% weight reduction (initial 6 months) and maintenance (1 year) in overweight and obese adults undergoing weight reduction treatment, free of charge, in a community setting.

Methods: Computerised medical files of 11 842 adults aged 50.6 ± 16.3 years, attending 162 primary clinics, were analysed retrospectively. Thirty medical, biochemical and demographic independent variables were tested as potential predictors using multiple logistic regression models.

Results: Significant predictors of high successful weight reduction were: not being treated with insulin (odds ratio (OR) = 0.53), higher baseline body mass index (OR = 1.05) and younger age (OR = 0.98). Weight maintenance predictors were: successful initial weight reduction (OR = 1.26), short time intervals between weighings (OR = 0.88) and frequent weighing (OR = 0.95). Visits to a dietitian were significantly associated with success during both periods: each visit raised the probability of success by 13.4 and 7.6%, respectively. Type 2 diabetes or use of hypoglycaemic drugs were not significant predictors.

Conclusions: In a community-based setting, number of visits to a dietitian is a strong predictor of successful weight reduction and maintenance. Initial success is a critical predictor of weight loss maintenance. Subgroup of older, diabetic patients treated with insulin has a dramatically lower probability of weight reduction success.

Key words: overweight, dietitian, insulin, obesity, weight loss, weight maintenance.

Introduction

Obesity has reached pandemic proportions worldwide.^{1,2} Obesity rates in Israel are high and comparable to those in the United States, reaching 30% for body mass index (BMI) ≤ 30 .³ Excess body weight is associated with decreased longevity and quality of life and a variety of pathological conditions.^{1,4–7} Clinical trials have reported numerous short- and long-term health benefits associated with weight loss.^{4,8–10} It is well established that achieving even a minimal goal of sustained weight loss of 5–10% can reduce or even eliminate overweight and obesity-related disorders.⁶

However, the goal of weight loss and its maintenance is mostly unachieved at both individual and public health levels. Thus, identifying variables that predict weight loss outcome is important, though challenging. In fact, to date, only few identified variables were found to significantly and positively predict successful weight reduction and its maintenance, including: continuous professional support,^{1,8,10} adherence to physical active lifestyle^{2,10–15} and the presence of a medical trigger for weight loss.⁸ Additional potential predictors of successful weight reduction outcome were identified; however, to date, there is inconsistency or lack of studies regarding the contribution and significance of these additional variables: gender,^{1,9,14–17} age,^{4,9,12–14,16,18} ethnicity,^{11–14,16} socioeconomic status,^{12,14} marital status,^{14,18} baseline BMI,^{1,11,13,16,17} smoking status,⁶ blood glucose,⁵ lipids, thyroid-stimulating hormone (TSH) levels, use of medications and blood pressure.¹⁷

To date, most studies related to identifying predictors of weight reduction and maintenance were designed and followed in a clinical setting, which is less relevant to

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prolonged maintenance of weight reduction, mainly due to the high number of people who do not adhere to prolonged weight loss programs.^{19,20} Furthermore, many patients are referred to treatment in community settings, which are organised by governmental or public institutes and covered by health insurance.

It is accepted by health associations, such as the American College of Cardiology, American Heart Association Task Force on Practice Guidelines and the Obesity Society, that 6 months is the time frame considered as short-term weight loss.^{20,21} The rationale is that the majority of studies describe a rapid initial weight loss occurring at the beginning of treatment, with maximum weight loss during the first 6 months, and then gradual regain of weight until the weight is stabilised somewhat below baseline levels. Participants who fail to lose weight during the first 6 months (the majority) are usually not followed up, and data regarding their weight reduction and maintenance outcomes are lacking. The time frame considered as weight loss maintenance is controversial, especially as weight regain after initial weight reduction is a common phenomenon; however, in most studies it is accepted to be 12 months.^{1,10,12}

The Israeli public health system is characterised with extensive array of high-quality services and technologies available to all residents, largely free at point of service, via the promulgation of the 1994 National Health Insurance Law. Primary care is provided through more than 5000 highly accessible clinics distributed throughout the country, offering monitoring and care programs (including dietitians).²² Each Israeli citizen is required to enrol with one of several health services providers, of which Clalit Health Services (CHS) is the largest. CHS offers each family member a wide variety of dietary and nutrition services in the community clinics, centres and hospital. The diabetes services at CHS are incorporated in Israel to eight geographical districts. At CHS, thorough health statistics databases are readily available, facilitating retrospective studies.²²

The aim of the present study was to identify predictors associated with successful weight reduction and maintenance among a large cohort of overweight and obese adults on charge-free weight control management in a community setting.

Based on previous research, we hypothesised that the number of visits to the dietitian, the frequency of weighing, medical triggers (e.g. the presence of a disease or abnormal blood test/blood pressure), older age, being physically active and initial weight reduction would be related to successful weight reduction and maintenance, and that the use of insulin would deteriorate the chance to succeed.

Methods

The cohort included computerised medical files of patients attending 162 primary clinics of CHS, between June 2010 and June 2011. The study was approved by the local Clalit institutional ethics committee and in accordance with the guidelines of the Helsinki Declaration for studies conducted using human subjects. The database included a list of

medical diagnoses, laboratory data, medications and demographics. We defined 'weight maintenance period' per the guidelines of the Institute of Medicine: losing $\geq 5\%$ of body weight and keeping weight below this minimum for a total of at least one year.¹⁰ Based on a preliminary evaluation done at CHS, we estimated several parameters, such as the percentage of participants achieving 5% reduction of body weight. In accordance with those evaluations, we used a simulation technique and implemented WINPEPI computer software (<http://www.brixtonhealth.com/pepi4windows.html>), and using a power of 90%, we estimated the minimal sample size required for the study ($N = 18\,262$).

The cohort included computerised medical files of residents in the Sharon-Samaria district who are medically insured by the CHS. The inclusion criteria were: adults (≥ 18 years), with BMI ≥ 25 , who had ≥ 2 weighings at 6 months and ≥ 3 weighings at 1 year. Exclusion criteria were: participants with only one weighing, participants with outlier characteristics, namely, BMI > 50 , age ≥ 90 and missing or mistaken weight or height data (identified by computer analysis and by univariate distribution and bivariate plots). The Ministry of Health criteria mandate health services to provide obese and overweight dyslipidaemia patients 14 charge-free meetings with a dietitian during the first year, and 7 meetings during the following years. According to the CHS estimates, 47% of referred patients visit the dietitian. Weight loss diet recommendations were given by certified dietitians (at the community clinics), based on shared dietary guidelines and physical activity recommendations.

The primary outcome measure was the percentage of weight change. All weight measurements were undertaken by a certified nurse or a dietitian at entrance examination and after two periods of follow up. Our original aim was to collect all the data of repeated weights after 6 and 12 months of follow up. However, the great majority of participants visited a dietitian/nurse for the second and third body weight measurements at somewhat different time intervals. Thus, the second weighing was taken after 7.6 ± 1.8 months (defined as the reduction period), and the third weighing after 13.3 ± 1.7 months (maintenance period). Independent cohort variables at baseline were: continuous variables: age, weight (kg), height (m), BMI (kg/m^2), blood levels of fasting glucose, TSH, T3-free, T4-free, total cholesterol (TC), high-density lipoprotein cholesterol (HDL), LDL and triglycerides (TG), systolic (SBP) and diastolic (DBP) blood pressure, number of visits to a dietitian and the time interval (months) between weighings. Categorical variables included: gender, ethnic background, socioeconomic status and smoking status. Dichotomous variables included: marital status, physical activity, presence of diabetes mellitus (DM), hypertension (HTN), ischemic heart disease (IHD) and chronic heart failure (CHF). Medical treatment included: statins, hypoglycaemic medications, insulin, hormonal replacement therapy (HRT) and oral contraceptives. Free T3, free T4 and TSH were not included in the final logistic regression due to missing data. There was also missing data regarding SBP and DBP; however, because

we had full data of HTN and because there is colinearity between those variables, we entered HTN in the multiple analyses. Additionally, in the final statistics, we did not analyse HRT and oral contraceptives, as those variables are relevant only to women.

Participants were classified into two categories based on the outcome of initial weight reduction: the high successful group (lost $\geq 5\%$ within 6 months) and the low successful group (lost $<5\%$ within 6 months). The high successful group was further followed up to determine what factors significantly predicted high successful maintenance during 1 year. All the analyses were performed using SPSS software version 19 (SPSS, Chicago, IL, USA). Continuous variables (listed in the variables subsection) were analysed with a two-tailed independent Student's *t*-test. Bivariate analyses of proportionality of distribution of categorical variables (listed in the variables subsection) were estimated using the chi-square test. For continuous variables we used a histogram of distributions and Q-Q plots to assess normality. The variables that were significantly related to high successful weight reduction in a series of univariate analyses were next tested in multiple logistic regression models, to establish their independent association with the corresponding dependent variable (categorially: successful/unsuccessful). For all tests, $P \leq 0.05$ was considered statistically significant. Testing statistical power of the above sample for the successful fulfilment of the 1-year follow up gave us 90% likelihood of rejecting the null hypothesis (no effect of the variable). Concerning missing data, as a rule and in line with statistical recommendations, we analysed only the available data (i.e. ignoring missing data). This created different sample sizes in univariate analyses per variable, yet allowed us to take an advantage of all the available data. However, in multivariable analysis such as multiple regression, only individuals with all data were used. Data (in tables) are presented as mean \pm SD.

Results

Our initial cohort included computerised medical files of 24 472 adults: 15208 women and 9264 men, aged 18–90 years (50.6 ± 16.3 years), with BMI $25\text{--}40$ (32.39 ± 5.21 kg/m²). Of these, 19 308 (78.9%) were Jews and 5164 (21.1%) were Arabs. Of the total available files, 12 630 were excluded due to exclusion criteria. Thus, the final study cohort included 11 842 participants. The baseline participants' characteristics are summarised in Table 1.

In summary, the mean participants' BMI was $32.7 (\pm 5.3)$. The mean (\pm SD) age of participants was $54 (\pm 15.6)$ years; 64% of participants were of moderate-to-high socioeconomic status (according to social security database) and 36% were of low socioeconomic status. Most participants (71%) were married. Most participants reported never smoking (71%) with the rest either former smokers or current smokers (18.5 and 10.4%, respectively).

The number of participants at every stage of the study and their weight reduction outcomes are summarised in Table 2. During the reduction period (6 months) all

Table 1 Baseline characteristics of participants

| Characteristic | Mean \pm SD |
|-------------------------------------|------------------|
| Age (years) | 53.9 \pm 15.6 |
| BMI (kg/m ²) | 32.7 \pm 5.3 |
| HDL-C (mg/dL) | 46.8 \pm 11 |
| Glucose (mg/dL) | 114 \pm 40 |
| TG (mg/dL) | 156 \pm 80 |
| TC (mg/dL) | 187 \pm 37.6 |
| LDL (mg/dL) | 109.7 \pm 31.5 |
| TSH (mu/L) | 2.5 \pm 1.5 |
| T3-free (μ g/dL) | 4.4 \pm 0.57 |
| T4-free (μ g/dL) | 14 \pm 2 |
| SBP (mmHg) | 126.6 \pm 14 |
| DBP (mmHg) | 76 \pm 8.4 |
| Characteristic | Frequency (%) |
| DM | 40 |
| HTN | 46 |
| IHD | 16 |
| Statin use | 30.6 |
| Insulin use | 5.3 |
| Hypoglycaemic medication use | 18.6 |
| Jews | 79 |
| Socioeconomic status ^(a) | |
| Low | 36 |
| Medium | 36 |
| High | 28 |
| Married | 70.7 |
| Smoking status | |
| Never smoked | 71.1 |
| Former smoker | 18.5 |
| Current smoker | 10.4 |
| Physically active ^(b) | 40 |
| CHF | 3.8 |
| Depression | 9.4 |
| HRT use | 0.6 |

BMI, body mass index; CHF, chronic heart failure; DBP, diastolic blood pressure; DM, diabetes mellitus; HTN, hypertension; HRT, hormonal replacement therapy; SBP, systolic blood pressure; TG, triglycerides; TC, total cholesterol.

^(a) Social security database.

^(b) As declared by participant at baseline.

participants' mean weight loss was 0.37 ± 6 kg. The highly successful participants ($\geq 5\%$ of initial weight), comprising 17.9% ($n = 2119$) of initial study cohort ($n = 11 842$), lost an average of 9.15 ± 5.7 kg ($9.87 \pm 5.14\%$). Fifty percent ($n = 1037$) of the successful group maintained their initial weight reduction during the maintenance period (13.3 ± 1.7 months).

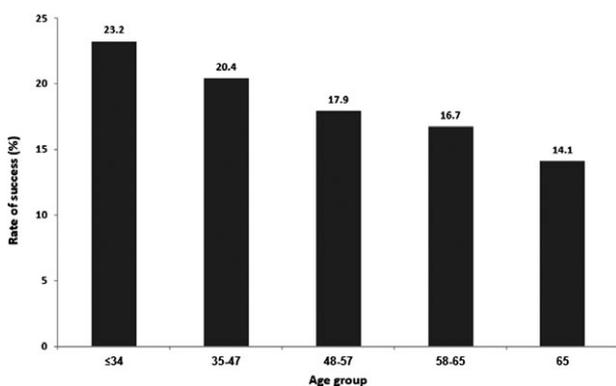
Predictors of successful weight loss—Initial reduction period (~6 months): Age, categorised by five equal quintiles, significantly ($P < 0.0001$) predicted the rate of initial high success in weight reduction, where the youngest group (≤ 34 years) had the highest rate of success (23.0%), compared to the oldest group (≥ 66 years, 14.0%), (Figure 1). A similar gradual trend, but in the opposite direction, was observed among baseline BMI groups, where lower initial BMI

Table 2 The number of participants at every stage of the study and their weight reduction outcomes (successful vs unsuccessful)

| | Participants | Attrition rate | N (%) | |
|------------------------------|---------------------|----------------|--|----------------------------------|
| | | | High success group (lost \geq 5%) | Low success group (lost < 5%) |
| Entrance (first weighing) | 24 472 | | | |
| Reduction (second weighing) | 11 842 | 12 620 (50.5%) | 2119 (17.9%) | 9723 (82.1%) |
| Maintenance (third weighing) | 1039 ^(a) | 1080 (49.6%) | 725 (69.8%) | 314 (30.2%) |

^(a) Out of 2119 that were successful at reduction period.

(25–26.99) demonstrated significantly ($P < 0.0001$) reduced initial weight reduction success (11.0%), compared to heavier initial BMI (≥ 40 , 28.6%). The logistic regression analysis retained higher baseline BMI and higher number of visits to the dietitian as significant predictors for high successful weight reduction (Table 3). The time interval between the first and second weighing, age and the use of insulin were positively correlated with low successful initial reduction. A DM participant treated with insulin had almost half the probability (47.5% lower) to succeed than his/her non-insulin treated counterpart. For each visit to the dietitian, the probability to succeed rose by 13.4%. When we categorised ‘visits’ to 0 visits versus ≥ 1 visits, we found that patients had 77% higher probability to succeed when receiving at least one dietary meeting, odds ratio (OR) = 1.77 (95% CI 1.62, 1.97, $P = <0.001$). Of 4536 individuals who visited the dietitian at least once during the initial reduction period, 23.4% lost $\geq 5\%$ weight, whereas of the 7300 individuals who did not visit a dietitian, only 14.5% succeeded in achieving this modest loss ($P < 0.0001$). We quantified the effect of time interval to weight loss success, calculating the effect of each additional month that passed between weighings on the probability to succeed (time between weighing for each participant was analysed individually and defined as a continuous variable); during the initial reduction period, the chances of high success declined by 4.5% with every month passing between the first and the second weighing.

**Figure 1** The rate of initial successful weight reduction (% of participants) according to quantiles of age.

Predictors of successful maintenance period (~1 year): During this period there was a stabilization of reduced weight (the mean total loss from baseline was 9.1 ± 9 kg; $9.5 \pm 8.34\%$). Using logistic regression analysis (Table 3), we found that higher initial BMI, higher number of visits to the dietitian, greater initial weight loss and shorter time interval between the first and the third weighing were all significant predictors for high successful weight maintenance. When we examined ‘visits’ as a dichotomous variable, we found that compared to 0 visits, even one visit (or more) was a strong independent predictor for high successful weight maintenance, OR = 2.15 (95% CI 1.52, 3.04, $P < 0.0001$).

Discussion

The aim of the current study was to identify significant predictors of initial weight loss and maintenance in a large cohort of overweight and obese adults in a community setting.

