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ORIGINAL ARTICLE

An Evaluation of Texture-Modified Diets Compliant with the International Dysphagia Diet Standardization Initiative in Aged-Care Facilities Using the Consolidated Framework for Implementation Research

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Abstract

Texture-modified diets (TMDs) are commonly prescribed for older adults with swallowing difficulties to improve swallowing safety. The International Dysphagia Diet Standardization Initiative (IDDSI) provides a framework for terminology, definitions and testing of TMDs. This observational mixed-method study used the consolidated framework for implementation research (CFIR) to establish the barriers and enablers to IDDSI adoption in aged-care facilities (ACFs). Five New Zealand ACFs who had adopted IDDSI > 12 months previously were recruited. Evaluation tools were developed based on CFIR constructs, integrating data from (i) mealtime observations; (ii) manager interviews and (iii) staff (nursing, carers and kitchen) self-administrated surveys. All facility and kitchen managers were IDDSI aware and had access to online resources. Three sites had changed to commercially compliant products post-IDDSI adoption, which had cost implications. Awareness of IDDSI amongst staff ranged from 5 to 79% and < 50% of staff surveyed felt sufficiently trained. Awareness was greater in large sites and where IDDSI was mandated by head office. Managers had not mandated auditing and they felt this had led to reduced perceived importance. Managers felt staff required more training and staff wanted more training, believing it would improve food safety and quality of care. Lack of a dedicated project leader and no speech pathologist on-site were perceived barriers. Collaboration between healthcare assistants, kitchen staff and allied health assisted implementation. ACF staff were aware of IDDSI but staff awareness was low. Using the CFIR, site specific and generic barriers and enablers were identified to improve future implementation effectiveness. Managers and staff want access to regular training. Multidisciplinary collaboration and improving communication are essential. ACFs should consider TMD auditing regularly. Successful implementation of IDDSI allows improvement of quality of care and patient safety but requires a systematic, site-specific implementation plan.

Keywords IDDSI · Texture-modified diets · Aged care · CFIR · Implementation · Malnutrition · Food service

Abbreviations

ACF	Aged-care facility
CFIR	Consolidated framework for implementation research
IDDSI	International Dysphagia Diet Standardization Initiative
TMD	Texture-modified diet

Background

Texture-modified diets (TMDs) are a common dietary intervention for older adults with swallowing difficulties (dysphagia) or poor dentition as they can improve swallowing safety, efficiency and/or enjoyment [1, 2]. The prevalence of TMD use in aged-care facilities (ACFs) in New Zealand aligns with international reporting prevalence of 15–30% [3, 4]. Texture modification refers to the alteration of food particle size, texture and consistency and may involve cutting up, mincing or pureeing food or the adding of thickening agents or additional liquids. Providing standardized and consistent TMDs remains challenging in practice [5–7]. Lack of standardized terminology and descriptions for the varying degrees of TMDs contribute to improper provision

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and therefore, increase the risk of adverse events, such as choking or aspiration pneumonia [8]. To overcome the inconsistency in clinical practice and potential communication breakdowns, a global multidisciplinary team developed the International Dysphagia Diet Standardization Initiative (IDDSI) framework. The IDDSI framework standardizes terminology and provides definitions and testing procedures of TMDs to guide individuals with dysphagia, their carers, health professionals and anyone involved in food provision or mealtime support for those with dysphagia [9].

The IDDSI framework consists of a progression of eight colour-coded levels, numbered and labelled to describe the textures of drinks and food [10]. The framework provides validated testing methods that can be conducted without specialist equipment or training for each food and drink level. The goal of a standardized common language for TMDs across all countries, ages, care settings and cultures is to advance patient safety, improve communication between health professionals and enhance collaboration of research [11].

IDDSI is rapidly being adopted by many countries worldwide but there are limited publications supporting ways to successfully adopt IDDSI. Both Lam et al. and Estrella et al. [12, 13] demonstrated successful implementation of the IDDSI framework in pilot hospital sites as evidenced by improved interdisciplinary collaboration and staff practices. IDDSI was adopted in New Zealand in May 2018 and implementation has been encouraged across all healthcare settings, including ACFs. ACFs support > 35,000 residents across New Zealand with one-third of residents on TMDs [4]. Our earlier work found the majority of ACF-pureed diets met IDDSI standards, yet none of the soft and bite-sized diets met the standards. Foodservice providers contracted to ACFs were struggling to adjust menus and to supply financially viable meals that adhered to the IDDSI standards. Similar themes were reported in the New York pilot implementation study where food particle size compliance and education and collaboration with foodservice management were identified barriers [13]. Lam et al. and Rule both emphasize the need for multidisciplinary support for successful IDDSI implementation [12, 14].

The formative evaluation of the implementation of a new healthcare practice helps to gain a better understanding of the complex factors influencing the process, which provide useful strategies for successful implementation. This in turn improves the effectiveness and sustainability of the implementation process. To our knowledge, this is the first study to explore IDDSI implementation in aged care using an established implementation science framework. We used the consolidated framework for implementation research (CFIR) to guide structured data collection, analysis and evaluation of the barriers and enablers associated with the adoption of IDDSI into TMD provision [15]. We asked the following questions: Were staff aware of IDDSI? Were the organizations and managers proactively promoting and facilitating the uptake of IDDSI? Did they have the resources required to adopt IDDSI? What are the barriers and enablers to successful IDDSI adoption? Summarized findings could assist future implementation in ACFs and enhance the effectiveness of implementation.

