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'A Necessary Idea Given Our Current Climate': A Qualitative Study of Stakeholder Perspectives and Actions Required to Increase the Proportion of Plant to Animal Protein in Hospital Patient Menus

Garalynne Stiles[1] | Jorja Collins[2] | Kathryn Beck[1]

[1]Massey University, Albany Expressway (SH17), Albany, New Zealand | [2]Department of Nutrition, Dietetics and Food, Monash University, Notting Hill, Australia

Correspondence: Garalynne Stiles (g.stiles@massey.ac.nz)

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ABSTRACT

Introduction: Replacing dietary animal protein with plant protein reduces greenhouse gas emissions and improves human health. Hospital foodservices can support change, but require buy-in and collaboration between people across the system.

Methods: A qualitative descriptive study aimed to explore hospital patient menu content expert perspectives regarding increasing the proportion of plant to animal protein in hospital patient menus and outline actions required to do this. Semi-structured interviews were completed with hospital or foodservice contractor employees and data were analysed using a general inductive approach.

Results: Twenty-five of the 35 content experts interviewed supported increasing the proportion of plant to animal protein foods. All voiced concerns, including patients not eating meals, jeopardising protein intake and increasing malnutrition rates, and the prohibitive cost of plant-based protein foods. Participants described steps to change patient menus, including a cyclical design process. This entailed consultation with stakeholders, setting a target, choosing a strategy, developing a menu and recipes, finding food product, planning the system and operations, and checking it works. Most felt the best ways to increase the proportion of plant to animal protein were to swap ingredients in familiar recipes or replace entire menu items ($n = 21$), add plant-based options to the menu ($n = 25$), and move the position of plant-based meals on the menu ($n = 22$).

Conclusion: This study conceptualised a process for increasing the proportion of plant to animal protein in hospital patient menus for use by hospitals or policymakers. Future studies should test these suggested menu changes, assessing impacts on greenhouse gas emissions, plate waste, malnutrition indicators, cost and patient satisfaction.

1 | Introduction

The food system accounts for one-third of global greenhouse gas emissions (GHGE) [1] while also contributing to death from chronic disease [2]. One proposed solution is to reduce consumption of animal-based foods, which account for over half of GHGE from food production, including livestock feed [3]. Replacing dietary animal protein with plant protein has a positive impact on both GHGE [4] and human health by improving diet quality [5], and reducing risk of chronic disease [6] and premature death [7]. National nutrition guidelines increasingly emphasise plant-based protein [8], but global meat consumption

Summary

- Hospital patient menu content experts support plant protein, but worry about acceptance, malnutrition and cost.
- Most felt positive about replacing meat in recipes or entire menu items, adding and moving options.
- A trigger, design process, preparation and monitoring/evaluation are required to change menus.
- Hospitals or policy makers may use the process identified to enact change.

has continued to rise [9] while per capita legume consumption has decreased [10] below recommendations [11].

A coordinated approach across food system sectors is needed to facilitate dietary change [12]. Institutional foodservices, including hospitals, are ideal change agents because they have a wide reach to populations with limited alternatives, are governed by policy, and have significant influence on the food supply through their purchasing power [13, 14]. In addition, they are often explicitly aligned with community health missions [15] and can promote health, corporate social responsibility and cost savings with plant-based meals [16]. Healthcare menus and procurement have been suggested as appropriate intervention points for food system change [17] by setting targets for animal and plant-based foods offered [18]. The British Dietetic Association's One Blue Dot campaign [19], which recommends reducing animal proteins and increasing plant proteins for better health and sustainability, is suggested by the National Standard for Healthcare Food and Drink as a basis hospital patient menus (HPMs) [20]. Despite this support, controversy exists about the potential impact of reducing meat, eggs and dairy on the nutritional adequacy of patients' diets and the risk of malnutrition in hospitals [21, 22]. This is illustrated by a gap in both adoption and evaluation of strategies to increase the proportion of plant to animal protein sources in healthcare settings [23–26].

Menu re-design shifts the responsibility for increasing plant-based food intake from consumers to foodservices by altering food availability. A recent systematic review found consumers in education and workplace foodservices chose plant-based meals more often when menus were re-designed but found no studies in hospitals [26]. Menu re-design has been recommended for foodservice dietitians to improve menu sustainability [27]. Yet, barriers to healthy and sustainable foodservice initiatives in hospitals, including providing more vegan and vegetarian meals, such as limited staff knowledge and self-efficacy, unsupportive management [25] and dietitians prioritising health over sustainability [28].

Designing an HPM requires collaboration among people across the foodservice system, such as managers, dietitians, menu planners, purchasers, cooks, service staff and patients. Menu changes must be both accepted by patients and staff and practical for large-scale implementation. Complexities in hospital foodservice include various contract arrangements, production models (e.g., cook-fresh or cook-chill/freeze) and transportation logistics. Challenges of meat reduction initiatives in other large-scale settings include time, budget, palatability, managing leftovers [29] and difficulty developing tasty and satiating recipes [30]. Most research on sustainable nutrition has focused on dietitians, overlooking other content experts [28].