Visits to the dietitian predicted high successful weight reduction and maintenance. Even a single visit to a dietitian had a significant effect on the likelihood to succeed in achieving and maintaining weight reduction. This finding is in line with previous studies, which found visits to a dietitian as a significant predictor for weight loss and maintenance in structured weight loss programs.^{1,4,10,11} It should be emphasised that our study is unique in showing this effect also in a community setting. The rationale behind this predictor is probably the dietitian’s professional support, which enhances motivation and provides knowledge and tools for lifestyle changes.¹⁰

Our study also found that higher frequency of weighing by a qualified person was significantly associated with the likelihood to high successful initial weight loss and maintenance. Several previous studies showed that higher frequency of weighing predicted better weight loss outcomes,¹² with most recent studies focusing on self-weighing. However, self-weighing resulted in inconsistent results, where in some studies²³ daily self-weighing and visual feedback facilitated minimal weight loss and its maintenance, while in other studies weighing every day led to greater adoption of weight control behaviours and generated greater weight loss.²² In fact, it was suggested that there is insufficient evidence as to whether self-weighing

Table 3 Summary of predictors for successful weight reduction and maintenance in multiple logistic regressions conducted for reduction and maintenance periods

| Predictor | Reduction (N = 11 836) | Maintenance (N = 1038) |
|---|--------------------------|--------------------------|
| Age (years) | OR = 0.988 (0.985–0.991) | |
| BMI | OR = 1.051 (1.042–1.060) | OR = 1.033 (1.005–1.061) |
| Insulin use | OR = 0.525 (0.402–0.686) | |
| The time interval between the first and the second weighing (in months) | OR = 0.955 (0.941–0.969) | |
| The time interval between the first and the third weighing (in months) | | OR = 0.88 (0.807–0.96) |
| Visits ^(a) | OR = 1.134 (1.109–1.160) | OR = 1.076 (1.037–1.116) |
| Initial weight reduction (%) | | OR = 1.259 (1.193–1.329) |

^(a)Visits = the number of visits to a dietitian during a relevant follow up period. Odds ratios (OR) and 95% confidence intervals (CI) are presented.

without other intervention components is effective.²⁴ Two systematic reviews specifically examined self-weighing for weight management, and both concluded that regular self-weighing appeared to be a good predictor of moderate weight loss, less weight regain or avoidance of initial weight gain in adults.^{25,26}

We show that initial weight reduction (6 month) is a powerful significant predictor of later maintenance (1 year). This finding is in agreement with previous studies, showing that greater weight loss during 8 weeks of low-calorie diet in females predicts better 6-month weight maintenance, and that initial 6-month reduction in weight is the main predictor of both long-term retention and success in weight loss.^{4,16} Our study found that higher initial BMI was a significant predictor of successful initial reduction and maintenance. A possible explanation is that when subjects lose large amount of fat they experience favourable changes in their body shape and motivation, and are thus more motivated to maintain weight.¹¹ The literature, however, is inconsistent regarding this issue: similar to our results, many studies reported higher baseline BMI as a significant predictor of success in weight reduction and maintenance during short and long follow up periods.^{1,11,13,15} However, it was also reported that at extreme baseline BMI (above 35) the probability of weight loss and maintenance success declines.¹²

Weight management is more challenging in obese patients with type 2 diabetes.⁹ In a meta-analysis, Dansinger *et al.* reported greater weight reductions in studies where diabetics were excluded from the cohort.²⁷ Similarly, insulin-treated diabetics at the Look AHEAD clinical trial lost 2% less weight compared to participants who took no diabetes medications.¹⁷ In our study, the initial high success probability decreased significantly in diabetics treated with insulin compared to participants not treated with insulin. However, unlike previous findings, which did not distinguish between different diabetic treatments and medications,^{2,9} we found, using multiple logistic regression models and quantifying the independent effect of using insulin on weight reduction success, that the mere presence of diabetes, elevated levels of blood glucose or being treated with hypoglycaemic medications did not significantly

change the probability of high success in losing or maintaining weight. Our results indicate that insulin treatment is likely the major effector on weight loss in diabetic patients.

Younger age significantly predicted only initial weight reduction success: the youngest group (≤ 34 years) had the highest rate of success (23.0%), compared to the oldest group (≥ 66 years, 14.0%). In fact, each year of age reduced the probability to succeed in weight reduction by 1.2%. Although our research design could not relate to reasons explaining this finding, it might relate to the higher lean body mass and metabolic rate typical to younger people,²⁸ which accelerate weight reduction. Contrary to our findings, previous studies found older age as a predictor of successful weight reduction and maintenance, probably due to higher motivation, fewer competing demands and more medical triggers.^{4,13,14,18} For example, in the Look AHEAD and in the TONE trial with cohort mean ages of 59 and 66, respectively, weight loss was associated with improved control of obesity co-morbidities.⁴

Our study did not find statistically significant associations of any of the demographic factors with high successful weight reduction and maintenance, including marital status, socioeconomic status, ethnic background and gender (using the final multivariate analysis). Previous studies examining the association of demographic parameters with weight reduction outcomes showed inconsistent results for marital status,^{13,16} socioeconomic status,¹⁴ ethnic background^{11,13,14,16} and gender.^{1,4,10,13,14,16} Thus, further research is needed to clarify the link between demographic characteristics and weight reduction and maintenance outcomes.

As in other retrospective studies, our study has some limitations. For instance, high attrition rate could create a selection bias and affect the external validity of the study. However, high attrition rate is known in this field and expected^{12,19,29} and was the rationale for the present study. Consequently, the high successful group that we analysed was expected to be relatively small, especially as our study cohort included free living population. In a preliminary analysis, we found that our final cohort participants that had ≥ 2 weighings tended to be older and with more background diseases compared to participants that had only one

weighing, that due to exclusion and inclusion criteria were excluded from the final study cohort. Not all participants were willing to lose weight, though they were instructed to do so by their doctor, nurse or dietitian, in order to meet quality measures. Other limitations include: lack of detailed and repeated data on type and intensity of the subjects' physical exercise; missing data, which were handled according to acknowledged statistical recommendation, where low percent of missing at random data were ignored. Additionally, confounders such as personal differences in counselling, and psychological characteristics might have influenced the results. The strength of our study lies in the following: a large sample size, representing different segments of the population; weight control follow up that is community-based and funded mainly by public insurance; the large number of variables analysed; body weight repeatedly measured by professionals and not based on self-reports. The current study focused on achieving minimal weight loss goal of 5%, which was found to grant health benefits as defined by health organizations and based on clinical studies. For future research we suggest further studies of the community setting, and to obtain further data regarding physical activity, demographics and participants' motivation.

In conclusion, our significant predictors of weight loss and maintenance, professional support and frequent weighing, are controllable factors that should be straightforwardly implemented in a community setting. Additionally, a subgroup of diabetic patients who are insulin treated were found to have a significantly lower probability of high success in weight reduction, and should be treated with more attention. We suggest to provide those patients more visits to dietitians and frequent weighing, which could raise their chances to succeed. Initial high success was found to be crucial for high successful maintenance, and thus this initial period should receive special professional attention. Our large long-term community-based research contributes to better understanding of the factors influencing the outcomes of weight reduction, enabling prediction of high success in weight loss and maintenance in community-treated individuals that are overweight and obese.

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Conflict of interest

The authors have no conflicts of interest to declare.

Authorship

All authors contributed significantly to the manuscript. We would like to acknowledge Professor Doron Hermoni (Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel and the Unit of Research, Clalit Health Services, Sharon – Shomron District, Netanya, Israel) who passed away and contributed to this manuscript. We are grateful to Irit

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ORIGINAL RESEARCH

Dietitians' opinions regarding refeeding syndrome, clinical guidelines and extended scope of practice

Kylie L. MATTHEWS ¹, Michelle A. PALMER² and Sandra M. CAPRA¹¹School of Human Movement and Nutrition Sciences, University of Queensland, Brisbane and ²Nutrition & Dietetics, Logan hospital, Logan, Queensland, Australia**Abstract**

Aim: Refeeding syndrome (RFS) prevalence rates vary across studies depending on the criteria used for assessment and identification. For registered dietitians, the assessment and management of RFS is highly reliant on daily serum electrolyte values; however, registered dietitians working within Australia do not currently possess laboratory test ordering privileges. We aimed to examine the opinions of registered dietitians regarding RFS identification, management and guidelines and the option of using extended scope of practice to order electrolyte monitoring autonomously.

Methods: A multi-method action research approach was used, incorporating two projects. The first was a survey examining Australian registered dietitians' (n = 187) opinions regarding RFS identification, management and guidelines, and autonomous electrolyte monitoring. To establish if results were similar internationally, an interview was conducted with 22 registered dietitians working within 10 different countries. Data were analysed using chi-square tests and thematic analysis.

Results: Australian registered dietitians (75%) identify patients at risk of RFS at a high rate of more than once per fortnight, with 74% reporting that they have previously worked with a patient diagnosed with RFS. Results varied internationally, with respondents from eight countries reporting that RFS is a problem within acute care *versus* respondents from five countries having never treated a patient with RFS. The majority (≥89%) of registered dietitians desire new guidelines and the option to order patient electrolyte monitoring autonomously.

Conclusions: Our findings suggest that more stringent tools for the identification of RFS are necessary. There was limited uniformity across countries, and updated practice guidelines are needed.

Key words: dietitian, extended scope of practice, nutritionist, refeeding syndrome.

Introduction

Refeeding syndrome (RFS), a diagnosable condition since the 1940s, is difficult to define, with reported symptoms ranging from mild serum electrolyte decreases to life-threatening respiratory failure.¹ Current literature examining the prevalence of the condition places emphasis on the presence of serum electrolyte imbalances (hypokalaemia, hypomagnesaemia and hypophosphataemia) in patients undergoing significant periods of starvation.² However, Rio *et al.*³ have proposed that a diagnosis should only be made when there is development of a minimum of one severely low serum electrolyte, with oedema, and a severe disturbance to organ function. Using Rio *et al.*'s³ method, 0–2%

of examined hospital populations have developed RFS,^{3–7} whereas studies that have focused solely on electrolyte imbalances have prevalence figures of up to 80%.²

With the diagnoses of RFS and prevalence rates varying across studies, effective preventative and identification methods are difficult to establish. The United Kingdom National Institute for Health and Care Excellence (NICE) guidelines, published in 2006, categorise patients with as few as five days of minimal intake as being at potential risk of developing RFS, with restricted energy intakes (5–20 kcal/kg/day) recommended as a preventative measure. This approach may be overcautious for patients at risk of developing RFS,^{8,9} and there is a potential risk of under-feeding malnourished patients. As these recommendations were made based on expert opinion and exclusively for use with patients receiving enteral and parenteral nutrition, clinical registered dietitians are provided with limited guidance on managing other patient groups at risk of RFS.¹⁰ While registered dietitians working within the UK reported that the guidelines lack supporting evidence,^{9,11} 70% nevertheless reported changing their practice following their release.^{9–11} Studies have also found that both Australian

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dietetics students and registered dietitians are relatively consistent with the applications of these guidelines.^{12,13}

While the scope of practice for registered dietitians includes the assessment of malnutrition and RFS risk, requesting pathology to monitor electrolytes is not currently available to many in Australia. This could be a barrier to increasing energy provision efficiently as the monitoring and stabilisation of electrolytes prior to increasing energy provision is a key recommendation in RFS guidelines.¹⁰ Within Australia and New Zealand, in 2009, only 14% of registered dietitians working within intensive care units possessed the privileges for ordering patient blood testing.¹⁴ In comparison, registered dietitians working within the United States have the authority to order blood tests, provided their hospital and state legislation have approved this privilege.¹⁵ Similarly, within Queensland, one of the eight states of Australia, pathology can be independently requested and interpreted by the registered dietitian in a registered dietitian-led gastroenterology outpatient clinic, under the jurisdiction of a consultant.¹⁶ However, no studies have been conducted examining the opinions and readiness of registered dietitians regarding pathology ordering in acute care, nor whether such rights influence RFS management.

To the authors' knowledge, the practices and opinions of clinical registered dietitians working in a number of different countries regarding RFS are yet to be examined or compared. Therefore, the aim of the present study was to obtain an overview of the opinions and practices of clinical registered dietitians from a variety of practice locations regarding RFS risk identification, feeding management and the type and use of refeeding guidelines. Secondly, we aimed to examine Australian clinical registered dietitians' opinions regarding extended scope of practice, focusing on the authority to order patient electrolyte monitoring.

Methods

A multiple method action research approach was used for the present study, incorporating two major but disparate sources of information. The study commenced with a national survey examining Australian registered dietitians' opinions regarding the assessment and management of patients at risk of RFS. The option of autonomous electrolyte monitoring was also examined. To establish if the results found reflected a broader understanding of RFS, in-depth interviews were conducted with a convenience sample of registered dietitians working within 10 different countries. These methods have been previously published in Matthews *et al.*¹⁷ The authors adhered to STROBE guidelines for reporting observational studies.

Project one: Survey—study design: A cross-sectional national survey of Australian clinical registered dietitians, using a specifically designed and tested tool, was undertaken in 2015. Ethics approval was obtained from the University of Queensland (approval number: HMS15/708).

Respondent eligibility: Eligible respondents were self-selected clinical registered dietitians working, or with prior work experience, within the acute care hospital setting in Australia. Registered dietitians with no experience in this setting and students were considered ineligible. Respondents who were working outside of Australia at the time of survey completion, those who reported completing the survey more than once and those who selected erroneous responses (e.g. selecting high serum potassium as an indicator for the development of RFS) were also excluded. Consent was implied by submission of completed surveys.

Survey tools and data collection: A 33-item questionnaire was created, commencing with questions drawn from previous surveys^{9,12} and using gaps in the literature to identify topics. Survey piloting for construct validity was completed by six individuals, including a new graduate registered dietitian, two Doctor of Philosophy (nutrition and dietetics) candidates and three experienced clinical researchers from a large metropolitan hospital. The survey incorporated 10 demographic and workplace questions, including gender, age, qualifications and years of clinical experience, as well as the geographical location and size of the current workplace.

Questions relating to RFS risk identification were included as well as the clinician's opinion on the existence of RFS in acute care, identification rates, patients most likely to be at risk and the signs and symptoms they used to identify 'at-risk' patients. Other questions focussed on RFS risk management, including the role of the registered dietitian in management, whether extra caution was applied to energy prescriptions based on feeding method and any changes in management based on the medical team in charge, and electrolyte monitoring. Finally, questions relating to guidelines and protocols included the existence of workplace-specific protocols, the need for international guidelines and how recently guidelines had been read. Open-ended questions completed the survey, examining opinions on the option of ordering electrolyte testing autonomously, with respondents also able to leave any additional comments.

A convenience sample was recruited via a web link to the online survey sent through email via the professional association's interest groups email lists (Gastroenterology, Nutrition Support, Oncology and Aged Care and Rehabilitation); Dietitian Connection's weekly update; and professional contacts of the research team, including via social media. Survey completion reminders were sent by Dietitian Connection and the research team. Members of both the professional association and Dietitian Connection comprise registered dietitians and dietetics students working in all fields, both in Australia and overseas. This recruitment process was chosen as it was the only known method of contacting practising registered dietitians within Australia.

The survey was created using Checkbox, version 6.7 (Checkbox Survey, Inc. Version 6.7, 2015, Massachusetts, USA). Respondents were given five weeks to complete the survey. Respondents could opt for a summary of results by

contacting the research team, which was emailed upon study completion. No incentive was offered for completing the survey.

Data analysis: After data cleaning, the Statistical Package for the Social Sciences was used for data analysis (IBM, version 23.0). Descriptive statistics were used to present respondent demographics and results from the RFS risk identification, management and guideline questions. Chi-square analyses were utilised to compare levels of clinical experience with identification, management and guideline responses. Qualitative responses were examined using thematic analysis, conducted individually by two members of the research team (KM and MP) and compared for consensus.

Project two: Semi-structured individual and group interviews—study design: Following the analysis of the results from Project one, questions arose around variations in responses. Informal discussions were completed with registered dietitians working within Australia, with only limited explanations gained. Limitations in Project one were also acknowledged as respondents were able to self-select whether or not they would complete the survey, which limited generalisability, as well as respondents being aware of the topic prior to completing the survey, gaining the opportunity to refer to guidelines and recommendations regarding RFS. To remove these opportunities, and to gain more understanding of the responses gained through the survey, a semi-structured interview design was selected to gauge the opinions of registered dietitians working in countries other than Australia with respect to the identification and management of RFS. Ethical approval was obtained from the University of Queensland (approval number: HMS16/0905).