Consolidated Framework for Implementation Science

Based on a recent review, the CFIR has been identified as one of the well-established conceptual frameworks in evaluating health service interventions [16]. In particular, it has been most commonly used to understand the determinants of implementation outcomes following new guideline implementation [17]. It can apply to a wide range of study designs, including mixed-method studies in organizations and has been particularly well adopted in healthcare settings [15]. The CFIR was created by combining previously published implementation science notions. It is a multi-dimensional framework, including five domains with 39 dynamic constructs which systematically evaluate both contextual and intervention factors that may influence an implementation process [15]. Damschroder et al.'s recommend that all CFIR constructs are included to avoid missing relevant factors that may have impacts on the implementation outcomes. In our study, we used a mixed-methods approach with mealtime observations, interviews and surveys developed to incorporate all CFIR constructs in order to identify the contributors affecting implementation (Additional file 1). Our study used CFIR as a systematic assessment guide in the data collection phase and quantitatively rated the influential constructs in data analysis.

Methods

The study received ethics approval from the University of Auckland Human Participants Ethics Committee (023048) on 28-June-2019.

Study Sample

Sample sites were selected through convenience sampling by emailing flyers to a list of central Auckland ACF managers retrieved from an internet search. According to the report from the Ministry of Health NZ, the average size of a certified ACF is 60 beds, with a median of 51 beds. Therefore, we stratified the facilities by size (small—less than 50; medium—50 to 99; large—100 to 200). Of the 140 ACFs located within the Auckland District Health Board, the majority of facilities covers rest home and/or hospital

levels of care and 10% have a dementia unit. Only three homes provide psychiatric care; therefore, those particular wards were excluded from selection. Our study aimed to recruit a representative range of facilities covering a mixed level of service care and size. Given that this is the first study to investigate IDDSI implementation in ACFs, we aimed to include a sufficiently large sample size to identify the common barriers and enablers. ACFs were invited one by-one based on locality convenience and size until the saturation sample size of five ACFs was achieved. All sites adopted the IDDSI in 2018–2019. Sites ranged from 54 to 153 beds and all had dietitian access. Between 23 and 37% of residents were receiving TMDs including puree, minced and moist and soft and bite-sized meals. Thickened drinks were much less frequent (range 5–12%). Details of sites and their meal services are displayed in Additional file 3. A total of 15 managers were interviewed and 85 surveys were completed by the staff across the five sites. The staff response rate from each site varied between 15 and 38%.

Data Collection

Based on CFIR constructs, data collection aimed to systematically gather information about enablers and barriers of current IDDSI adoption and use of TMDs in ACFs. A parallel mixed-method approach was chosen for data collection and analysis. Both quantitative and qualitative data were interpreted to appreciate the reasons and self-perceptions of implementation success and failure.

To minimize the inconsistency of observations and interview techniques, data were collected by an independent foodservice dietitian researcher who was experienced in TMD interventions and had four years of experience in older adult research. The independent researcher was not the local dietitian who had been involved in IDDSI adoption. The researcher visited each site and conducted (i) mealtime observations; (ii) manager interviews and (iii) staff self-administrated surveys. Interviews were conducted on a one-day visit, whilst mealtime observations were conducted across 1–2 days at each site depending on dining room numbers. Surveys were handed to staff on the first visit and collected a week after. Healthcare assistants, nursing staff and kitchen staff were all invited to complete the survey. All data collection was completed between July 2019 and April 2020.

Mealtime Observations

The researcher was present in the dining room at lunch and dinner time to observe the residents consuming TMDs. To minimize the ACF staff performance bias, staff were not aware of the research aims, and there were no interactions with the residents or staff. Staff were told the research was to observe the plate wastage. As part of the inner setting domain analysis, feeding assistance, meal presentation, dining environment and staff communication with residents were recorded on the mealtime observation sheet.

Manager Interviews

To understand the implementation process at sites, the researcher initiated 30–50-min semi-structured interviews with facility managers, kitchen managers and clinical managers at each ACF. Questions were guided by the CFIR Interview Guide tool (Additional file 1). Participants were prompted to outline their involvement in TMDs at their facility, any changes they have made during the implementation of IDDSI and perceived challenges and successes. Profession-specific probes were formulated according to their daily responsibilities (e.g. training schedules and use of external foodservice questions for facility managers; incidence of choking and clinical system for clinical managers; food preparation and testing for kitchen managers). Managers were asked to rate the implementation difficulty, self-perceived success and how confident they were regarding staff performance improvement after implementation on a 10-point Likert scale (0 = lowest and 10 = highest). The interviews were audio recorded and transcribed verbatim using F4Transkript software and reviewed by the interviewees for accuracy checking.