Participant eligibility: A convenience sample of participants was recruited from those attending an international conference in 2016. Participants could choose to be interviewed individually or in a group with delegates from the same country. Invitations to participate were sent out by a member of the research team (SC) via email prior to commencement of the conference. Participants were also recruited via word-of-mouth at the conference. Students and those working in Australia were considered ineligible. All participants provided written consent.

Interview questions and data collection: Interview questions were created based on the results from the survey used in Project one, including “What does RFS mean to you?”, “Do you think it is the dietitian’s responsibility to diagnose RFS?”, “Have you had much experience with RFS?”, “Who do you think is most at risk of RFS?” and “Do you think RFS is a problem within your country?” Respondents were also asked if they used specific guidelines for RFS in their country of work. Respondents were interviewed in sessions lasting between 10 and 30 minutes in a private room. An interpreter was required for one group.

All interviews and group interviews were recorded on an MP4 recorder to assist with transcription. A second interviewer was present during all interviews and group interviews to assist with participant understanding and to ensure the validity of the responses captured.

Data analysis: Interviews were transcribed verbatim. Inductive thematic analysis, guided by the framework described by Braun and Clarke,¹⁸ was applied to the survey questions. This involved six phases: (i) familiarisation with the data; (ii) initial code generation; (iii) searching for themes; (iv) reviewing themes; (v) defining and naming of themes; and (vi) writing up of results. Coding of the responses was performed using the NVivo qualitative analysis software (QSR International Pty Ltd. Version 11, 2015, Victoria, Melbourne). One researcher (KM) conducted the analysis, coding all responses to allow for data immersion and to obtain an overall sense of the entire dataset. Generated codes and subsequent themes were checked through a process of ongoing discussion with a second researcher (SC), who was familiar with the data before finalisation.

Results

Project one: Survey: A total of 203 completed surveys were submitted through Checkbox. Three respondents selected ‘yes’ for having previously completed the survey, five respondents’ selected erroneous responses, and eight respondents were working outside of Australia, resulting in 16 ineligible responses, with the final sample being 187. The potential member overlap across the interest groups and Dietitian Connection could not be determined, and therefore, a response rate could not be calculated.

Respondent characteristics: The majority of respondents were female (96%, $n = 180/187$), with an average age of 31 ± 7 years. More than half of the respondents had a Bachelor degree in Nutrition and Dietetics (57%, $n = 106/187$) and were working within the acute care setting in a metropolitan area (65%, $n = 122/187$), in hospitals with ≥ 200 beds (67%, $n = 126/187$). Of the remaining respondents, 34% ($n = 63/187$) had a Masters degree in Nutrition and Dietetics, and 10% ($n = 18/187$) possessed a postgraduate diploma. Less than a quarter of the respondents were working in the rural setting (11%, $n = 20/187$) or in hospitals with < 50 beds (3%, $n = 5/187$). Respondents had an average of six years of hospital clinical experience, with 159 respondents working within an acute care facility at the time of survey completion, within a department of 12 ± 8 registered dietitians.

Patients at risk of RFS were reportedly identified at least once per fortnight by 75% of the respondents (see Table 1). While three respondents reported uncertainty regarding RFS’s existence, every respondent reported that they identify a patient at risk at least once per year.

Patients suffering with alcoholism, anorexia nervosa, severe malnutrition and/or individuals receiving enteral or parenteral nutrition following more than five days nil by

Table 1 Survey responses from registered dietitians relating to refeeding syndrome (RFS) (*n* = 187)

| Variables | n = 187 n (%) |
|---|------------------|
| Guidelines | |
| Have read RFS guidelines within the past 2 months | |
| Yes | 127 (68) |
| Believe international RFS guidelines are needed | |
| Yes | 167 (89) |
| Have access to workplace protocols for RFS ^(a) | |
| Yes | 143 (90) |
| Unsure | 2 (1) |
| RFS risk identification | |
| Does RFS exist in acute care? | |
| Yes | 184 (98) |
| Unsure | 3 (2) |
| Do dietitians have a role in preventing RFS? | |
| Yes | 186 (99) |
| Do dietitians have a role in treating RFS? | |
| Yes | 171 (91) |
| Have worked with a patient diagnosed with RFS | |
| Yes | 138 (74) |
| How often do dietitians in acute care identify patients at risk of RFS? ^(a) | |
| More frequently than once a week | 32 (20) |
| Once a week | 38 (24) |
| Once a fortnight | 49 (31) |
| Once a month | 26 (16) |
| Once a quarter to once a year | 14 (9) |
| Patients most likely to be at risk of RFS syndrome ^(b) | |
| Alcoholics | 167 (89) |
| Patients with anorexia nervosa | 165 (88) |
| Marasmus/Kwashiorkor/Severely malnourished patients | 150 (80) |
| Individuals receiving enteral or parenteral nutrition following >5 days nil by mouth | 143 (76) |
| Patients with greater than 10% weight loss | 127 (68) |
| Hunger strikers | 119 (64) |
| Individuals with low serum potassium, magnesium and/or phosphate | 117 (63) |
| Patients with cancer | 116 (62) |
| Homeless/individuals with no food security | 113 (60) |
| Patients with eating disorders not otherwise specified (restrictive) | 101 (54) |
| Other (<i>results with < 50% consensus, including gastrointestinal surgery, bulimia nervosa, malabsorption issues, eating disorders not otherwise specified (purging), complications following bariatric surgery, hyperemesis gravidarum, dementia, HIV/AIDS, uncontrolled diabetes</i>) | 165 (88) |
| Signs and symptoms used to identify RFS risk ^(b) | |
| History of low nutritional intake | 144 (77) |
| Weight loss >15% body weight | 126 (67) |
| Low serum phosphate | 98 (52) |
| Low serum potassium | 91 (49) |
| Low BMI | 88 (47) |
| Low serum magnesium | 84 (45) |
| Other (<i>results with < 45% consensus, including nutrition-related signs and symptoms (e.g. vomiting), weight loss < 15% body weight, thiamine deficiency, social history causing an impact on nutritional intake, hypoglycaemia, low serum sodium, low serum albumin, hyperglycaemia</i>) | 151 (81) |
| Dietitians are more cautious with enteral or parenteral nutrition than with oral nutrition support if a patient is identified as at risk of RFS ^(a) | |
| Yes | 145 (91) |
| Dietitians who consider enteral and parenteral nutrition a higher risk than oral nutrition for patients at risk of RFS, consider parenteral feeds a higher risk (<i>n</i> = 145) ^(c) | |
| No difference between parenteral and enteral feeds | 75 (52) |
| Yes | 66 (46) |

Table 1 Continued

| Variables | n = 187 n (%) |
|--|------------------|
| No, enteral is a higher risk | 4 (3) |
| Dietitians believe they may need to be more conservative with energy prescription for patients at risk of RFS depending on the medical team in charge of patient care ^(a) | |
| Yes | 99 (62) |
| Would dietitians opt to order electrolyte monitoring if the option was available? ^(a) | |
| Yes | 143 (90) |

^(a) n = 159 as questions only applicable for respondents currently working in acute care.

^(b) Respondents could select as many options as they felt were applicable.

^(c) Percentages \neq 100 because of rounding.

BMI, body mass index, IQR, interquartile range, RFS, refeeding syndrome, SD, standard deviation.

mouth were identified as being the most likely population groups ($\geq 75\%$ consensus) to be at risk of developing RFS (see Table 1). Respondents were likely to rely on a patient history of low nutritional intake (77%) to assist in the identification of risk of RFS but did require a combination of four (1–13) (median (range)) signs and symptoms to confidently identify risk.

Respondents who possessed more years of clinical dietetic experience (>5 years) were more likely to have worked with a patient with diagnosed RFS ($P < 0.001$) and more likely to be conservative with energy prescriptions depending on the medical team in charge ($P = 0.035$) (see Table 2). There were no differences in identification rates or opinions regarding RFS guidelines or electrolyte monitoring by years of experience ($P = 0.147$ – 1.000).

Open-ended responses regarding the opinions of registered dietitians on the option of ordering patient electrolyte monitoring revealed several main themes and subthemes (see Table 3).

Roles: The majority (n = 120/159) of respondents identified that ordering electrolyte testing is part of a registered dietitian's scope of practice (see Table 3). One respondent with five years' clinical dietetic experience reported, "Ultimately, to progress patients' nutrition support management. Often (it) is

the case, clinicians are waiting on EUC/CMP to be ordered and ready for assessment, sometimes they never get ordered and resultantly (sic) dietitians are either being overly-cautious and not progressing nutrition support, or progressing with an unknown risk. This would also contribute to greater autonomy and workplace satisfaction - I feel as dietitians we currently have little scope and autonomy in the areas we seem to have well established knowledge."

In comparison, a lesser number (n = 16/159) of respondents reported that electrolyte monitoring is not within the scope of a registered dietitian's practice and is therefore a responsibility solely for the medical team. A respondent with 28 years' of clinical dietetic experience wrote, "Medical staff are the experts at biochemistry translation and understanding. We have a role in knowing this and what it means but ultimately they understand the patient in totality."

Patient benefits: Potential improvement in patient care was identified by 41 respondents (see Table 3). One respondent with 35 years of experience stated, "...Blood electrolytes provide rapid and accurate data to modify composition of nutrition support and keep (the) patient safe." Respondents also expressed concerns about the potentially negative effects of waiting for electrolyte results. A respondent with five years of hospital experience wrote, "...allows faster increase in reaching energy goals. When relying on medical teams to order these tests, if there is a delay in getting them done then this delays progression of nutrition. Therefore management of risk of refeeding syndrome actually leads to underfeeding and possibly increasing risk of refeeding in some cases." A minority (n = 3/166) working in wards with automatic blood testing saw no added benefit in having the option to order electrolyte monitoring.

Additional comments: An additional 45 open-ended comments were received, 14 of which reflected on potentially overcautious behaviour demonstrated by the profession. One respondent commented, "...As a profession, we over-identify the risk and I feel that negatively impacts on the perception of refeeding syndrome (for high risk patients) and the perception of dietitians in general..." Supporting this, another three respondents discussed the limited understanding registered dietitians can have regarding electrolyte

Table 2 Comparing RFS management with the years of clinical dietetic experience possessed by respondents

| | ≤ 5 years n (%) | > 5 years n (%) | P-value |
|--|-------------------------|----------------------|------------------|
| Have worked with a patient with diagnosed RFS | n = 117 | n = 70 | <0.001 |
| Yes | 76 (65) | 62 (89) | |
| Are more conservative with energy prescriptions depending on the medical team in charge | n = 96 | n = 63 | 0.035 |
| Yes | 53 (55) | 46 (73) | |

RFS, refeeding syndrome.

Table 3 Emerged themes and their subthemes regarding registered dietitians' opinions on the option of dietitians ordering electrolyte monitoring (n = 159)

| <i>Yes, the option to order electrolyte monitoring should be available to registered dietitians</i> | <i>No, the option to order electrolyte monitoring should not be available to registered dietitians</i> |
|---|---|
| <p><i>It is part of a dietitians' role as dietitians are the experts in RFS</i> n = 120</p> <ul style="list-style-type: none"> • It is part of a dietitian's role/Dietitians' possess the knowledge to order electrolyte monitoring • Medical teams are not as concerned as dietitians regarding risk of RFS • Medical teams rely on dietitians to monitor for RFS and RFS risk • Medical teams may forget to order tests • It is evidence-based practice <p><i>Patients will benefit from dietitians ordering blood tests</i> n = 41</p> <ul style="list-style-type: none"> • It can negatively affect patient care waiting on electrolyte results/Feeds can be increased more rapidly if dietitians are not waiting for results • Improve patient outcomes | <p><i>It is the medical teams' role alone as they are the experts in patient care</i> n = 16</p> <ul style="list-style-type: none"> • This is the medical teams' role, not the dietitian's • No previous issues ordering electrolyte monitoring through the medical team • Dietitians do not wish to have the responsibility of then ensuring electrolyte derangements are treated • Avoid excessive ordering of blood tests <p><i>Patients will not benefit from dietitians ordering blood tests</i> n = 3</p> <ul style="list-style-type: none"> • Electrolyte monitoring is automatically completed in Intensive Care Units |

RFS, refeeding syndrome.

derangements, with one respondent stating, "...*Electrolyte derangement is not refeeding syndrome. Clear definition on clinical signs of refeeding syndrome (cardiac, respiratory, renal dysfunction) are needed for dietitians to understand what refeeding syndrome actually is...*" An additional three respondents reported that there is a need for improved education across the profession.

Project two: Interviews—respondent characteristics: Twenty-two respondents from 10 countries, including the United States (n = 1), Hong Kong (n = 1), Malaysia (n = 5), Singapore (n = 4), Taiwan (n = 1), Thailand (n = 3), Oman (n = 1), Pakistan (n = 3), Indonesia (n = 2) and Lebanon (n = 1), were interviewed; 86% (n = 19/22) of the respondents were female. All were working, or had previously worked, in a hospital setting for approximately 12.5 (1–34) (median (range)) years. Fourteen (64%) were working in hospitals with >500 beds at the time of interview.

Interview responses: Similar to the findings in Project one, the patient groups nominated as most likely to be at risk of developing RFS included patients suffering with alcoholism, anorexia nervosa, cancer, malnutrition or those experiencing starvation; patients receiving excessive energy prescriptions; patients undergoing surgery; critically ill patients; and elderly patients. However, during the interviews, seven additional patient population groups were identified, including patients post-stroke or post-bariatric surgery, those under treatment for severe burns or severe injuries, those with uncontrolled diabetes or metabolic syndrome, and homeless patients. The identified patient groups at risk were highly variable, with some respondents reporting only one group at high risk and others reporting up to 11.

Variance was observed not only between respondents from different countries but also from respondents working within the same area.

Decreases in serum electrolyte levels and their subsequent symptoms (including changes in heart rates and the respiratory system) were identified by respondents from six countries as the primary definition of RFS, with another from a seventh country identifying electrolyte imbalances in combination with fluid shifts. While phosphate or potassium were specifically identified as causes of concerns for some respondents (n = 3 and n = 4 countries, respectively), respondents from two of the countries reported that all three electrolytes (potassium, phosphate and magnesium) would have to decrease below normal limits before they would consider RFS. Respondents from the remaining three countries were either unable to answer the question or discussed signs and symptoms not of primary concern in the development of RFS. Overall, these responses differed from findings in Project one.

Alongside the varied knowledge demonstrated regarding the definition of RFS, respondents from eight countries reported that RFS was a problem within the acute care setting, whereas respondents from six countries reported that RFS was rare; although respondents from half of these countries reported that this may be secondary to the type of workplace (e.g. nursing homes). Variability was also seen in responses regarding frequency. Respondents from four countries reported that they treated a patient with RFS at least once per week, with respondents from five countries reporting that they had never seen a patient with RFS. However, respondents from three countries did report difficulties in having RFS documented or recognised by treating medical teams, potentially confounding these findings.

These results differed from Project one as the majority of those respondents (74%) reported having worked with a patient with RFS.

Similar to definition and frequency responses, there was no consensus in opinions regarding the responsibility of RFS diagnosis. Respondents from four countries reported that the diagnosis of RFS requires a multidisciplinary team approach, whereas respondents from three countries reported that it is the medical team's role alone. Differing to Project one, only two respondents reported that it is primarily the registered dietitian's role because of registered dietitians' expertise regarding the condition.

Specific guidelines for RFS were used in seven countries, with the majority using ASPEN/ESPEN or hospital-specific protocols. The remaining respondents reported that guidelines were rarely used, with one reporting that hospital-specific protocols were under development and another reporting that those guidelines currently used were considered over-conservative in their workplace.

Underlying themes: One theme that emerged was frustration regarding the perceived limited understanding demonstrated by the treating teams in relation to RFS. One respondent with 11 years of clinical experience stated, "I haven't seen a patient diagnosed by a doctor with refeeding syndrome as I don't think the doctors believe in refeeding syndrome..." A respondent from another country, with over a year of experience in acute care, reported, "I told a doctor that I thought a patient was in refeeding and she told me it was impossible as refeeding syndrome is only seen in third world countries." Similarly, a respondent from the same country with two and a half years of clinical experience reported, "It really depends on the doctors, with some, telling them you saw a patient at risk of refeeding syndrome, it is like telling them you saw a ghost."

Another theme was the lack of autonomy regarding electrolyte monitoring, although this was not universal. A respondent with eight years of clinical experience stated, "...dietitians cannot order blood checking so we have to remind the nurses and doctors..." Another respondent from a different country, with four years of experience in acute care, reported, "...we can't order bloods. There's lots of things we can't order but we can suggest and recommend..."

Discussion

This is the first study to examine the opinions of clinical registered dietitians, working across 11 countries, regarding RFS identification, management, guidelines and extending scope of practice with autonomous pathology ordering. It demonstrates a lack of consistency in the identification and management of RFS.

Identification: Three quarters of the respondents from Australia, as well as respondents from four other countries, reported that they identify a patient as at risk of developing RFS at least once per fortnight, if not weekly, with three quarters also stating they had previously worked with a

patient with diagnosed RFS. These results differ considerably from studies examining the prevalence of RFS using the Rio *et al.*³ diagnostic criteria, with rates of 0–2%.^{3–7} Studies with similar RFS prevalence rates (>50%)^{19–21} used decreases in serum electrolyte values to identify RFS. This practice was also evident in responses from Project two, where decreases in serum electrolyte values was used as the primary definition of RFS by respondents from six countries. As heavy reliance on serum electrolyte decreases is not best practice,^{2,4} these results should be interpreted with caution, and the results do not necessarily reflect either the prevalence of risk or the prevalence of RFS. Consistency in the signs and symptoms used to identify patients at risk and to diagnose RFS is necessary.

Although the majority had worked with a patient with RFS, and every respondent reported seeing a patient at risk of RFS at least once per year in Project one, respondents from half of the countries interviewed in Project two reported no experience with treating patients with RFS, despite working in acute care. This variability between respondents having treated a patient with RFS *versus* those having never treated one is to be expected based on the more accurate prevalence rates of 0–2%.^{3–7} These results provide further evidence that the findings from Project one are not generalisable.

Management: The majority of respondents (91%) reported that they were more cautious with energy prescriptions for patients receiving parenteral or enteral feeds compared with patients identified as at risk of RFS consuming an oral diet. However, studies conducted with patients with anorexia nervosa, one of the most well-known population groups at risk of RFS and a population identified by the majority (88%, n = 165/187) of Project one's respondents as an 'at-risk' group, have shown that continuous enteral feeding is likely safer for these patients compared with oral diets because of the reduced chance of insulin surges and hypoglycaemic rebounds.^{22,23} Several studies have also identified RFS developing in patients consuming oral diets,^{4,24–26} suggesting that these patients should still be monitored and managed accordingly. Updated clinical guidelines will likely benefit these issues.

Extending scope of practice with autonomous pathology ordering: With more than half the respondents in Project one (62%) reporting that they may be more cautious with energy prescriptions depending on the medical team in charge, autonomous registered dietitian-led pathology ordering in Australia may be beneficial. With prevalence of malnutrition in Australian hospitals ranging from 23% to 42%,^{27–32} delays in increasing energy prescriptions because of missed or forgotten pathology testing could exacerbate these patients' malnutrition. Studies examining the effect of registered dietitians performing activities classified as extended scope of practice, including pathology ordering and interpretation, have identified positive outcomes, including high levels of patient satisfaction, decreased workloads for specialists, decreased costs to the health-care

system and increased satisfaction levels for registered dietitians and other health-care professionals involved.^{16,33} As the majority of respondents (90%, $n = 143/159$) desire the option to autonomously order pathology tests, and with colleagues in the United States already possessing the ability,¹⁵ it may be time to consider increasing the number of opportunities for registered dietitian-led pathology ordering within Australian practice.

Limitations: There were a number of limitations within the two projects. As mentioned, RFS was advertised as the survey topic to potential respondents, so respondent bias may be present as registered dietitians who do not consider RFS a clinical issue may not have responded. The tick-box responses used in Project one have also limited the information obtained; for example, we are unsure what Australian registered dietitians would have responded with open-ended responses or interviews, as utilised in Project two. Furthermore, our sample size in Project one may have been limited as survey completion reminders were not sent by every association who initially invited respondents. Respondents from Canada or any country within Europe were not available for interviewing. These limitations all have the potential to impact the generalisability of results. In Project two, respondents may have had difficulty interpreting questions as English was not the primary language utilised by the majority of respondents, although translation and rephrasing were used when necessary.

Conclusions: Our findings demonstrate that the majority of respondents identify RFS risk at a higher-than-expected rate of at least once per fortnight, likely indicating that more stringent tools for identification are necessary. Respondents also reported that registered dietitians have a key role in diagnosing RFS, either autonomously or as a part of a multidisciplinary team, although actual diagnoses were less common compared to risk. The majority of registered dietitians opted to order electrolyte monitoring as part of extended scope for those patients at risk of RFS; therefore, using extended scope of practice should be given further consideration in the future. Overall, there was limited uniformity across countries, and updated practice guidelines that are supported by research are needed.

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Conflict of interest

The authors report no conflict of interest.

Authorship

K. Matthews, M. Palmer and S. Capra contributed to the conception and design of the research project. All authors

contributed to the acquisition, analysis and interpretation of the data. K. Matthews drafted the manuscript. K. Matthews, M. Palmer and S. Capra critically revised the manuscript, agree to be fully accountable for ensuring the integrity and accuracy of the work and read and approved the final manuscript. M. Palmer and S. Capra provided expert guidance throughout the entire project. We thank everyone who reviewed the survey, the respondents who completed the survey and the participants who agreed to be interviewed. The authors also thank Dietitian Connection and DAA for distributing the survey.

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ORIGINAL RESEARCH

Survey of disability-related content in Australian dietetics programs

Shannon BUTLER ¹, Jane KELLETT,¹ Rachel BACON ¹ and Annette BYRON ²¹Faculty of Health, University of Canberra, Bruce and ²Dietitians Association of Australia, Canberra, Australian Capital Territory, Australia**Abstract**

Aim: Nutrition and dietetic services are an important component of healthcare for people living with a disability. The introduction of the National Disability Insurance Scheme (NDIS) in Australia is providing more opportunities for individuals to access these services from an Accredited Practising Dietitian (APD). The aim of this research was to identify how students in Australian tertiary dietetics programs are being prepared to provide these services to people with a disability.

Methods: A purpose-built questionnaire with eight open-ended questions was developed by the researchers to describe the disability-related content of university and professional placement learning opportunities and was distributed to all course conveners (or their nominated representative) of dietetics programs accredited by the Dietitians Association of Australia. The qualitative data were analysed using a descriptive approach. Responses were sorted into response category themes and counted to identify common themes.

Results: A representative from 14 of 18 programs (78% response rate) participated in the survey in September and October 2016. Results indicated that although 12 programs incorporate disability-related topics into the curriculum, content was inconsistent and of varying depths. Four programs offered a disability-specific placement opportunity and nine discussed the NDIS to varying degrees.

Conclusions: It is important that graduates are provided with adequate learning opportunities in the area of disability to ensure that they are prepared for entry-level practise in this area. Further research may provide insight into the skills, knowledge and behaviours used by APDs working in disability to identify those that need to be strengthened in dietetics programs.

Key words: dietetics program, dietetics student, disability, National Disability Insurance Scheme.

Introduction

During university-based learning and practical placements, students in accredited dietetic programs are required to develop and demonstrate the National Competency Standards for Australian Dietitians.¹ This includes practicing professionally, positively influencing the health of individuals, groups and/or populations to achieve nutrition outcomes, applying critical thinking and integrating evidence into practice, and collaborating with clients and stakeholders. On graduation, they are eligible to participate in the Accredited Practising Dietitian (APD) program, the basis for self-regulation of the dietetic profession in Australia.²

The World Health Organization defines disability as ‘impairments, activity limitations and participation restrictions ... reflecting the interaction between features of a person’s body and features of the society in which he or she lives’³ and this definition is used by the Australian Institute of Health and Welfare for data collection.⁴ As of 2012, 18.5% of the Australian population (4.2 million people) have a disability.⁵

Nutrition and dietetic services are important for people living with a disability: (i) as some impairments (e.g. oropharyngeal issues in children with cerebral palsy) directly affect nutritional status;⁶ (ii) they have an increased risk of developing nutrition-related chronic conditions such as cardiovascular disease, cancer, diabetes, hypertension and obesity;^{7,8} and (iii) they are less likely to participate in planned physical exercise.⁹ Poor health outcomes in this population are a result of complex interactions between physical, behavioural and socioeconomic determinants, such as inadequate access to appropriate health services, dependence on carers and lesser understanding of health education concepts.¹⁰

The rollout of the National Disability Insurance Scheme (NDIS)¹¹ in Australia represents a significant change to the

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environment in which nutrition and dietetic services are provided to people who have a disability. The purpose of the NDIS, which currently being established throughout the nation in stages following regional pilot programs, is to fund supports for Australians who have a disability so they might more equitably participate in social and economic activities, exercise choice and control over their lives, and increase their skills and overall independence.¹¹ The NDIS is based on a social insurance model with services funded by the Australian, state and territory governments to reduce the lifetime cost of disability at both the population level and individual level.¹² The NDIS places emphasis on capacity-building, for example through engaging the services provided by an APD, to empower the participant to live more independently and rely less upon funded support.¹³

The NDIS is providing greater opportunities for people who have a disability to access dietetic services from an APD and is placing demand on health professionals to adapt to a consumer-driven model.¹¹ Operational changes associated with the NDIS include provider registration, individual participant plans, focus on social outcomes as opposed to health outcomes and the shift from government delivered, block funded services to a private, fee-for-service market.¹⁴ These changes are likely to affect disability service organisations and will also disrupt health service provision.¹⁵ Although an unknown proportion of the 460 000 individuals who are expected to enrol into the NDIS by 2020¹⁶ will be eligible for funding to access nutrition and dietetic services, it is likely that there will be an increase in demand for dietetic services. Already there are signs that allied health practitioners, such as dietitians, who are experienced in disability are at capacity and there is concern about ongoing workforce shortages.¹⁷ In recognising both (i) the significant proportion of Australians with a disability with increased health needs who may benefit from nutrition and dietetic service and (ii) the emerging need for qualified service providers under the NDIS, there is a need to adequately prepare students to practise in this area. Yet, there is no information available to describe the methods dietetics programs are using to prepare students for these opportunities.

It is important for dietetics programs to understand the changing environment of service provision under the NDIS in order to provide adequate and appropriate disability-related learning opportunities for students. The disability-related content of Australian dietetics programs has not been described previously. The aim of this study is to identify and document how students are being prepared to provide nutrition and dietetic services to people with a disability, both in current care settings and under the social model of the NDIS. With this information, the Dietitians Association of Australia (DAA) and dietetics programs might be in a better position to provide appropriate disability-related learning opportunities for students, leading to better outcomes for people with a disability and an adequately resourced workforce.

Methods

A purpose-built questionnaire was designed by the researchers in order to describe how disability-related topics are currently incorporated into Australian dietetics programs (Figure 1). Open-ended questions were chosen in an effort to elicit a greater amount of detail about disability-related program content as little is currently known about this area. Survey content validity was addressed through the researchers experience with dietetics course delivery or familiarity with NDIS. The survey included a project description and provisions for opting out. The survey was pilot-tested with a representative from a dietetics program that is no longer accepting enrolments and a dietitian with expertise in the area of disability. This resulted in minor modification improving the readability of the survey.

To identify appropriate participants, course contacts from accredited dietetics program in Australia, listed on the DAA website, were contacted by telephone/email using information provided by DAA.^{18,19} Programs which are no longer accepting enrolments were excluded due to the prospective nature of this research. Course conveners were asked to nominate an alternate if they were unable to participate. Participants from 18 programs in 15 universities accepting enrolments and one seeking accreditation were then invited by email to complete the survey in September 2016. To maximise the response rate: (i) participants could respond electronically or verbally via telephone or video conference; (ii) non-responders were followed-up by telephone in October 2016 by the student researcher.

| Questions |
|---|
| 1. How many students are currently enrolled in the final year of your nutrition and dietetics program/s? |
| 2. Is the topic of disability currently incorporated into the teaching curriculum in the following areas? If yes, please elaborate on the teaching and assessment activities in the area of disability and an estimate of how much time is spent focused on these areas. <ul style="list-style-type: none"> • Individual Case Management • Community and Public Health Nutrition • Food Service • Counselling and Communication • Research • Other Units |
| 3. Does your program currently incorporate placement/s and/or work-integrated learning opportunities in the area of disability? If yes, please elaborate on the nature of the opportunity and the amount of time the student will spend specifically in the area of disability If yes, are these opportunities undertaken by all students, allocated randomly, or allocated by specific request? |
| 4. Is the National Disability Insurance Scheme (NDIS) discussed in your program? |
| 5. Is your program able to provide students who are interested in working in the disability sector under the NDIS model advice or opportunities to extend their skills in this area? |
| 6. Do you have any plans to change learning activities or placements in the area of disability in the next 12 months? If yes, in what way? |
| 7. How do you see disability as an area of interest or employment for Dietitians? |
| 8. Would you be willing to share relevant course material? (Material will not be collected at this time) |
| 9. Do you have any further comments? |

Figure 1 Survey of disability-related content in DAA-accredited dietetics programs.

Table 1 Descriptive statistics of survey programs and participants

| | |
|--|--------|
| Programs participating in survey | n = 14 |
| Programs unable to participate by deadline | n = 3 |
| Participants participating in survey | n = 12 |
| Participants representing two programs | n = 2 |
| Opted-out of participation | n = 0 |
| <i>Program type</i> | |
| Masters | n = 9 |
| Bachelors | n = 4 |
| Bachelors with honours | n = 1 |
| <i>Geographic location of participating programs</i> | |
| ACT | n = 1 |
| NSW | n = 3 |
| QLD | n = 4 |
| SA | n = 2 |
| VIC | n = 2 |
| WA | n = 2 |
| <i>Survey response method of participants</i> | |
| Electronic | n = 9 |
| Telephone | n = 1 |
| Video conference | n = 1 |
| Face-to-face | n = 1 |

Main ideas were transcribed by the student researcher for each verbal participant. A mixed-method descriptive approach was used to analyse information obtained from the survey. The qualitative data were sorted into response category themes, which were not predetermined but emerged from the responses themselves, and organised into a descriptive summary. Common themes were counted and presented as descriptive statistics (Table 1). This research was approved by University of Canberra Human Research Ethics Committee (HREC 16-156). This article has been prepared according to the Standards for Reporting Qualitative Research (SRQR).²⁰

Results

Twelve participants responded on behalf of 14 programs (response rate of 78%) including postgraduate master's programs (n = 9), bachelor's programs (n = 4) and bachelor's programs with honours (n = 1). In two cases, one participant responded on behalf of both the undergraduate and postgraduate programs available at the same university. Programs were located in WA (n = 2), ACT (n = 1), NSW (n = 3), QLD (n = 4), SA (n = 2) and VIC (n = 2). Participants (n = 12) responded electronically (n = 9), and verbally through telephone, video-conference or in person (n = 3). Three participants were not able to participate in this project by the deadline. No participants opted-out of participation in the study.

In all, 12 out of 14 programs reported at least one disability-related university-based learning opportunity including within Medical Nutrition Therapy (MNT) (8/14); public health nutrition (6/14); food service management (8/14); counselling and communication (3/14); research

(5/14); placements (4/14) and other opportunities (4/14). Within each area, disability-related material was included with the following topics/opportunities:

MNT: Adult disability, paediatric disability, dysphagia, stroke, motor neuron disease, adrenoleukodystrophy, Parkinson's disease, dementia, other neurological diseases, cerebral palsy, cystic fibrosis and mental health.

Public health nutrition: Advocating for and working with vulnerable populations, the NDIS and schools for students with disabilities. One of these programs provided a disability workshop in this unit from a specialist dietitian in the area of disability. Another of these programs mentioned that disability was only described in this unit generically in the discussion of at-risk groups.

Food service management: Texture-modification and enteral/parenteral feeding, with one program relating this material to a group home setting.

Counselling and communication: Language barriers, non-verbal communication and communicating with carers of a person with a disability.

Research: Exploring clinical outcomes of people with a disability, providing food to a disability group home and exploring the disability-related content of dietetic programs.

Placements: A group house, a rehabilitation centre, a therapy centre and a developmental disability site. Further four programs indicated that placement opportunities in disability were either rare or were centralised on acute care or disadvantaged groups where exposure to a person(s) with a disability might be incidental.

Other areas included a case study, designing resources for people living with a disability or for disability support organisations, an optional 'independent studies project' with a disability health agency, and a disability lecture that discusses nutrition, terminology and the NDIS. One program reported that disability was not integrated into the curriculum but might be covered opportunistically.

In all, 8 out of 14 programs reported a disability-specific lecture. Of these, half (n = 4) were reported within MNT lecturers as: (i) two hours in adults and one hour in paediatric disability (n = 2); (ii) two hours on adults and two hours on paediatrics (n = 1); or (iii) three hours on paediatrics (n = 1). The other programs (n = 4) reported including a lecture about the NDIS and practicing in the disability sector, which was delivered by, or had significant input from, an expert dietitian in the area of disability. Nine programs (9/14) reported that the NDIS was described during the course of the program. Some participants (n = 2) reported that the NDIS was discussed briefly but students are encouraged to do their own research if they have any interest in pursuing this area.