Staff Surveys

Self-administrated anonymous surveys were distributed in paper form to healthcare assistants, nursing staff and kitchen staff and collected in a dropbox. The survey was designed based on a review of the relevant literature and was used to investigate staff knowledge and attitudes towards IDDSI implementation and the use of TMDs. The survey consisted of five sections and 46 questions: (i) background and experience with using TMDs; (ii) knowledge of malnutrition; (iii) knowledge of dysphagia; (iv) knowledge of TMDs and IDDSI framework and (v) attitudes towards IDDSI implementation and nutrition education (Additional file 2). All questions related to knowledge level were multiple choices. Staff were asked to rate their perception of the facility TMDs on a Likert scale. The survey was developed by a dietitian researcher and evaluated and reviewed by an expert dietitian and speech pathologist to ensure the questions were relevant to the topic and plain language was used. Questions related to malnutrition and dysphagia aimed to measure staffs' general dysphagia knowledge. IDDSI questions were designed based on the information provided by the official website documents, which covered classification, labelling, testing methods and implication. Questions regarding attitude

queried the staffs' insight of IDDSI implementation and their interests in future education.

Data Analysis

Mealtime observations and survey results were tallied by site and coded by prepopulated CFIR construct codes. A content analysis approach was used to systematically code interview transcripts and surveys, again, using prepopulated CFIR construct codes. Coding categories reflected each domain and construct of CIFR (Additional file 1). Identified constructs from each interview, survey and mealtime observations were then rated for strength for each of the facilities using CFIR Rating Rules recommended by Damschroder and Lowery [18] (2 = strong, 1 = weak, 0 = neutral). Positive (+) influence was considered as an enabler, and negative (−) influence was considered as a barrier to the implementation. Two authors (X.W. and A.B.) independently rated the constructs using the coded data. There was a 16% variance of the construct rating and the third author (A.M.) was consulted for disagreements. Coding and rating were checked by all authors for consensus agreement.

Results

Intervention Characteristics

Table 1 displays the overall construct ratings across sites. The IDDSI is a global standard for texture modification developed by an international committee and was adopted by New Zealand in 2018. Comprehensive IDDSI resources are available and accessible to the public. The IDDSI framework has detailed descriptions of definitions, test methods and food examples. Accordingly, intervention source and design quality and packaging had a strong positive influence on all sites. Trialability was also rated as a strong positive factor. As part of the implementation, three sites conducted IDDSI-compliant commercial TMD trials before moving on to a larger scale of commercial TMD, positive feedback was received from residents and staff. The other two sites indicated they did not make particular changes to TMD provision, so trialability did not apply to them.

With the exception of Site 1, where perception of the relative advantage was negative, the relative advantage had a favourable influence on the implementation. Compared to the previous terminologies, participants saw the benefits of having clearly defined levels and instructed testing methods for improving resident safety. According to the managers, TMDs have always been provided in ACFs and the various levels of TMDs were easily adaptable. Only Site 4 struggled to accommodate the minced and moist level due to the chef and kitchen manager's lack of understanding and experience with TMD.

On the other hand, the evidence strength and quality showed a strong negative influence on all sites. Participants expressed that they wanted to know more about the IDDSI background suggesting a lack of awareness of the development process, which weakened their perception of the implementation needs: '*I don't think it's been publicized enough maybe….They all know what soft, minced and moist and puree is. But, actually, the background behind that change'* Site 5 manager.

Complexity was another common negative influence. The mean range of implementation difficulty was 4.4 out of 10 (range 3–5). Four sites indicated the previous terminologies used to describe TMDs in New Zealand were very similar to IDDSI, but '*it was hard getting the staff to adopt the new terminology and to understand what the new changes were and why we're changing all these terminologies.*' Site 2 manager. Site 4 manager considered the process as relatively complex considering it as an ongoing process: '*I would say that we're probably still going through the process. It's not like we're done with it. There're still some things that we need to regather.*'

The cost had a mixed rating with either, having a negligible or negative influence. Although the cost of implementation delivery and education sessions was less of a concern for the majority of the managers, Site 3 clinical manager stated that additional funding dedicated to IDDSI implementation would be beneficial: *'I think we need extra (funding) … at the moment, our suppliers would do it (education) or students would do it (education).'* Twenty-three percent ($n = 7/30$) of participants reported the higher cost to produce or purchase IDDSI-compliant meals was the most challenging change. The budget of food purchasing was mentioned by three kitchen managers who started purchasing commercial IDDSI-compliant meals. Although higher priced, commercial meals offer guaranteed texture and consistency whilst saving staff cooking time. These advantages were deemed to outweigh the price difference between freshly made and commercial meals. Two managers discussed the consumption of commercially fortified meals and clinical gains in nutrition and wound healing, reductions in hospital admissions and cost savings for purchasing additional supplements.