When asked about offering additional disability-related opportunities, responses included: active support for interested students (n = 9); dependent on placement

opportunities or no additional support ($n = 4$); and no response ($n = 1$). Reported future changes to disability-related material included: availability of new disability-related placements ($n = 2$); material updated currently with regional NDIS roll-out ($n = 2$); and incorporation of a disability-related case study ($n = 1$). One program, which does not have any plans to include material in the future, indicated that there were only three full-time equivalent disability dietitians in their area.

Most participants (9/12) described their opinion on the relevance of disability to dietitians. Participants felt that currently there were limited opportunities for dietitians in disability services but this was likely to change for private practitioners under the NDIS. Given that disability is an emerging area adequate preparation for graduate dietitians is important; however, more information and resources are needed. In particular, the opportunity to incorporate disability into mental health lectures was noted.

Discussion

Most Australian dietetics programs incorporate disability-related topics into their curriculum, although the frequency and depth of these learning opportunities vary between programs. The majority of programs provide cursory information about the nutritional management of chronic conditions, which are more prevalent in people with a disability, while fewer programs also provide information about applicable policies and opportunities to practise in the sector and might have disability-related research and/or placement opportunities.

Policy documents, which describe nutrition services in relation to Australian disability practice, have only recently begun to emerge, supporting the claim from some programs that they lack information and resources necessary to provide adequate learning opportunities. These resources, including a role statement and a set of dietetic core standards for dietitians working with people with a disability, would be useful in informing disability-related content of dietetic programs.

The role statement,²¹ published by the DAA Disability Interest Group in 2014, describes the knowledge and skills required for dietitians practising with people with a disability. Expanding on this role statement are the 2017 NSW Dietetic Core Standards for dietitians working with people with a disability, created jointly between the NSW Department of Family and Community Services (FACS) and Cerebral Palsy Alliance (CPA),²² and are intended to guide students and new graduates in learning the foundations of nutrition in disability. Additionally, two e-learning modules are being developed by NSW FACS and CPA to provide education to dietitians, other health practitioners, and disability support workers on the topic of nutrition in disability.²³ These materials could be used by universities in the planning and delivery of program content in relation to disability.

Some survey participants expressed an opinion that disability is an emerging area for dietitians; a statement supported by the recent establishment of the NDIS to fund better access to nutrition services. Preparing students to practise in this emerging area by including greater disability-

related content might be challenging due to the limited space available in program curricula and competition from equally important topics. As a first step the knowledge, skills and attitudes required to work in disability, as identified by the disability role statement, could be mapped against existing disability-related content of dietetic programs. From this, strategies could be developed to fill critical gaps. As the National Competency standards provide a flexible framework, which can be adapted to emerging areas of practice, it may also be useful for universities to understand how the application of disability content might sit in relation to the standards, such as how the NDIS provides a client-centred funding model that enables dietitians to empower people with a disability to improve their own health.

Postgraduate training opportunities may offer an alternate pathway to equip dietitians to meet the anticipated workforce demand within the disability sector. Similarly, the 2011 study on the mental health knowledge, skills and attitudes of entry-level dietitians in Australia found that these emerging professionals felt underprepared to deal with the variety of mental health situations they were facing.²⁴ This study concluded that new graduates require training to address mental health situations competently, leading to the development of teaching and mentoring resources.

This is the first study to describe how dietetics students are being prepared to provide nutrition and dietetic services to people with a disability. While this project has described the scope of disability-related content provided to students across several Australian dietetics programs, the information provided by survey participants ranged in specificity. Despite the inclusion of a definition of disability in the project description, there could have been various interpretations of which parts of the curriculum are deemed to relate to disability, making the identification of patterns or consistencies difficult. Additionally, although the participants were presumed to have knowledge of planned teaching opportunities and activities, impromptu disability-related discussions were likely not reported. No data were collected on the impact of the provided learning opportunities on students' learning outcomes or graduates' preparedness to practise in the disability sector. Future research to understand students' perspectives in working in this area may also be useful for the development of disability content. Although the results do not cover all Australian dietetics programs participation was representative in terms of geographical location.

This study showed there is variation in the disability content of dietetic programs. While some resources are available to inform the planning and delivery of disability-related content, more research is needed to characterise the competencies needed to work successfully with people with disability to inform entry-level and postgraduate training. It is important to explore these avenues in a timely fashion to promote positive outcomes for APDs and people with a disability alike.

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Conflict of interest

The authors declare they have no conflicts of interest. AB is employed by the Dietitians Association of Australia but has no role in program content or accreditation.

Authorship

JK, RB and AB conceived the idea for the project. SB, JK, RB and AB contributed to the methodological design of the study. SB collected and summarised the survey responses and prepared the manuscript. JK, RB and AB contributed to the revision of the manuscript. The study was undertaken as a requirement for the degree of Master of Nutrition and Dietetics by SB at the University of Canberra in Bruce, Australia. All authors contributed to critical appraisal of the final version of this article. The content of this report has not been published or submitted for publication elsewhere except as an abstract in the Proceedings of the 2017 Dietitian's Association of Australia Annual Conference.

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ORIGINAL RESEARCH

Level of empathy among dietitians: A pilot study

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Aim: The health-care providers' empathy has been linked to better patient outcomes. The increased demand for dietetics services has called for dietitians to examine their clinical practices and encounters with patients. To date, there are limited studies published on empathy among dietitians. Hence, this study aimed to determine the clinical dietitians' empathy level in Malaysia.

Methods: Using a purposive sampling method, this study was conducted on dietitians practising in the Malaysian hospitals (government and private). The Toronto Empathy Questionnaire (TEQ), a validated 16-item questionnaire was self-administered, either by online survey method or face-to-face method. Additional information on gender, ethnicity, years of experience and percentage of working time spent on clinical, administrative and other areas were collected.

Results: A total of 69 dietitians participated in the study (private (n = 36) and government (n = 33)). The dietitians' mean total TEQ scores were 49.72 ± 5.62 (score ranged between 35 and 63). Significant difference of mean total TEQ scores was found between dietitians from private (51.06 ± 5.26) and government hospitals (48.27 ± 5.72). There was no significant difference in the level of empathy by gender, ethnicity, years of experience and percentage of time spent on clinical consultations, administration or others while at work.

Conclusions: Results from this study showed that there were differences in empathy level of Malaysian dietitians by work setting. This preliminary finding serves as a baseline for future studies and could facilitate the development of dietetics education in Malaysia.

Key words: developing countries, dietetics, dietitian, empathy, Toronto empathy questionnaire.

Introduction

Empathetic engagement in patient care has been shown to lead to better patient outcome.^{1,2} Specifically, in the clinical setting, empathy is expressed through good communication skills as it assists to build trusting and good health-care provider–patient relationship.¹ The increased trust allows the patient to provide thorough and correct information to inform the health-care professionals in making accurate diagnosis and delivering better care.³ In addition, William *et al.* suggested that these significant outcomes may help patients to reduce financial burden in long term,⁴ which associated to greater patient treatment compliance⁵ achieved within shorter period.

Empathy is generally defined as a person's ability to perceive how the other person feels and the ability to do so accurately.⁶ Despite the many years of interest and studies

investigating the level of empathy among the medical and nursing professionals, the precise meaning of empathy remains a debate.^{6–10} This is mainly attributed by the complex concept of empathy involving multiple phase processes.⁸ Currently, the key components identified include cognitive, behavioural and affective/emotional. In the clinical context, both cognitive and behavioural components of empathy have received the most attention, as empathy would not be effective without patient's acknowledgement.⁹ The cognitive component describes the ability to understand and comprehend another's experiences and feeling,¹⁰ while the ability to act accurately by communicating the understanding to the patient falls under the behavioural component.⁹

The lack of attention into the emotional component of empathy could be attributed to the inconsistencies in the level of empathy across different ethnicities^{11–13} and gender.^{14,15} Ethnicities/culture can play a role in how emotions are felt and expressed in certain situation, hence understanding cultural differences is critical to appreciate emotions and to recognise the role of empathy. It has been suggested that cultural differences exist in emotional arousal level between the east and the west. Specifically, high arousal emotions are valued and promoted in the western culture as opposed to low arousal emotions in the eastern

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culture.¹³ With limited studies on level of empathy to inform the current base of evidence, data must be interpreted cautiously when considering the context of the dietetics profession and in multi-ethnicities.

Dietitians are trained professionals to provide nutrition counselling to optimise patient care by facilitating patient's behavioural change.¹⁶ As such, empathy is important to achieve successful outcomes for nutrition interventions with patients.¹⁷ The capability of expressing empathy has been regarded as one of the desirable traits of a competent dietitian,¹⁸ because of its role in nutrition counselling to establish good therapeutic relationship between the dietitian and patient.¹ A previous study among diabetes specialist dietitian showed that greater empathy in the consultation resulted in higher agreement about decisions made.¹⁹ It has been suggested that higher agreement about decisions made in consultation would promote therapy adherence.²⁰ Similarly, another study found that when dietitians responded to empathetic opportunities in a consultation session, the patient reported greater satisfaction.²¹

A recent systematic review on decline of empathy and associated reasons amongst medical students and residents highlighted several factors affecting empathy and suggested recommendations on the development for future training and education of health-care professionals.²² The increasing demand for dietetics services in clinical setting has called for dietitians to examine their clinical practices and encounters with patients. Dietary and lifestyle changes are cost-friendly modifiable factors yet involve complex area of behavioural change that can be facilitated by practising dietitians through effective communication skills including empathy.^{16–18} Therefore, there is a need to know that the dietitians are practising effectively in order to instil effective practice in others. To date, there are limited studies published on empathy among dietitians. Hence, the primary objective of this study is to determine the clinical dietitians' empathy level in Malaysia. This pilot study also aimed to determine the factors associated with the dietitian's level of empathy.

Methods

This cross-sectional study was carried out among clinical dietitians practising in Malaysian hospitals and is in compliance with the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.²³ Purposive sampling methods were used for participant recruitment to achieve similarity amongst the study sample across multiple sites in terms of demographic characteristics and to improve the representation of the sample to the Malaysian dietitian community. Krejcie and Morgan table²⁴ for finite population was utilised to determine an appropriate sample size. With estimated population size of 75 clinical dietitians of selected hospitals, margin of error of 5% and confidence interval at 95%, the sample size required was 69 (including non-response rate of 10%). Dietitians from both private and government hospitals were invited to participate in this study. Most of these hospitals were involved in training

dietetics interns from the local universities. The study was approved by two committees: the International Medical University's Joint Committee for Research and Ethics (IMU BDN I-2016 (21)) and the National Medical Research and Ethics Committee (NMRR-17-57-33834). For the government hospitals, additional permissions were obtained before data collection commenced.

The Toronto Empathy Questionnaire (TEQ)^{6,25} is a 16-item, 5-point Likert type scale (0 = Never; 1 = Rarely; 2 = Sometimes; 3 = Often; 4 = Always) developed to measure empathy levels. TEQ is a unidimensional scale and is constructed by factor analyses of items from various existing self-reported empathy questionnaires, to determine the common factor of the concept of empathy. Empathic concern was found to be the common single factor reflected primarily on emotional process. This questionnaire has high internal consistency with Cronbach's α of 0.85 and high retest reliability ($r = 0.81$, $P < 0.001$), which indicates that there was a correlation of the same test over two administrations. The construct validity is demonstrated through associations with behavioural self-report measures of interpersonal sensitivity. TEQ has a total of 16 questions with 8 negatively worded items in the scale which were reverse scored. The sum of the 16 questions reflects the empathy scores. The higher scores indicate higher level of self-reported empathy and the score can range from 0 to 64.

The period of data collection was from January to April 2017. Different distribution approaches were used for private and government hospitals. The person-in-charge at private hospitals was initially contacted by phone-call and followed by an email. Details pertaining to the study were provided, which included the cover letter and web link access (https://www.surveymonkey.com/tr/diet_empathy) to participate. On the website, participants provided their consent before they could proceed with the online survey. Additionally, the person-in-charge was requested to disseminate the information and recruit other dietitians practising in the same hospital. A follow-up email was sent 2 weeks after the initial contact. For the government hospitals, after administrative permission was obtained, the participants were recruited using face-to-face method and the hardcopy questionnaires were distributed. The study information sheet and informed consent form were provided together. Participants' self-reported responses were collected either on the same day or the following week. Incomplete questionnaires were excluded.

Statistical Package for the Social Sciences version 20.0 was used for data analyses. Normality of raw data was confirmed by Kolmogorov–Smirnov test. For the descriptive data (gender, ethnicity, years of experience, work setting, percentage of working time spent and empathy scores) results were calculated and expressed as frequency and percentage or mean and standard deviation (SD). For inferential data, independent *t*-test was used to test the difference in mean empathy scores for two variables (gender and work settings). Analysis of variance was conducted to compare the difference in mean empathy scores between ethnicity,

years of experience and percentage of time spent on clinical consultations, administration and others. *P*-values of less than 0.05 indicate significant difference.

Results

Out of the total of 73 participants who consented for the study, 71 responded and 69 participants completed the survey. Table 1 shows the demographic characteristics of the participants. Of the total sample, the majority of participants were females (95.7%) with work experience of less than 5 years (42.0%). Participants were mostly either Chinese (47.8%) or Malay (43.5%). Participants from both private and government hospitals were almost equally represented with 52.2% from private hospitals and 47.8% from government hospitals. The majority of participants spent 75% of time performing clinical consultations ($n = 33$), and 25% of time on administrative work ($n = 36$).

The mean total empathy score for 69 participants was 49.72 ± 5.62 (mean \pm SD). The actual TEQ score ranged between 35 and 63 (range: 0–64). As shown in Table 2, the empathy scores were explored to determine the differentiating

factors. These included gender, ethnicity, setting of practices, years of experience and time spent on clinical and administration. In terms of gender, males slightly outscored females in the mean empathy score (50.33 ± 2.08 and 49.70 ± 5.74), however, the difference was insignificant ($P = 0.85$). Malay participants scored slightly higher than Chinese participants (49.90 ± 5.49 vs 49.06 ± 5.68 , $P > 0.05$). There was a significant difference between mean empathy scores of different settings of practice ($P = 0.039$). Participants from the private hospitals scored significantly higher mean total scores compared to participants in government hospitals (51.06 vs 48.27). Participants who worked for 20 years and over had higher mean empathy scores (51.20 ± 5.36) compared to participants with lower years of experiences. However, the difference was not significant; similarly, *post hoc* testing did not demonstrate any statistically significant difference between mean empathy scores of different years of experience. Participants with experience between 9 and 20 years had lower empathy scores compared to participants in other categories. Participants who spent the majority of their time on clinical-related work scored slightly higher than participants who spent the majority of their time on administration (50.45 ± 5.74 vs 49.00 ± 5.29 , $P > 0.05$).

Table 1 Sociodemographic characteristics of study participants ($n = 69$)

| Variable(s) | Overall, n (%) | Private hospital, n (%) | Government hospital, n (%) |
|--------------------------------------|------------------|---------------------------|------------------------------|
| Gender | | | |
| Male | 3 (4.3) | 1 (1.4) | 2 (2.9) |
| Female | 66 (95.7) | 35 (50.7) | 31 (44.9) |
| Ethnicity | | | |
| Malay | 30 (43.5) | 6 (8.7) | 24 (34.8) |
| Indian | 4 (5.8) | 2 (2.9) | 2 (2.9) |
| Chinese | 33 (47.8) | 27 (39.1) | 6 (8.7) |
| Others | 2 (2.9) | 1 (1.4) | 1 (1.4) |
| Years of experience | | | |
| <5 years | 29 (42.0) | 23 (33.3) | 6 (8.7) |
| ≥ 5 to <10 years | 18 (26.1) | 6 (8.7) | 12 (17.4) |
| ≥ 10 to <20 years | 17 (24.6) | 5 (7.2) | 12 (17.4) |
| ≥ 20 years | 5 (7.2) | 2 (2.9) | 3 (4.3) |
| Percentage of working time spent on: | | | |
| Clinical | | | |
| 25 | 12 (17.4) | 11 (15.9) | 1 (1.4) |
| 50 | 17 (24.6) | 6 (8.7) | 11 (15.9) |
| 75 | 33 (47.8) | 12 (17.4) | 21 (30.4) |
| 100 | 7 (10.1) | 7 (10.1) | 0 (0.0) |
| Administration | | | |
| 0 | 14 (20.3) | 6 (8.7) | 8 (11.6) |
| 25 | 36 (52.2) | 18 (26.1) | 18 (26.1) |
| 50 | 15 (21.7) | 9 (13.0) | 6 (8.7) |
| 75 | 4 (5.8) | 3 (4.3) | 1 (1.4) |
| Others | | | |
| 0 | 33 (47.8) | 18 (26.1) | 15 (23.2) |
| 25 | 29 (42.0) | 13 (18.8) | 16 (23.2) |
| 50 | 5 (7.2) | 5 (7.2) | 0 (0.0) |
| 100 | 2 (2.9) | 0 (0.0) | 2 (2.9) |

Discussion

The main objective of this study was to determine the level of empathy among clinical dietitians in Malaysia using the TEQ as the study instrument. Despite the lack of published literature on dietitian's level of empathy worldwide, this preliminary finding suggests that the empathy level among Malaysian dietitians in the hospital setting could be higher. In the present study, the dietitians' mean empathy scores were higher than the French general practitioners²⁶ and medical students from Serbia²⁷ (49.72 vs 45.89 and 45.25 , respectively). The possible interpretation of this finding could be related to the dietetics profession. Dietary management is a major component of patient's self-care which is quite personal and requires patient-centred approach to promote behavioural change.²⁸ Nutrition counselling provided by a dietitian includes analysis of nutrition science, psychology and physiology before an individualised and negotiated plan is developed and followed through.²⁹ As empathy is part of this integrated and interpersonal process, the capability of expressing empathy has been regarded as one of the desirable traits of a competent dietitian.¹⁸ The dietitians' capability in expressing empathy would establish good therapeutic dietitian–patient relationship¹ and enhance the quality of care received by patients. In addition, such an in-depth patient approach is the key element towards successful patient outcomes which typically require longer duration to achieve. This concurs with the study findings from New Zealand where dietitians spent 60 minutes in consultations³⁰ as compared to 20 minutes amongst the French doctors.²⁶ The longer length of consultation allows development of clinical empathy and hence, translates into higher empathy score.³¹ Further investigation is required to explore the differences in empathy among

Table 2 Scores of participants on Toronto Empathy Questionnaire⁶ by gender, ethnicity, work setting, years of experience, majority of work time spent on clinical and administration

| Variable | Overall (n) | Mean | Standard deviation | P-value |
|------------------------------------|-------------|-------|--------------------|---------|
| Gender | | | | 0.85 |
| Male | 3 | 50.33 | 2.082 | |
| Female | 66 | 49.70 | 5.738 | |
| Ethnicity | | | | 0.55 |
| Malay | 30 | 49.90 | 5.492 | |
| Indian | 4 | 51.75 | 7.411 | |
| Chinese | 33 | 49.06 | 5.684 | |
| Others | 2 | 54.00 | 2.828 | |
| Work setting | | | | 0.039* |
| Private | 36 | 51.06 | 5.259 | |
| Government | 33 | 48.27 | 5.724 | |
| Years of experience | | | | 0.43 |
| <5 years | 29 | 49.79 | 5.408 | |
| ≥5 to <10 years | 18 | 50.89 | 6.729 | |
| ≥10 to <20 years | 17 | 47.94 | 4.723 | |
| ≥20 years | 5 | 51.20 | 5.357 | |
| Majority of the work time spent on | | | | 0.63 |
| Clinical | 38 | 50.45 | 5.741 | |
| Administration | 4 | 49.00 | 5.292 | |

* $P < 0.05$ is statistically significant.

various health-care professionals due to the variability in the nature of work and patient encounter.

Interestingly, this study found significant differences between the mean empathy scores of Malaysian dietitians by work setting. The clinical dietitians working in private hospitals reported significantly higher mean empathy scores than those working in government hospitals. This may be due to the dissimilarities in workload in these settings as shown by Mercer and Reynolds.⁹ The researchers highlighted that when performing holistic consultation, the limiting factor to demonstrate clinical empathy was workload. Like many developing countries, the delivery of health services in Malaysia is mainly divided into public and private health care. According to the Malaysian National Health and Morbidity Survey (2015), the overall utilisation of government facilities for inpatients and outpatients' services was more than the utilisation of private facilities.³² This report suggested that dietitians working in the government hospitals had higher patient load compared to those in private hospitals. As explained earlier, one of the main differentiating factors to develop empathy is the length of consultation,³¹ with time spent by health-care providers during consultations found to be a strong predictor of clinical empathy.³³ Hence, having higher workload to complete within stipulated clinic hours among those working in government setting, there is an increased likelihood of shorter length of dietetics consultation and may lead to insufficient time to be able to develop and express empathy effectively. It is also possible that with more direct patient interaction and increased workload, these dietitians tended to be less empathic in order to cope with their own stress.³⁴ Such explanation was first reported among medical students and

could be explored further on its impact in the dietetics profession.

Results from the present study showed that dietitians who had the most years of experience had the highest empathy scores compared to other groups, but this was not statistically significant. Evidence from literature on the impact of years of practice experience in influencing empathy level is mixed.^{22,35–39} The lack of consistent results could be partly explained by the variability of the study participants (either interns or professionals) and the stage of professional practice. Two longitudinal studies among undergraduate medical and dental students found a decline in empathy level as the students progressed through their professional training.^{37,38} This decline throughout internship has been attributed to the lack of clinically empathetic role models, high volume of materials to learn, time pressure, patient and other environmental factors.³⁷ Similar observation was reported among the health-care professionals, however, different reasons were cited including additional of clinical responsibilities, higher patient contact and the need to make management decisions.³⁹ It is possible that the decrease in empathy level is caused by the dehumanisation factor in the clinical setting. The dehumanisation is defined as denial of a distinctive human mind to another person, with diminished attributes and consideration of others' mental state,⁴⁰ resulting in psychological desensitisation and lower empathy level over time. While causative factors affecting student interns can be resolved through the design and delivery of curriculum, the definite impact on the level of empathy as a result of years of professional practice would be best ascertained through prospective studies. However, the maintenance of the level of

empathy in the dietetics profession is crucial because effective dietetics practice over the years facilitates patients' behavioural change and favourable outcomes in the course of chronic disease management.¹⁶

Previous studies have reported differences in the level of empathy by ethnicity^{11,12} and gender.^{14,15} Cultural differences do partly explain these variances in the level of empathy as emotional arousal, a characteristic of empathy is expressed differently across culture.¹³ Malaysia, is a multi-racial Asian country, mainly comprises of 60.3% Malays, 24.6% Chinese and 7.1% Indians with diverse cultural values, languages and religious beliefs.¹² Furthermore, researchers postulated that such diversities could be the limiting factors in clinical setting between the health-care professionals and patients to develop and maintain trusting relationships, therefore, resulting in less empathy being expressed by health-care professionals.^{41,42} Despite no significant ethnic differences being found in the present study, Malay dietitians scored slightly higher than Chinese dietitians, consistent with a local study among the dental students.¹² Similarly in terms of gender, findings from this study among the Malaysian clinical dietitians found the opposite to what we expected. Although empathy is known to be associated with feminine trait and females were expected to be more receptive to emotional signals,¹⁰ male dietitians were more empathetic than their female colleagues. Nevertheless, it has also been suggested that empathy may be merely a heritable characteristic irrespective of one's gender.⁴³ Both insignificant observations in the present study could be attributed to the disproportion of ethnic and gender. The small number of participants from specific ethnicity and male dietitians could potentially confound the results, hence likely to reduce the representation of the overall population. Further investigation is required to explore and ascertain the effect demographic factors on empathy in different cultures and in the field of dietetics and nutrition.

One of the main strengths in this study was the utilisation of two approaches of data collection (online survey method and face-to-face method). These methods complemented each other in terms of achieving the maximum responses of dietitians from different settings. The face-to-face method was logistically less viable to collect responses from private hospital dietitians because of geographical location and budget limitation. The online survey method overcame this limitation and was useful in reaching out to dietitians located outside of central of Malaysia with minimum cost. This also addressed the need to include clinical dietitians outside of central of Malaysia to increase the representation of dietitians specifically those from private hospitals and involved in dietetics education. Besides that, data were collected using a validated tool, TEQ, hence permitted comparisons with findings across studies locally and internationally.

This study also includes several limitations. Firstly, the use of self-report measures, that is TEQ to determine empathy level could increase the respondent bias and may not reflect the actual clinical setting. Observational methods (e.g. History-taking Rating Scale) or method that involves

patients' perception (e.g. Consultation and Relational Empathy, CARE Measure) can be used together with TEQ to minimise the respondent bias. Despite TEQ being validated, the cultural adaptations on TEQ for Malaysian dietitians is uncertain because of lack of evidence from the literature. Future studies could explore different measurement tools of empathy for Malaysian dietitians and target wider populations of dietitians globally by region. This was a cross-sectional study which did not reveal change of empathy scores in dietitians, hence a longitudinal study is suggested to determine how the level of empathy scores behave as the dietitian becomes more experienced.

In conclusion, this study provided preliminary data on the empathy level of Malaysian dietitians. Results of this study supported the hypothesis that there were differences in empathy level of clinical dietitians by the work setting (private or government hospital). More studies are required to further explore and understand the relationship between dietitians and empathy to facilitate the development for future training and education for dietetics students. Given the importance of empathy in improving the dietitian-patient relationship and dietitians' level of satisfaction at work, research on different patient populations and work settings such as community could have key implications in the provision of advanced health care.

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Conflict of interest

The authors have no conflicts of interest to declare.

Authorship

WYY contributed to the study design and methodology, coordinated data collection during the study period, interpreted the study results, critically reviewed and contributed to drafts of the manuscript, and approved the final manuscript as submitted. YF contributed to the study design and methodology, coordinated, carried out data collection during the study period, conducted analyses and interpreted the study results, drafted the manuscripts, critically reviewed and approved the final manuscript as submitted. The manuscript has not been published elsewhere. We would like to thank the Director General of Health Malaysia for his permission to publish this article, the International Medical University, Malaysia and study participants. This research formed part of YF's undergraduate studies supervised by WYY.

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ORIGINAL RESEARCH

A Consensus Model: Shifting assessment practices in dietetics tertiary education

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Abstract

Aim: The aim of this research was to evaluate a *Consensus Model* for competency-based assessment.

Methods: An evaluative case study was used to allow a holistic examination of a constructivist-interpretivist programmatic model of assessment. Using a modified Delphi process, the competence of all 29 students enrolled in their final year of a Master of Nutrition and Dietetics course was assessed by a panel (with expertise in competency-based assessment; industry and academic representation) from a course e-portfolio (that included the judgements of student performance made by worksite educators) and a panel interview. Data were triangulated with assessments from a capstone internship. Qualitative descriptive studies with worksite educators (focus groups n = 4, n = 5, n = 8) and students (personal interviews n = 29) explored stakeholder experiences analysed using thematic analysis.

Results: Panel consensus was achieved for all cases by the third-round and corroborated by internship outcomes. For 34% of students this differed to the 'interpretations' of their performance made by their worksite educator/s. Emerging qualitative themes from stakeholder data found the model: (i) supported sustainable assessment practices; (ii) shifted the power relationship between students and worksite educators and (iii) provided a fair method to assess competence. To maximise benefits, more refinement, resources and training are required.

Conclusions: This research questions competency-based assessment practices based on discrete placement units and supports a constructivist-interpretivist programmatic approach where evidence across a whole course of study is considered by a panel of assessors.

Key words: competency-based education, dietetics, professional competence, programmatic assessment.

Introduction

In Australia, there has been continued growth in the nutrition and dietetics workforce, with a predicted increase in positions from 6600 in 2015 to 9000 by 2020.¹ At the same time, the roles within the profession are changing with a shift towards private health, community and ambulatory care and e-health services.² With this changing environment, it is critical that new graduates are able to showcase their

capabilities to future employers and are prepared for new and emerging areas of practice.³ Future graduates will need to be equipped not only with the skills, knowledge and attitudes currently required by the dietetics profession⁴ but more importantly with the capacity to learn and adapt to a rapidly changing workforce. They will need to be critical thinkers, transformative practitioners and life-long learners.⁵ Palermo⁶ argues that outcome-based education and assessment practices are critical to the development of the profession.

Within Australia, students are required to demonstrate their readiness for independent practice by demonstrating professional competence.⁴ Competence is defined holistically as a relationship between individual attributes (knowledge, skills and attitudes) together with the key tasks and job roles of the profession.⁷ It is positioned within the novice to expert continuum,⁸ where competence is a point on a spectrum of improving capability.⁹ Competence cannot be directly assessed but rather is inferred from 'observable' performances in simulated and work contexts against professional competency standards.⁶ Traditionally, workplace

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assessments in health education^{10–12} have been viewed from a positivist paradigm, where there is one true measurement of student competence that can be objectively determined using valid and reliable assessment tools. Khan and Ramachandran⁹ argue that observed performance is a variable trait that is influenced by capability, personality traits, emotional and physical state. Research has shown assessors' judgements to be complex, dynamic and highly variable, informed by assumptions and influenced by contextual factors.^{13,14} An alternative constructivist–interpretivist approach to assessment proposed by Govaerts and van der Vleuten¹⁰ is to consider the assessments of worksite educators as credible 'interpretations' of performance and for the 'truth' about a student's competence to be a defensible consensus judgement made by a panel of assessors based on a body of evidence.^{10,15,16}

The Dietitians Association of Australia (DAA) Accreditation Standards of Dietetics Education Programs (Standard 5.2) requires the inclusion of a minimum of 100 days of professional placement providing experiences in Medical Nutrition Therapy (MNT), Food Service Systems (FSS) and Public Health Nutrition (PHN).¹⁷ A national study¹⁸ conducted in 2015, explored how dietetic students (post-placements) perceived the role of assessment in their development of competence. The present study found a disconnection between current assessment practices and workforce development. Similarly, research from physiotherapy¹⁹ found current placement supervision and summative assessment models resulted in students adopting passive learning approaches and perpetuating the practises of their worksite educators, even in the face of internal conflict. Boud⁵ has advocated for the use of sustainable assessment practices within higher education, characterised by: (i) a shared understanding of performance standards; (ii) moderated self-assessments (including qualitative assessment tools) used as a catalyst for future development and (iii) the opportunity to practice and transform learning across a variety of contexts. This author suggests that such practices give students more control and ownership of their learning and supports development of life-long learning capabilities.

A constructivist–interpretivist approach to assessment¹⁰ and the use of sustainable assessment practices⁵ both align with a programmatic system of assessment, initially proposed by medicine²⁰ and recently applied to nutrition and dietetics programs.^{21–23} A programmatic system uses authentic tasks mapped across a course of study that are: (i) formatively assessed against outcome focus criteria (such as competency standards) as a catalyst for learning and (ii) used to develop a longitudinal body of evidence (such as a portfolio) to inform the *high stake* summative judgement of competence that is made by a panel of experienced assessors.^{20,21} This research is the first study to evaluate the implementation of a programmatic approach to competency-based assessment applied within the dietetics profession.

Methods

The present study describes the development of the programmatic *Consensus Model*. Data generated from the implementation and the evaluation of the model are collected and reported separately, and then considered together in

the discussion with the intention of providing a more comprehensive evaluation of the model. The University of Canberra Committee for Ethics in Human Research approved the present study (CEHR 16-74) that conforms to the provisions of the Declaration of Helsinki. All participation in the present study was voluntary and required written informed consent.

Development of the model: After initial stakeholder engagement in January 2016, the first author developed and implemented a new *Consensus Model* of competency-based assessment within a postgraduate nutrition and dietetics program using an iterative process that allowed for the graduated incorporation of stakeholder feedback. The model aimed to provide a credible and defensible approach to assess professional competence and to support students to:

- (i) integrate their learning across the whole course of study linking learning and achievement to workforce expectations through the DAA professional competency standards^{4,5,17,20,21},
- (ii) moderate their performance expectations and self-assessments to inform their future learning^{5,20,21} and
- (iii) transform their learning across contexts.^{5,20,21}

An overview of the model's programmatic assessment system^{20,21} and sustainable assessment practices⁵ is provided in Table 1.

Consistent with a constructivist–interpretivist approach to assessment,^{10,14,16} the panel (Table 1, Units (3)) used a three-round modified Delphi process and assessment instrument (Figure 1) that had been previously used by experienced assessors to reach a summative consensus judgements on student competence.¹⁶ The process was designed to enable the assessors to reach a credible and defensible consensus in their assessments^{10,15,16} and to develop a shared understanding of competent performance.^{5,16} The modified Delphi process required panel members to independently assess each student's portfolio. The panel was then invited to reflect on and review their judgements in light of the other assessments. Any areas of dissension were discussed at a face-to-face meeting prior to the student's interview. The interview provided an opportunity for the student to speak to outstanding issues, before the panel made a final judgement. 'Competent' students subsequently completed a four-week capstone internship placement (Table 1, Units (4)).