Outer Setting

Despite IDDSI being endorsed by the New Zealand Speech-language Therapists' Association and the Dietitians Association, there was a lack of mandatory performance measurement or evaluation. Whilst it was incorporated into the New Zealand Dietitian Menu Audit Tool, this was not mandated. Except for external policy and incentives, the other three

Table 1 Consolidated framework for implementation research (CFIR) construct rating of participating aged-care facilities

		SITE 1	SITE 2	SITE 3	SITE 4	SITE 5
Intervention characteristics						
1.1	Intervention source	+2	+2	+2	+2	+2
1.2	Evidence strength & quality	−2	−2	−2	−2	−2
1.3	Relative advantage	−2	+2	+1	+2	+2
1.4	Adaptability	+1	+1	+1	−2	+1
1.5	Trialability	NA	+2	+2	NA	+2
1.6	Complexity	+1	−1	−1	−1	0
1.7	Design quality and packaging	+2	+2	+2	+2	+2
1.8	Cost	0	−1	−2	−2	0
Outer setting						
2.1	Patient needs & resources	−1	+2	+2	+2	+2
2.2	Cosmopolitanism	+1	+1	+1	+1	+1
2.3	Peer pressure	+1	+1	+1	+2	+1
2.4	External policy & incentives	−1	−1	−1	−1	−1
Inner setting						
3.1	Structural characteristics	−1	+2	+2	−2	+1
3.2	Networks & communications	−1	+1	+1	−2	−1
3.3	Culture	−1	+1	+2	−1	+1
3.4	Implementation climate					
3.4.1	Tension for change	−2	NA	NA	+2	+2
3.4.2	Compatibility	−1	−1	−1	+2	+2
3.4.3	Relative priority	NA	NA	NA	+2	NA
3.4.4	Organizational incentives & rewards	0	0	0	0	0
3.4.5	Goals and feedback	−1	+1	+1	+2	+1
3.4.6	Learning climate	+1	+2	+1	+1	+1
3.5	Readiness for implementation					
3.5.1	Leadership engagement	−1	+2	+2	+1	+2
3.5.2	Available resources	0	+1	+1	−2	+1
3.5.3	Access to knowledge and information	+1	+2	+1	+1	+1
Characteristics of individuals						
4.1	Knowledge & beliefs about the intervention	−1	+2	+2	+1	+1
4.2	Self-efficacy	+2	+2	+2	+2	+2
4.3	Individual stage of change	NA	NA	NA	NA	NA
4.4	Individual identification with organization	+1	+1	+1	0	+1
Process						
5.1	Planning	0	0	0	−1	−1
5.2	Opinion leaders	−2	−2	−2	−2	−2
5.2.1	Formally appointed internal implementation leaders	−2	−2	−2	+1	−2
5.2.2	Champions	−2	−2	−2	−2	−2
5.2.3	External change agents	−2	+2	+2	−2	+2
5.2.4	Key stakeholders	−1	−1	−1	−2	−1
5.2.5	Patients/customers	NA	NA	NA	NA	NA
5.3	Executing	NA	NA	NA	NA	NA
5.4	Reflecting & evaluating	−1	−1	−1	−1	−1

Identified constructs from each interview were then rated for strength for each of the facilities using CFIR rating rules recommended by Damschroder & Lowery (2013) (2 = strong, 1 = weak, 0 = neutral). Positive (+) influence was considered as enablers, and negative (−) influence was considered as barrier of the implementation

NA not applicable

constructs in the outer setting domain all had a favourable impact on implementation.

Both managers and staff acknowledged that IDDSI aims to enhance patient safety, which led to the motivation in IDDSI implementation. Choking incidents were mentioned by clinical managers at all sites except Site 1 which only had rest home level of residents. Managers indicated the inconsistency they observed in freshly made TMD and powder-mixed thickened fluids before IDDSI was implemented. Sites that purchased commercial IDDSI-compliant meals found they were able to accommodate resident needs better with more suitable food options. Upgrading resident dining experience was another incentive for ACFs to implement IDDSI*: 'we want to make sure that everyone … engaging dining experience.'; 'we just started a new quality goal for this year. And one of them is foodservice, including texture modification and flavours and things like that.'* Site 3 manager and Site 5 clinical manager. On the other hand, managers in the smallest site were not enthused about the changes when only a few residents needed pureed diets due to the poor dentition. Therefore, the perception of patient needs and resources was only a positive impact on medium to larger sites. Cosmopolitanism and peer pressure acted as positive influencers to all sites. IDDSI implementation was considered a recommended project in healthcare. They all indicated having communicated with other clinicians or organizations during the initial implementation. Hospitals and commercial companies had all moved to use the IDDSI framework.

Inner Setting

Structural characteristics and readiness for implementation constructs acted as positive factors to implementation outcomes. All sites reported a well-established foodservice and nutrition policy, including menu review by dietitians and individualizing ethnic food by preferences. Two types of foodservice systems were observed as described in Additional file 3. IDDSI labels were only used at Site 2. The kitchen manager and chefs with advanced experience working in ACFs and producing TMD demonstrated a better understanding of the need to improve TMD and comply with IDDSI. Surveys indicated that half of the staff had 1–5 years of work experience and a third had < 1 year of experience (Additional file 4).