The instrument included (i) a Visual Analogue Scale (VAS) (novice = 1; competent = 7), where competence was viewed within the novice to expert continuum⁸ (rather than as an end point of competence or not yet competent) and (ii) a qualitative description^{5,10} of the student performance based on multiple sources of evidence^{20,21} as described in Table 1. This global judgement was informed by: (i) the competency standards⁴ as a description of the key tasks and job roles of a dietitian⁷ (rather than as a checklist of functional skills) and (ii) behavioural descriptors²⁵ (Figure 2) that considered the impact of different settings, the complexity of the tasks and the student's experience within each context. The Global Assessment Form, used to support moderated self-assessment⁵ within the placement

Table 1 The Consensus Model

| Units | Moderated self-assessment practices |
|--|--|
| <p>(1) University units</p> <ul style="list-style-type: none"> • Community and Public Health Nutrition • Epidemiology + Research Project • Dietetics 1 + Dietetics 2 • Counselling and Communication for Dietitians • Food Service Management | <p>Students mapped graded authentic assessment tasks against the competency standards⁴ and identified:</p> <ul style="list-style-type: none"> • Evidence of competence (assessed work-samples, e.g., research manuscript, simulated nutrition consultation, simulated project plan etc.) • Areas for development (used to inform personal learning goals for first developmental placement unit)^(a) |
| <p><i>Graded units</i></p> <p>(2) Developmental placement units</p> <ul style="list-style-type: none"> • Public Health Nutrition • Medical Nutrition Therapy (community + hospital) • Food Service Systems | <p>Students:</p> <ul style="list-style-type: none"> • Used a Competency Tracking System²⁶ (modified to include the DAA standards⁴ and a 'reflection-in-action' column) to regularly self-assess their performance of job tasks completed during placement against the competency standards.⁴ This was informed by evidence that included, but was not limited to: <ul style="list-style-type: none"> ◦ Compulsory work samples (set out in the Assessment Unit Outline) that had been independently mapped by academic staff, as part of the course curriculum development, against the competency standards⁴ ◦ Multi-source feedback using tools developed by Jamieson and coworkers²² and a Professional Behaviours Appraisal Form (Dart J, 2015, unpublished data) used with permission. • Completed a written moderated self-assessment of their overall practice using the Global Assessment Form. This form incorporated the assessment instrument (Figure 2) with both the student and worksite educator required to independently formatively assess the student's performance. • Together at a <i>Reflective Practice Meeting</i> this form was used to discuss the student's learning and to revise her/his learning goals and strategies^{(a),(b)} |
| <p><i>Formative assessment only (designed to support the change in role of the worksite educator from 'assessor' to coach)</i></p> | |
| <p>(3) Assessment unit</p> <ul style="list-style-type: none"> • Assessment of dietetics competence <p><i>Summative panel assessment with a focus on future learning and development (Figure 2)</i></p> | <p>Students:</p> <ul style="list-style-type: none"> • Develop and submit a course e-portfolio with the onus on the students to provide evidence to demonstrate their professional competence • Attend a panel interview that offers an opportunity to speak to their e-portfolio and any concerns raised by the panel^(a) <p>The assessment panel consisted of two academics, an industry representative who was experienced in assessing students' performances in the workplace, and an external moderator with expertise in competency-based assessment</p> |
| <p><i>A remediation placement is offered to students if further development is requirement to reach competence. These students are then required to repeat the panel assessment process</i></p> | |
| <p>(4) Capstone unit</p> <ul style="list-style-type: none"> • Nutrition and Dietetic Professional Internship <p><i>Assessed</i></p> <p><i>Used a mentoring model emulating the new graduate DAA Provisional Practising Dietitians (APD) program²⁴</i></p> | <p>Students:</p> <ul style="list-style-type: none"> • Use a learning contract <p><i>Aims to consolidate learning and assist transition to the workforce</i></p> <p><i>Required to make an autonomous contribution as a dietitian</i></p> |

^(a) Throughout this process, students were supported through online resources, email and individual appointments with the University Placement Coordinator.

^(b) Prior to the commencement of the Developmental Placement Units worksite educators attending training workshops on the new assessment forms and processes.

ROUND 1

ASSESSOR 2: You are required to make an independent assessment of this student's e-portfolio

Please make a global rating of the student's performance as observed from their e-portfolio showcase.

Please use the following documents to inform your judgement:

(1) National Competency Standards for Dietitians in Australia with guide
 (2) Behavioural Descriptors
 (3) 10137 Unit Outline

Please place an X on the VAS below:

| | | | |
|--------|----------------------|-----------|--|
| Novice | Advanced Beginner | Competent | |
|--------|----------------------|-----------|--|

Please provide a qualitative justification for your judgement:

Figure 1 The assessment instrument as used within the panel assessment form.

units (Table 1, Units (2)), was also based on this assessment instrument.

Data generated from the implementation of the model: Formative and summative assessment data was collected for all 29 Master of Nutrition and Dietetics students who participated in the pilot implementation from January to December 2016. Consistent with the constructivist–interpretivist approach to assessment,^{10,14,15} raw scores and descriptive statistics from the quantitative VAS ratings were used to identify if any variations in judgement were evident. The qualitative descriptions for each student, that informed the VAS ratings, were reported as qualitative summaries based on the outcomes of the Delphi process and panel discussion. The internship qualitative assessment data were also reported enabling triangulation with the summative assessment data.

Evaluation of the model: Two qualitative descriptive studies were undertaken with key stakeholders to explore their experiences with the new assessment model: Study 1 with worksite educators and Study 2 with students.

Study 1 was conducted in November 2016. It explored the experiences of worksite educators with the *Consensus Model* using focus groups. This method was chosen to make use of group dynamics to stimulate discussion and to elucidate controversial and more complex issues.²⁷ All worksite educators from 16 placement sites involved in the program were invited to participate. To maximise attendance, three focus groups were held (two at different worksites and one at the university). Each group was attended by two researchers one as a facilitator who was experienced in conducting focus groups and one as a scribe. Semi-structured questions, developed by the first author in consultation with the research team, were used. The questions covered the educators' understanding of professional competence; their experience with the new model; their perception of the role of the student and the worksite educator; the model's capacity to support the development and demonstration of competence; and their recommendations for

improvement. Each focus group ran for 60–90 minutes and was conducted face to face where possible or via *Zoom Video Communications Inc.* (2016) (<https://zoom.us/>), which has been shown to be as effective as face-to-face focus groups when used by trained facilitators.²⁸ All discussions were audiotaped and transcribed verbatim to maintain the integrity of the participants' responses. Transcripts were analysed by the primary researcher using a qualitative descriptive approach²⁹ that is exploratory, inductive and process orientated. Data were coded using descriptive labels, sorted into subcategories and organised into themes. Each transcript was then independently analysed and crosschecked for consistency by one other member of the research team. The perspective of the researchers, as educators experienced in competency-based assessment was acknowledged, and reflexivity applied in the coding process.

Study 2 was conducted following completion of all summative assessment required for the Masters of Nutrition and Dietetics. All students (n = 29) were invited to participate in a personal interview lasting 20–40 minutes. This method maximised participation. The interviews were conducted by an academic experienced in qualitative research or by a second researcher from the project team who had been trained by the primary interviewer. The same semi-structured interview questions were used as in Stage 2. Similarly, data were audio-recorded, transcribed verbatim and thematically analysed²⁹ by the primary researcher and then independently analysed and cross-checked for consistency by another member of the research team. Themes arising from the interviews were compared to focus group themes and found to be similar enough to pool.

Results

Table 2 presents the data generated by the implementation of the model. Some variation (31%; 9/29) was evident in the first round of the panel assessments (VAS rating);

Novice Student

- High degree of supervisory support
- Can recall some aspects of relevant theory
- Needs support to:
 - Draw conclusions about a client
 - Develop a plan for action
 - Understand the total clinical situation
 - Apply problem solving strategies, principles and theory.
- Spends a high degree of time and effort in meeting clinical responsibilities
- Highly focused on own performance rather than the client.

Intermediate Student

The complexity of the client, the workplace environment and the student's previous experience determines:

- Degree of supervision (moderate to low)
 - Ability to recognise the meaningful aspects of a situation.
- Recognises several aspects of a problem but not all, and relates these to the client's needs and is able to:
- Draw some accurate conclusions about a client
 - Develop some plans for action
 - Recognise some important aspects of the total clinical situation.
- Requires support to:
- Recognise and prioritise all aspects of a situation
 - Flexibly apply problem solving strategies, principles and theory.
- Developing automaticity resulting in:
- A moderate expenditure of time and effort
 - Greater ability to focus on the situation than on own performance
 - A developing ability to use observation to assist clinical reasoning.

Entry-level (Competent) Student

The student is able to

- Perform the majority of his/her work independently and competently
- Seek support if the situation is new or a number of features about the client or workplace setting combine to create complexity
- Identify the meaningful aspects of problems and integrate these to generate a number of logically possible conclusions. Conclusions/actions will be modified with new information
- Prioritise appropriately
- Be sufficiently automatic and maintain a focus on the client or situation
- Carry out his/her work in an efficient and timely manner.

Used with permission from Speech Pathology Australia. Source: McAllister, S., M. Lincoln, Ferguson, A. & McAllister, L. (2006). COMPASS®: Competency assessment in speech pathology. Melbourne, Speech Pathology Association of Australia Ltd.

Figure 2 The behavioural descriptors of student competency.

however, consensus was achieved for all cases by the third round (Table 2). In 34% of cases (10/29), the final judgment (VAS rating) made by the panel differed from those made by at least one of the worksite educators, at the end of placement. All students concurred with the final panel assessment decision. Assessment data from the four-week autonomous capstone placement corroborated the panel outcomes (Table 2).

In Study 1, 17 worksite educators participated in three focus groups (n = 4; n = 5; n = 8). These educators were from sites providing more than 80% of the placement hours and were distributed across all three areas of practice: MNT, FSS and PHN (Appendix I). All three focus groups included worksite educators from all areas of practice. In Study 2, 29 students participated in the personal interviews. Three themes that emerged from both the focus groups and the personal interviews

were that the *Consensus Model*: (i) supported sustainable assessment practices; (ii) shifted the power within student educator relationships requiring students to take more control over their learning and (iii) provided a fair way to assess competence. Table 3 provides subcategories and exemplar quotes as evidence for these themes.

Theme 1: The Consensus Model supported sustainable assessment practices. There was general agreement among the worksite educators that the new model gave students more control and ownership over their learning. The model required both students and worksite educators to engage with, and discuss their interpretation of, the DAA competency standards.⁴ This helped students to gain an understanding of performance expectations. Worksite educators reported that students' self-assessment gave them insight into their students' understanding of their feedback and

Table 2 Data generated from the implementation of the *Consensus Model*

| Student No. | Worksite educators VAS rating ^(b) | | | | Panel members VAS rating | | | | Qualitative outcomes from the delphi process and panel discussion | Capstone internship qualitative assessment data | | |
|------------------|--|---|---|---|--------------------------|-------------------------------|---------|----|---|--|--|---|
| | SA | 1 | 2 | 3 | 1 | 2 | 3 | 4 | | | | |
| 1 | 7 | 7 | 7 | 7 | R1 | 6 | 7 | 7+ | 7 | Social-determinants of health explored; [Student] demonstrated self-awareness, appropriate self-care strategies and good reflective practice. | Private outpatients: Will be an invaluable asset to any prospective employer. I have no hesitation in offering my full support. | |
| 2 ^(a) | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Conflict resolution strategies explored; student supported in her transition to the workforce. | Private outpatients: It has been a delight to have [Student] working with us. Her dedication and commitment to all tasks has been outstanding. | |
| | | | | | R2 | 7 | 7 | 7 | 7 | | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | | |
| 3 | 7 | 7 | 7 | 7 | R1 | 6 | 7 | 7 | 7 | Social-determinants of health explored; supported student in her transition to the workforce. | Professional association: [Student] has been a pleasure ...and will be missed. I wish [Student] all the best for her bright future in dietetics! | |
| | | | | | R2 | 6 | 7 | 7 | 7 | | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | | |
| 4 | 7 | 7 | 7 | 4 | R1 | 7 | 7 | 7 | 6 | Team work and performance in ICM context explored; [Student] demonstrated self-awareness and appropriate strategies for development | Private aged care: Has shown herself to be an enthusiastic and professional intern. She has been an asset to the practice. | |
| | | | | | R2 | 7 | 7 | 7 | 6 | | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | | |
| 5 | 7 | 7 | 7 | 5 | R1 | 7 | 7 | 7+ | 7 | Limitations of her research project and ICM context explored with appropriate understanding demonstrated; supported student in her transition to the workforce. | Tertiary hospital: [Student] has completed her tasks competently, professionally and in a timely manner. It has been a pleasure having her for her internship. | |
| | | | | | R2 | 7 | 7 | 7+ | 7 | | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | | |
| 6 ^(a) | 4 | 7 | 7 | 2 | Panel 1 | Failed Panel – did not submit | | | | (1) Failed panel: did not submit; (2) Repeated panel: had used self-directed strategies to improve communication and clinical reasoning; (3) Post supplementary placement: deemed competent by site, self-awareness and lifelong learning capacity evident | Workplace health initiative: Delivered appropriate dietetic services and resources. | |
| | | | | | Panel 2 | R1 | 3 | 6 | 4 | | | 3 |
| | | | | | | R2 | 3 | 5 | 4 | | | 4 |
| | | | | | | R3 | 4 | 4 | 4 | | | 4 |
| | | | | | Remediation Placement | 7 | Panel 3 | 7 | 7 | | | 7 |
| 7 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 6 | 7 | Social-determinants of health explored; supported student in her transition to the workforce | Rural hospital: Successfully completed internship. | |
| 8 | 7 | 7 | 7 | 6 | R1 | 7 | 7 | 7 | 7 | Strategies to improve performance for individual case management explored; clear, reflective, holistic response demonstrated | Private outpatient: Impressive personal/professional reflection skills, great to have her. | |
| | | | | | R2 | 7 | 7 | 7 | 7 | | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | | |
| 9 ^(a) | 7 | 7 | 7 | 6 | R1 | 6 | 6 | 6 | 6 | The panel felt this student needed to consolidate and increase confidence and that this would be best managed by progressing to the internship | Base hospital: Has been an asset to the dietetics department. He has shown effective communication with both patients and staff. Well done! | |
| | | | | | R2 | 7 | 6 | 7 | 6 | | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | | |
| 10 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | "Very impressive" integrated personal and professional experience; clearly demonstrated readiness to practice | Tertiary hospital: Has been an outstanding student. She worked very efficiently and achieved more than what was asked of her. | |
| | | | | | R2 | 7 | 7 | 7 | 7 | | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | | |

Table 2 Continued

| Student No. | Worksite educators VAS rating ^(b) | | | | Panel members VAS rating | | | | Qualitative outcomes from the delphi process and panel discussion | Capstone internship qualitative assessment data | |
|-------------------|--|---|---|---|--------------------------|---|---------|---|---|---|---|
| | SA | 1 | 2 | 3 | 1 | 2 | 3 | 4 | | | |
| 11 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Competence clearly demonstrated with passion for the profession and outstanding contributions beyond the core requirements of the course clearly evident | Base hospital: Displayed professionalism and has been a valued member of the dietetics team. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 12 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Excellent interview skills and holistic strategic response to questions demonstrated | Rural hospital: Worked hard (above and beyond what I expected). I am delighted with [her work]. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 13 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | More practice required with the interview process however, overall panel maintained view that student was competence for practice | Mental health: Professional manner and successfully managed a significant number of projects. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 14 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Articulate strategic response; confirmed competence | Indigenous health: Will exceed at her duties in her future employment opportunities as she did in this placement. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 15 ^(a) | 6 | 7 | 7 | 6 | R1 | 6 | 6 | 6 | 6 | Her portfolio was under-developed and some concerns were raised around professionalism, communication and professionalism; student demonstrated insight into her learning needs felt she would benefit from a supplementary placement | Private hospital: Independently and efficiently managed a clinical caseload, developed excellent rapport with patients and staff. Thank you for your hard work! |
| | | | | | R2 | 6 | 6 | 6 | 6 | | |
| | | | | | R3 | 6 | 6 | 6 | 6 | | |
| | | | | | Remediation Placement | 7 | Panel 2 | 7 | 7 | | |
| 16 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | - | "Very Impressive" excellent thorough responses provided through the panel interview | Private outpatient: Fantastic intern, worked independently, reflected well, great team member, contributed valuable input thorough internship. |
| | | | | | R2 | 7 | 7 | 7 | - | | |
| | | | | | R3 | 7 | 7 | 7 | - | | |
| 17 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | - | Appropriate responses to panel interview questions; supported student in her transition to the workforce | Government department: Work collaboratively, high level of independence, invaluable input, sound communication, completed all tasks. |
| | | | | | R2 | 7 | 7 | 7 | - | | |
| | | | | | R3 | 7 | 7 | 7 | - | | |
| 18 ^(a) | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | - | Very impressive" with a clear vision for the future | Tertiary hospital: A pleasure! Independently managed caseload across inpatient and outpatient settings and completed small food service project. |
| | | | | | R2 | 7 | 7 | 7 | - | | |
| | | | | | R3 | 7 | 7 | 7 | - | | |
| 19 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | - | Strong portfolio and interview across all areas; supported student in her transition to the workforce | Tertiary hospital: Demonstrated competence and professionalism throughout. I believe she will continue to excel. |
| | | | | | R2 | 7 | 7 | 7 | - | | |
| | | | | | R3 | 7 | 7 | 7 | - | | |
| 20 ^(a) | 7 | 6 | 7 | 6 | R1 | 6 | 6 | 6 | 6 | Clearly demonstrated insight into her own performance and had identified appropriate strategies for development | Base hospital: Has been a delight, fitted in well. Managed a new graduate workload. |
| | | | | | R2 | 6 | 6 | 6 | 6 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |

Table 2 Continued

| Student No. | Worksite educators VAS rating ^(b) | | | | Panel members VAS rating | | | | Qualitative outcomes from the delphi process and panel discussion | Capstone internship qualitative assessment data | |
|-------------------|--|---|---|---|--------------------------|---|---|---|---|---|---|
| | SA | 1 | 2 | 3 | 1 | 2 | 3 | 4 | | | |
| 21 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Appropriate responses; discussed research project; explored future opportunities | University health services: Developed excellent resources within a timely manner |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 22 | 7 | 7 | 7 | 6 | R1 | 7 | 7 | 6 | 7 | Explored performance in the hospital context and standard of portfolio presentation; overall performance considered – deemed competent by panel | AIS: Met requirements of the internship. |
| | | | | | R2 | 7 | 7 | 6 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 23 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Sound interview responses; supported student in her transition to the workforce | Child and maternal health: Completed all tasks, independently ran nutrition clinics at two locations, asset to the team. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 24 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Excellent portfolio with competence demonstrated across all domains; supported student in her transition to the workforce | Rural hospital: A pleasure, practices evidence based practice, is efficient and goes above and beyond. A bright future ahead of her. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 25 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Social-determinants of health and conflict resolution explored; supported student in her transition to the workforce | Tertiary hospital: Managed caseload, managed time well and completed all tasks allocated. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 26 ^(a) | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Supported student in her transition to the workforce | Private outpatient: Great addition, worked independently, good client interaction, with ongoing practice will make a fantastic content creator. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 27 | 7 | 7 | 7 | 6 | R1 | 6 | 6 | 6 | 7 | Discussed performance in an inpatient setting; deemed competent by the panel | Tertiary hospital: Completed tasks competently, professionally and in a timely manner, a pleasure. |
| | | | | | R2 | 6 | 6 | 6 | 6 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 28 | 7 | 7 | 7 | 7 | R1 | 7 | 7 | 7 | 7 | Panel impressed by increase in confidence following placements; supported student in her transition to the workforce | Base hospital: Managed medical and stroke unit, provide high quality nutrition care, worked well in team. |
| | | | | | R2 | 7 | 7 | 7 | 7 | | |
| | | | | | R3 | 7 | 7 | 7 | 7 | | |
| 29 | 7 | 7 | 7 | 6 | R1 | 7 | 6 | 6 | 6 | Discussion on inconsistent performance in the ICM context related to student's health issue; supplementary placement after period of personal leave recommended | Yet to complete final panel and internship. |
| | | | | | R2 | 7 | 6 | 6 | 6 | | |
| | | | | | R3 | 6 | 6 | 6 | 6 | | |

R = Delphi Round; SA = Student's self-assessment using the Visual Analogue Scale (VAS).

■ Variation in VAS Rating between Worksite Educator/s and Panel Members Round 3.

■ Variation in VAS Ratings by Panel Members Round 1.

^(a) International students.

^(b) VAS ratings made by Worksite Educators within the Global Assessment Form completed at the end of each placement unit with ratings represented for different practice contexts (e.g. MNT, FSS and PHN)

their reflective practice skills. For some worksite educators, this positively influenced their moderation of the student's performance. Both students and worksite educators viewed these processes as part of a continuum of learning rather than an end point.

There was however, variation in how well students engaged with the model. In particular, some worksite educators and students raised concerns that this model was more challenging for international students. This is illustrated by the quotes below:

'This person just reiterated what was in the examples on the form into her reflection. Of course, she had a second language, language was a barrier for her, but it was very obvious she really didn't quite get it' #2:2

'It's a very different method of teaching to what they experience in their countries...I think that model of teaching from what I've heard from the students that I've spoken to, it's much more, you're given a set of instructions or rules to follow, and you follow them and you do it and that's it. Whereas getting someone to come up with their own way of doing things is very different. I think we're asking a lot more from them in this system than we're asking from someone who has gone through the Australian system' #7

Theme 2: The Consensus Model shifts the power within student educator relationships requiring students to take more control over their learning. Most worksite educators felt that the model helped to provide a more supportive environment for the students, facilitating more open communication. With the new model, the worksite educator role shifted from judge to a facilitator of the student's learning. Many worksite educators found this role more enjoyable; however, others struggled with the shift in power within the student educator relationship.

'In my head I am like, "If I just let them be and tell them to reflect and not pick them up on things, that's just me sending them out to not be a good dietitian. I just still... I mean, you know, I am fair and I am nice. I am helpful and blah, blah, all that jazz, but I still supervise them' #2:2

'It's really clear that you have authority as a supervisor. As a student that you are for one, to respect that authority but two, respect their experience, their understanding' #2:4

'It's probably the whole concept of adult learning but... there is a lot of students that come through that still want to be hand held the whole way through' #2:2

From the student's perspective, the role of the worksite educator varied within placements and across contexts as illustrated by the quotes below.

'I felt very much that the onus was on me to create the discussion and to talk about what I felt that I needed guidance on, and the weaknesses that I thought I had. Although the supervisor had a role in commenting on that and helping me to suggest strategies' #14

'I felt in the clinical setting, particularly in the hospital, the evaluation of the supervisor is a lot 'stronger' assessment compared to the other settings where it was more of a supportive role' #4

Overall most students highly valued their worksite educators. They saw them as role models, providing support, resources and practical knowledge, facilitating constructive discussions and giving critical feedback.

Theme 3: The Consensus Model provided a fair way to assess competence. In general, students and worksite educators felt it was a fair process to use a panel of assessors to make the summative judgement of professional competence based on the student's performance over their whole course of study using multiple sources of evidence from a variety of contexts. Yet, some worksite educators felt undervalued when their interpretation of the student's performance was different to the final judgment made by the panel. They found it difficult to see their experience with their student within the broader context of the student's whole course of study. Both students and educators commented that they felt the panel process (portfolio and interview) helped to better prepare the students for workforce recruitment practices.

There were many suggestions from worksite educators and students to improve the *Consensus Model*. First, given that the system was very different to what had been used previously, more training and resources were requested. Many worksite educators were unaware of the exemplar forms and resources available online suggesting there was also an access issue with this material. Second, all stakeholders wanted more refinement with the assessment tools including a reduction in the number of forms and more structure and/or instructions.

As an example, one educator commented:

'...how detailed do we need to be in the feedback on the forms? Maybe some subheadings or guidance on the feedback section of the forms' #3.4

Discussion

Although a programmatic competency-based assessment approach has been applied within other nutrition and dietetics programs,²¹⁻²³ this research is the first to evaluate its implementation. The qualitative feedback from key stakeholders (worksite educators and students) supported the model as a fair method to assess professional competence (Theme 3). All 29 students, including those who required remediation (n = 2), agreed with the panel's summative judgement that was based on their course e-portfolio and panel interview (Table 1). By adopting sustainable assessment practices (Theme 1), students reported more control and ownership over their learning (Theme 2) and felt supported in their development of life-long learning capabilities (Theme 3). The capstone internship assessment data (Table 2) suggested that the students who participated in the model were work-ready and able to make an autonomous contribution as a dietitian.

The variation in judgements between worksite educators and panel assessors is consistent with an interpretivist approach,^{10,15,16} that views assessor variance as alternative

Table 3 Evaluation of the *Consensus Model*—stakeholders' perceptions

| Themes and subcategories | Worksite educators' perceptions | Students' perceptions |
|---|--|--|
| Supports sustainable assessment practices | | |
| A shared understanding of professional competence | <i>Whereas before you would just be ticking boxes and giving some examples and now there is probably more discussion about what they are doing and what they need to achieve # 3:7</i> | <i>It [Reflective Practice Meeting] was more about me talking through my thinking and reflecting on my performance, and really gaining and providing my opinion and insight into what I feel it is to be a dietitian #14</i> |
| Moderated self-assessment | <i>I think it opens up those lines of communication a bit better than having them sitting there with you saying, "Well, I think you've done this." It's our assessment of what they're doing whereas here it's the other way around and we're either confirming or discussion it further #1:1</i> | <i>It provided a two-way communication between students and supervisors. I guess from my experience, the placement supervisors do take a look at what you've written, what you've thought about, what strengths and weaknesses and then provide corresponding feedback #8</i> |
| Transformative learning | <i>It was really insightful as a supervisor to hear their reflections on where they felt they were at...It looks at a more holistic view of the person growing as a clinician #3:1</i> | <i>I started to recognised how I have changed before I came here and after all my placements...I realised that I have really learnt something...my whole mindset has changed...I think those assessments do provide us with a chance to think about our dietetic practice and how to become a professional in this field #20</i> |
| Shifted the power within student educator relationships requiring students to take more control over their learning | | |
| Control and ownership life-long learning | <i>I feel like more of a support person or coach, if you want to use that word. To help the student learn and develop... while you might have seen the placement as really critical... the learning for all of us continues #3:5</i> | <i>You were the driver of your own learning and your experiences. This was like the ball in your court, so do what you want. Because of that I actually did a lot of reflecting on my own #6</i> |
| Power Balance | <i>We don't see the final product. We don't see everything and we don't have any say in what happens there [at the panel] #2:2</i> | <i>It's not up to them to make a judgement call whether you fail. It's based on competence over a number of different areas...stop thinking that you are dictating what is going to happen to me #28</i> |
| Provides a fair method to assess competence | | |
| Shared judgement | <i>I suppose potentially conflict or not so great a relationship...that can maybe impact an assessment. This is fair in that we are not the assessors. It's a panel #2:3</i> | <i>It's not just one person sitting and telling where they think you are along the scale. It's a lot of input and a lot of different opinions. You can get the perspective of a lot of different people #14</i> |
| Based on evidence | <i>I think what makes it fair is that it's looking at the student's performance across a variety of contexts...looking broadly at their overall performance in each of their clinical, food service, community and their research work as well #3:1</i> | <i>It's not so much just going through the placement, ticking the boxes...You have to demonstrate how you did it...why you're competent #26</i> |
| Workforce ready | <i>It's a very well rounded assessment and it's very much preparing them into the working world. You're going for your interview panel. It's almost like going for an interview itself. Then you've got your internship, so it really is just that consolidating everything ready for the workforce #3:3</i> | <i>It helped me to push myself towards the career as a dietitian, so what I need to continued on with from here and how I'm going to be independent in myself #24</i> |

yet credible perspectives. By using a programmatic approach, that considers the students whole course of study, inconsistencies in assessment data can be explored.²¹ Previous research in dietetics¹⁴ suggests that by justifying, sharing and discussing judgements, (as undertaken in the reflective practice meetings and in the panel assessments—Table 1) students and dietitians can identify their assumptions, learning from the observations of other and move closer towards a shared understanding of competence.

The shared roles of assessor and coach are incongruent with an effective learning environment in the workplace, as students can be reluctant to expose their learning needs.^{18,19} The adoption of the role of coach by worksite educators in this case study was variable across sites with some worksite educators in clinical setting continuing with the previous role as a summative assessor of student performance. In these settings, worksite educators were less comfortable with the panel process. When the model was used as intended, both students and worksite educators reported enjoyable placement experiences, with improved communication and student initiative (Theme 2). By limiting the risks associated with the power relationship that is evident in some clinical placement experiences between students and clinical supervisors,¹⁹ 'observed' student performances may more accurately emulate 'actual' performance.

The unique challenges for international students with professional placements are well documented in the literature.³⁰ In the present study, eight students were international. Of these, two required supplementary placements; three received formative feedback from their worksite educators suggesting their performance was 'borderline' (although this judgement was not reflective of their summative panel assessment) and three excelled throughout their placements. Qualitative data from both students and worksite educators suggested that the practices required by the *Consensus Model* may be particularly difficult for these students. Yet, the potential for international students to engage in sustainable assessment practices was also evident. As an example, the student quote (Table 3, Theme 1, #20) was in fact an international student and demonstrated transformative learning. The best way to support international students during placements and the benefits or challenges of the *Consensus Model* for these students warrants further investigation.

This research, as an evaluative case study, provides an example of a successful programmatic approach, but these results cannot be generalised. The worksite educators' participation, although not universal, represented sites providing 80% of the placement hours. The depth of personal interview data was variable reflecting the experience of the second interviewer. For six students, the industry member was absent from their assessment panel. In this instance, the industry member withdrew from the panel at the last minute due to pressing work commitments. It is unlikely to have impacted the final results (all worksite educators and panel members agreed that the students were competent). It raises questions however, as to the priority given to external participation on further assessment panels and whether

additional incentives and support from the university (such as financial remuneration, an adjunct appointment and more resource and training on the assessment model) are required to overcome this limitation.

The costs associated with the *Consensus Model* are worthy of further research. While, workload costs are associated with the panel assessment process, anecdotal evidence suggests that the more supportive learning environment during placements may translate into a reduced workload for the placement coordinator. Additionally, the university does not pay for the capstone internship, unlike many compulsory placements, as it offers sites increased workforce capacity and a means to trial future employees (while students are able to consolidate their practice, build confidence and showcase their potential).

Qualitative data from both students and worksite educators indicate that the *Consensus Model* may increase students' familiarisation with employer recruitment practices. Further research is recommended to measure the employability skills and employment outcomes for graduates who participated in the *Consensus Model*. In particular, this research should explore how well-prepared graduates are to work in new and emerging areas of practice.

In conclusion, this research supports the use of a holistic assessment approach that is student centred, uses evaluation as a catalyst for learning and incorporates a panel of assessors for high-stake decisions. This is a shift towards an interpretivist view of competency-based assessment.

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Conflict of interest

The authors have no conflicts of interest to declare.

Authorship

RB was the main author and contributed to the conception and research design; data collection and analysis; drafting and revision of the manuscript. JK, JD, CK-A, RM, SA and CP contributed to the research design, data collection and analysis and revision of the manuscript. All authors are in agreement with the manuscript. The content has not been published elsewhere with the exception of abstracts presented as oral presentations at the 2017 Dietitians Association of Australia's 33rd National Conference, the Australian and New Zealand Association for Health Professional Educators National 2017 Conference and the Canberra Health Annual Research Meeting 2017.

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Appendix I**Table A1** Placement site representation provided by focus group participation

| <i>Placement site</i> | <i>Placements weeks per site</i> | | | <i>Total weeks</i> | <i>Participants</i> | |
|-----------------------|----------------------------------|------------|------------|--------------------|---------------------|-------|
| | <i>By practice area</i> | | | | | |
| | <i>MNT</i> | <i>FSS</i> | <i>PHN</i> | | | |
| 1 | 80 | 32 | 12 | 124 | 5 | |
| 2 | 75 | 16 | — | 91 | 4 | |
| 3 | 65 | 8 | 24 | 97 | 1 | |
| 4 | 20 | 8 | — | 28 | 2 | |
| 5 | — | — | 24 | 24 | — | |
| 6 | 20 | — | — | 20 | 1 | |
| 7 | 20 | — | — | 20 | — | |
| 8 | — | — | 18 | 18 | 1 | |
| 9 | — | 16 | — | 16 | 1 | |
| 10 | 5 | 8 | — | 13 | 1 | |
| 11 | — | — | 12 | 12 | 1 | |
| 12 | — | — | 12 | 12 | — | |
| 13 | 10 | — | — | 10 | — | |
| 14 | — | 8 | — | 8 | — | |
| 15 | — | 8 | — | 8 | — | |
| 16 | 5 | — | — | 5 | — | |
| | 300 | 104 | 102 | 506 | 17 | Total |