Leadership engagement had a strong positive influence in three sites. Managers at some were highly engaged in monitoring performance, delivering training and actively seeking necessary input, whereas some leaders had conflicting opinions regarding the priority of the project. Having available resources and access to knowledge and information also contributed to the positive effect of readiness for implementation. Although IDDSI offered adequate online-learning material, no sites received additional resources to facilitate implementation, such as extra staff, space or funds. Those sites that switched to commercial TMDs reported significant space and time savings. In contrast, due to IDDSI's stricter criteria, Site 4 stated that a shortage of kitchen staff and equipment hindered their capacity to supply all levels of TMDs.

Managers mentioned staff need more training to reinforce the knowledge, in particular, for new staff. IDDSI framework posters were displayed in Site 2 and 4. All sites received IDDSI training from dietitians and commercial company support staff. However, of 84 staff surveyed, only 25% ($n = 21$) were aware of IDDSI. A limited knowledge level of IDDSI was found in all sites, with only 12% ($n = 10$) able to match the terminologies with the correct number and colour coding. Of the staff who reported being aware of IDDSI implementation, Site 2 and 4 had 75% of staff ($n = 3/4$) and 45% ($n = 5/11$), respectively, felt they received sufficient information to understand IDDSI (Additional file 3).

There were distinguishing differences in networks and communications between sites. One site reported a close working relationship between dietitians, kitchen and clinical staff, whereas two sites implied a need to improve communication between staff and dietitians: '*it's a good relationship between clinical staff and kitchen, but there's a lot of work in progress.* Site 4 clinical managers. The fact that none of the sites assembled an interdisciplinary project team was regarded as a hurdle. Meanwhile, rather than having a team coordinator on-site, the majority of the locations relied on an off-site dietitian to act as the implementation coordinator. All sites used online systems or electronic documents regarding dietary requirements. Clinical and kitchen managers were in charge of documenting. However, limited staff had access to up-to-date information. Foodservice preferred using paper format displaying the updated dietary requirements, and verbally delivered to healthcare assistants at the mealtime. A lack of input from speech pathology was indicated at all sites: *'because if the resident is not high in the priority with the healthcare service, then it is a matter of between 6 weeks and 3 months, or even longer, the waiting period.'* Site 4 clinical manager. The private funding system means that facilities have access to 'free' community speech pathologists for one-off resident referrals only, but they are obligated to pay for education or training needs.

The culture construct was evaluated from interviews, surveys and direct observations. All sites had a friendly but intense working environment. Most of the managers implied they have adequate staff producing meals and assisting residents. Routine staff were familiar with resident dietary preferences and were able to accommodate cultural requirements. Managers were satisfied with staff performance and valued good quality of nutritional care and safety for the residents. A mix of positive and negative comments about

TMD was received. Staff were asked to rate their satisfaction with TMD provided in the facility (Fig. 1). Site 2 and 4 had lower satisfaction ratings compared to other sites (average below 4 out of 5).

There were a few implementation climate constructs that were not applied to Sites 2 and 3 where the implementation was provided by their central office. They did not have time to ponder the necessity at the time. However, choking incidents were brought up by two sites.

In two sites, concerns for resident safety empowered tension for change: *'I doubt (the current thickener gives the right consistency) because in the previous facility we used liquid water, the pump. And that was such a quality improvement. It was consistent and the taste was good, there are no lumps. I would really like us to start using that here as well.'* Site 5 clinical manager. The need for change was not felt to be urgent in small organization site: '*we are not there yet, maybe we need it more when we move to a bigger site and having more patients [on TMDs].'* Site 1 clinical manager.

Compatibility was rated as a strong influencer for Site 4 and 5 because they both had IDDSI quality improvement projects in progress. IDDSI was compatible with all sites goals of quality improvement and resident safety; however, IDDSI terms were incompatible with medical software from an Australian business that some sites were using, which still utilized Australian terms for TMDs. Staff could only select from the options presented on the software and the resulting confusion was a negative contributor to compatibility.

The relative priority construct was only rated for Site 4, which was a self-directed implementation project. Other sites were led as a mandated project by the main office. As a result, none of the sites offered any incentives or prizes; all sites were rated as neutral in terms of organizational incentives and rewards.

Except for site 1, which was rated negative in goals and feedback, all sites had some form of monitoring in place. Site 2 and 3 monitored the terminologies used and managers would correct staff when they used the wrong name. Both Site 4 and 5 started ongoing TMD auditing using IDDSI audit sheets. Site 4 had monthly TMD testing sessions and collected staff feedback on the texture and taste of the food, staff would also point out and send back the inappropriate TMD to the kitchen when noticed.

There were no potential risks related to the learning climate. All sites had a positive rating as a result of the collaborative working climate. Managers indicated chefs and kitchen managers as key players. Clinical staff reported they were able to communicate efficiently with the kitchen managers with the exception of Site 2, where 18–25% of the clinical staff (nurses and healthcare assistants) surveyed had limited involvement with TMDs, which could lead to a negative perception of them being less motivated and involved in the changes.

Characteristics of Individuals

Results from this domain were interpreted indirectly from staff self-reported surveys as we did not directly assess individual attitudes at the time of implementation. We were unable to assess individual staff belief in their ability to succeed in IDDSI practice or staff readiness for change. As a result, the individual stage of change construct was inapplicable. The other three constructs: knowledge and beliefs about the intervention, self-efficacy and individual identification with organization were all considered as positive influences towards the implementation.

Managers had mixed beliefs and understanding of the importance and implication of IDDSI mainly due to their background and job responsibility. Fifty-three percent

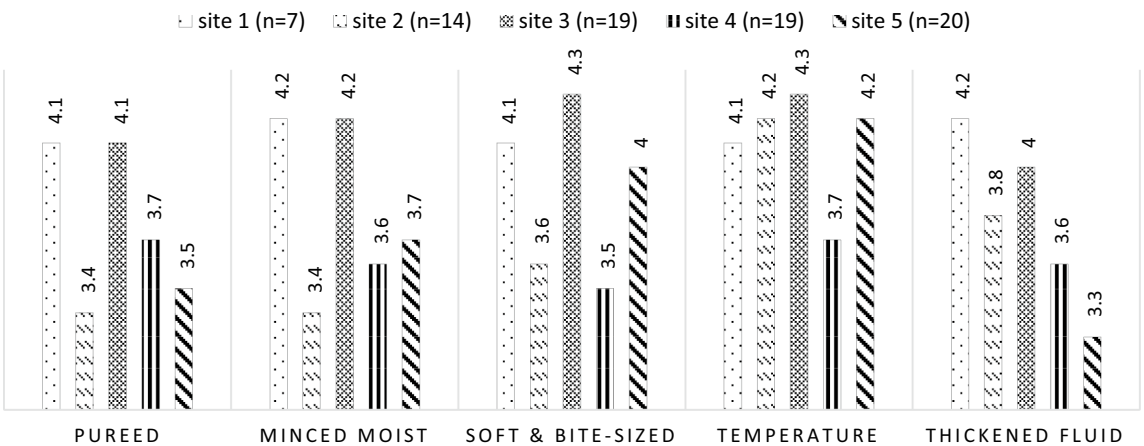

Fig. 1 Average satisfaction rating of texture-modified food and thickened fluid by aged-care staff from five sites (1 = not satisfied; 5 = highly satisfied)

($n=8$) of managers considered meals had improved since IDDSI roll-out, 27% ($n=4$) expressed few changes were seen, and the other 20% ($n=3$) indicated that TMDs still required improvements at their site. Despite the agreement on improving clinical safety, some managers pointed out the confusion staff had regarding the reason for implementing IDDSI: '*make sure that everybody understands the differences between the different textures and the reasons why someone might be on them and the risks of what could happen if they don't deliver alright'* Site 5 clinical manager. Site 1 manager indicated the relevance of IDDSI was insignificant to their site considering their limited use of TMD. Nonetheless, all managers expressed a high confidence level in staff performance and knowledge development in the future training (rated from 8 to 10 out of 10) and were satisfied with staff performance.

Staff demonstrated positive attitudes towards learning IDDSI; 94% ($n=79$) wished to receive more information. Workshops ($n=43$), training courses ($n=38$) online resources ($n=33$), seminars ($n=30$) and hard copy handouts ($n=25$) were the most popular choices of learning. Site 1 showed a poor response rate as evidenced by only 29% of staff ($n=2/7$) completing all sections of the survey. Most staff showed positive beliefs of IDDSI with only 18% reporting IDDSI hard to understand and comply with (Table 2).

Four sites said that having a dietitian who could assist them comprehend and address problems regularly made them feel supported: *'the dietitian comes in every month, we're in touch almost every 2 weeks … she came to train us for the moulding part twice, which was going on pretty smoothly'* Site 2 kitchen manager. Managers demonstrated strong existing relationships: '*the dietitian comes here often and makes sure things are working well'* Site 3 manager.

Process

Missing an organized structural plan was rated as a barrier in two sites. Although four sites received the plan from their headquarters, it was not tailored to each of them. There was no comprehensive plan encompassing pre-implementation gap analysis. Internal training was given for all sites at the time of implementation but without follow-up. The other site rolled out the implementation by an allied health coordinator. Site 5 indicted that the roll-out could have been better developed.

The absence of influential opinion leaders, formally appointed internal implementation leaders and champions were considered as major barriers for all sites. None of the leaders had a working team engaging in the implementation. Only site 4 had a formally appointed internal leader to lead the implementation: '*she has a project called 'Dining with dignity. She came into IDDSI and we worked alongside the kitchen, then we've invited a dietitian. Then she reviewed the meals that we serve and what should the texture be. She did some education training'* Site 4 clinical manager.

Three sites gained compelling support from commercial companies, which offered resources and staff training. The introduction of IDDSI-compliant products (thickener and TMD) resulted in a reported improvement in service quality. Therefore, external change agents brought strong positive influence to the implementation outcomes.

The absence of key stakeholder involvement, as well as the lack of reflection and evaluation, both had a negative impact on implementation. One of the significant changes of IDDSI was the detailed instructions on TMD preparation and testing. Food particle size, consistency, and texture should be tested for each level of TMDs. Only kitchen managers received information on TMD preparation and testing. Other kitchen staff and clinical staff had minimal involvement and were lacking awareness of IDDSI evidenced by the unsatisfactory IDDSI knowledge level from the surveys (Additional file 4), inconsistent use of IDDSI terminologies from observations and inaccurate terminologies used by managers in interviews. Every site held regular team meetings, but none of them mandated IDDSI on the agenda. All sites lacked an evaluation. Participation in this study was voluntarily and sites were willing to receive formal feedback and reinforce implementation. A positive attitude was shown towards evaluation and improvement. Because the residents were not involved in the implementation and the absence of precise planning, the intervention participants and executing constructs were inapplicable.

Table 2 Staff attitude towards IDDSI framework ($n=33$, staff survey)

Staff attitude	Percentage of participants (n)
Improve food safety	91% (30)
Improve the quality of care	76% (25)
Enhance staff practice	45% (15)
Easy to put into practice	30% (10)
Enhance team communication	24% (8)
Hard to understand and comply with	18% (6)

Discussion

This study identified barriers and enablers to the implementation of IDDSI in New Zealand ACFs using CFIR. All five ACFs (54 to 153 beds) had adopted IDDSI, yet only one site delivered the information efficiently to staff. Similarly to previous New Zealand research, 27% of residents were prescribed TMDs [4]. IDDSI terminologies and testing methods were not widely used by staff. Both managers and

staff showed a willingness for further assistance to succeed in IDDSI implementation. Our study categorized the significant influencers to success under four main CFIR domains of barriers and enablers and then provided sites with a tailored intervention to facilitate the IDDSI implementation.

Barriers to Implementation

Tailored Material, Delivery and Planning

Although IDDSI is being adopted globally, it is still a recent change. Not all ACF staff were aware of the IDDSI online resources which may have limited their perception of the strength of evidence and motivation to comply. Jukes et al. assessed the use of Australian TMD standards and found a lack of knowledge about the implementing standards by ACFs and reported staff as a common barrier and therefore, an introduction of the standards is necessary to help staff to understand [11]. More than half of the staff recognized IDDSI but indicated receiving unsatisfactory learning resources. For sustainable implementation and the best uptake of guidelines, structural strategies focusing on the improvement of knowledge and attitudes should be used [19, 20]. None of the facilities conducted a local needs assessment nor had a formal implementation plan in place. Powell et al.'s review highlighted a planning process has been successfully used in implementing clinical innovations [21]. Given the heterogeneities amongst facility settings and culture, such as operational structure and staff experience, tailored implementation strategies are warranted corresponding to individual ACFs' contexts.

Strategies to Attract and Involve Staff

Staff motivation for the change was a significant influencer in moving forward with new guidelines. A previous study investigating 50 ACFs identified insufficient foodservice staff training as a significant issue leading to compromised nutrition [22]. Our study corroborates this finding with TMD training non-compulsory for staff, therefore, limiting IDDSI awareness. Cabana et al.'s review found lack of awareness and familiarities were significant barriers to physician adherence in clinical guidelines [23]. It is important to engage the key personnel who play an important role in food and feeding. Translation of the guidelines into practical demonstration is crucial to actively engage staff-learning interests, in particular healthcare assistants and foodservice staff. Educational posters and pocket guidelines are ideal reminders, which would increase staff familiarity and awareness.

Interactive engagement showed success in IDDSI implementation in the Kempen Pilot [12]. Rule's study confirmed both self-learning alone and with hands-on practice of IDDSI testing methods improved the effectiveness of individual's learning outcomes [14]. Practical evidence-based training is recommended for foodservice and clinical staff. A successful education programme is a key contributor to enhance the awareness of safety and nutrition risks [24]. Aligning with the training, rewards and incentives could motivate staff enthusiasm and behaviour change [25]. Non-financial incentives from the facilities can be used as recognition and modelling, such as staff performance reviews and champion nomination.

Opinion Leaders and Professional Input

Dietitians and speech pathologists play important roles in IDDSI knowledge translation. Lacking opinion leaders during the implementation was considered a significant barrier. Dietitians or speech pathologists may act as educational initiative opinion leaders to promote active learning [26]. An expert review confirmed the needs for multidisciplinary collaboration in dysphagia management [27]. Whilst ACFs had access to dietitians and speech pathologists, this was often a private service or referral based rather than having staff on-site. Previous research suggests that speech pathologist-prescribed TMD guidelines in ACFs were more likely to be adhered by healthcare assistants compared to providing 1:1 support for individual residents [20]. In Kempen Pilot, both foodservice and clinical staff improved awareness of their role in TMDs provision through multidisciplinary collaboration and speech pathology-initiated training series [12].

Reflections and Evaluations

Reflections and evaluation were limited in our study. Previous work has demonstrated that when reflection and evaluation are more structured through regular meetings, implementation is more successful [18]. Audit and feedback are effective quality management strategies that have been used in implementing clinical innovations [19, 21]. Team meetings should include goal-sharing, feedback of training and any changes arisen during implementation. Our early work similarly found that texture and consistency of TMDs were insufficiently audited [28]. Assessment of the adherence to IDDSI guidelines is suggested as a measurement for the effectiveness of education [14]. Menu audits, including IDDSI compliance, as well as staff performance and knowledge-level assessments are recommended on regular basis.

Enablers of Implementation

Established Evidence and Accessibility of the Resources

IDDSI is well recognized globally and has been launched in over thirty countries. Implementation in each country is supported by the dietetic and speech-language pathologist

associations. With this international-level endorsement, our study mirrors findings overseas, with management all valuing IDDSI and a willingness to implement and educate their staff [11, 23]. Positive understanding and agreement of the guideline act as an enabler in implementation. Although there are adequate online resources on the IDDSI website that can be accessed, implementation using electronic resources remains challenging due to the lack of technological infrastructure and motivation [29]. Having dedicated resources available for implementation is positively associated with effectiveness, such as training, kitchen space, recipes and commercial TMD [15, 29]. Evidence supports that the provision of accessible resources facilitates the implementation of guidelines, in particular printed, portable and centrally located resources [29, 30]. Tailored resources will assist the staff to understand the guideline recommendations within a local context [29, 31].

Team Leader Engagement and Self-efficacy

Managers were committed to enhanced patient care. This finding is supported by Jukes et al. with supportive management and senior staff promoting the implementation of a TMD guideline [11]. Managers were confident in staff performance and learning abilities. Matwiejczyk et al. found foodservice staff with confidence and a positive belief in their ability showed improvements after an education programme [32]. ACFs with a supportive culture reassure staff confidence and motivation in learning and acceptance of new guidelines. Active leadership engagement and a positive view of self-efficacy both contribute to implementation success [15, 33].

Network and Communications

Regardless of the structural heterogeneities amongst the facilities, staff agreed on the importance of communication between the clinical team and the kitchen. Although Austbø Holteng et al. argued healthcare assistants expressed a lack of communication with foodservice staff, our study observed consistent communication and mealtime coordination [34]. Foodservice staff and nurses were more confident with the presence of in-house dietitians, which allowed them to communicate resident dietary changes efficiently. Casual staff without information of IDDSI have shown poor consistency in terminologies and therefore weakened communication amongst facilities [35]. Having a stable team and appropriate communication channels across the organization is important to effective implementation.

External Support

Supportive external change agents (commercial companies) had a significant impact on facilitating the implementation. Staff received the opportunity of interactive learning and were fond of the TMD tasting and moulding demonstrations. Companies used up-to-date IDDSI terminologies and labels on their products, which stimulated the learning process of new guidelines. Although external change agents may act as catalysts when introducing additional resources to facilitate the implementation, they have less understanding of the organization culture and commercial goals may match organizational needs [15]. It is important to balance the involvement of external change agents and maintain a long-term supportive relationship to boost implementation sustainability.

In 2020, the IDDSI working group received New Zealand Qualification Authority (NZQA) approval for a micro-credential in IDDSI for chefs. The micro-credential involves an e-learning interactive training package followed by a hands-on competency certification assessment. This will launch in early 2021 and further adds to the external resources available to foodservice. The IDDSI committee also offers implementation guidelines for various healthcare settings, including healthcare providers, foodservice and commercial businesses.

Limitations

Voluntarily participated ACFs and staff may be more motivated in quality improvement and have more interest in nutritional care. This study only included urban ACFs that had implemented IDDSI, therefore the findings may not be generalized to all organizations. We aimed to capture responses from both clinical and foodservice staff; however, response rates varied across facilities. Staff numbers were uneven due to the staffing arrangements and professional requirements. We used a semi-structured interview with a more flexible question sequence and numerous prompts; nonetheless, responses still rely on participant subjectivity and memory. Although data were coded and rated independently by two authors to minimize bias. Future studies should consider incorporating CFIR with objective measurement.

Due to the fast-paced working environment in ACFs, staff were unable to complete the surveys at the same time under supervision. Staff were asked *not* to look up answers but to show their true knowledge in order to support the researchers to design a workshop specific to their needs. Staff demonstrated limited awareness of IDDSI resources suggesting that staff did not look up answers. Additional evidence of reliability is found in the consistency of interview and survey

data. Survey results were not shared with management and there was little incentive to have the 'correct' answers.

Conclusion

This is the first study to evaluate the enablers and barriers to implementation of IDDSI in ACFs using a consolidated framework. Staff awareness and compliance with IDDSI are not optimal after the initial implementation. Barriers and enablers identified from this study should be used to improve future implementation effectiveness and sustainability. Practical training incorporated with printed resources should be recommended as part of the implementation. Clinical experts, such as speech pathologists and dietitians, should be involved in planning, delivery, monitoring, and reflection. Although IDDSI learning resources are easy to access, team leaders should encourage staff to participate in continuing education in dysphagia and TMD production. Successful implementation of IDDSI and appropriate use of TMDs require multidisciplinary efforts. Tailored structural implementation strategies are required to achieve successful implementation of IDDSI and allow improvement of quality of care and patient safety.

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Declarations

Ethical Approval Ethic approval was received from the University of Auckland Ethics Committee. All study participants and facilities provided written consent agreeing to participate in interviews and verbal consent prior to the audio recording of interviews.

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