No research has explored perspectives of a broad range of HPM content experts specifically on protein sources. This study aimed to:

- Explore perspectives of content experts on increasing the proportion of plant to animal protein in HPMs.
- Outline actions required to increase the proportion of plant to animal protein in HPMs according to content experts.

2 | Methods

This qualitative descriptive study utilised semi-structured interviews, with pragmatism as the guiding philosophical ideology for design and decisions. Pragmatism is concerned with solving real-world problems by examining shared beliefs and focusing on outcomes of actions, while directing researchers to seek practical answers from diverse perspectives to address concrete problems [31] and present findings in a form applicable to practice [32]. Asking content experts with real-world lived experience in the area how to solve a problem in a general qualitative descriptive study design is one way to do this [32, 33].

Ethics approval was granted by the Massey University Human Ethics Committee: Northern, Application NOR 22/49. Consolidated criteria for reporting qualitative studies were used to guide reporting [34].

All researchers are female, qualified dietitians and work at universities. The primary researcher is completing a PhD and her professional experience includes 2 years in foodservice, 10 years as a clinical dietitian, and 5 years in academia. She had an existing relationship with some participants in her university role and some were previous students of hers. Participants were informed that she was studying for a PhD and a staff member in the Massey University dietetics training programme.

Purposive and snowball sampling were used to select content experts in hospital foodservice across New Zealand.

Content experts were required to have all the following characteristics:

- Employee of a hospital or hospital foodservice contractor within the last year;
- At least 6 months experience within the hospital foodservice system;
- Self-reporting they had influence on the HPM as part of their role.

For example, current employees with influence on the HPM but less than 6 months experience in hospital foodservice, past

employees with influence on the HPM who had left the organisation more than a year ago, and current long-term employees with no influence on the HPM were not eligible.

Participants were identified through personal relationships, LinkedIn and the Dietitians New Zealand website. They received an invitation email or a LinkedIn direct message including a request to forward the invitation to other interested parties. Efforts were made to ensure representation across the New Zealand hospital foodservice system, aiming for diversity in roles, location and contracting arrangements. The number of participants was guided by information power [35], which posits sample size will have sufficient information power when it fulfills the study aims. The estimated target was 20–30 participants, which was reviewed during recruitment and analysis. Participants were given a $30 supermarket or petrol voucher as compensation.

Interviews were conducted by the primary researcher online via Zoom, except for one participant who requested a phone interview. Written informed consent was obtained. The interview guide was pilot tested with an individual experienced in hospital foodservice (see Supporting Information S1: Supplement 1).

The first part of the interview guide asked participants' age, ethnicity, gender identity and their role and influence on the menu. If a participant was no longer working in hospital foodservice, their most recent relevant role was described.

The second part of the interview guide was based on participatory backcasting steps described by Manners et al. [36]. Backcasting offers a framework for medium to long-term planning that includes strategy development to attain desirable futures [37, 38] and sustainable futures [39], including one where plant proteins are produced at the expense of animal proteins [36]. Participants were asked what steps were required for HPMs in Aotearoa New Zealand to contain, on average, more plant-based protein foods (PBPF), including legumes and nuts and plant-based meat alternatives (PBMA), than animal-based protein foods (ABPF), including beef, lamb, pork, poultry, fish, eggs and dairy, by the year 2050. When describing preferred strategies, participants were prompted for their opinion on labelling, for example, Climate Friendly or Dish of the Day, moving PBPF options to the top of the menu, adding PBPF options, replacing some ABPF options with PBPF options, and weekly vegetarian days, for example, Meatless Monday.

Interviews were audio recorded and transcribed using Otter.ai [40]. A backup audio recording was made with a Phillips audio recorder and uploaded to Otter.ai in case the primary recording failed. The primary researcher then checked the transcription while listening to the audio recording to ensure accuracy. To help facilitate researcher reflexivity, field notes were taken using guides provided by Phillippi and Lauderdale [41].

Analysis was completed using a general inductive approach described by Thomas [42]. In line with a pragmatic stance, the analysis was designed to provide useful and practical information to assist future problem solving. Data were managed using NVivo software [43].

The primary researcher completed data cleaning and an initial close reading of the text. Two coders completed parallel coding for 10% of the data by each creating an independent set of categories, which were compared, discussed and re-developed as needed. Categories were derived from the data to address the study aims, that is, content expert perspectives and actions required to increase the proportion of plant to animal protein in HPMs. After the primary researcher coded the entire data set, a second coder completed a clarity check by assigning 5% of the raw text to the developed categories. Data were enumerated to identify what percentage of the sample spoke about each category. A list of preliminary themes was provided to participants for feedback within 10 days to support reflexivity, but no feedback was returned. Results were planned to be reported in detail to support change and align with pragmatism.

3 | Results

Thirty-five content experts were interviewed. Most participants identified as female ($n = 29$) of European ethnicity ($n = 33$) and were qualified dietitians ($n = 24$). A range of roles, hospital locations, types of employer and foodservice contract arrangements represented. Mean ± SD age was 43 ± 14 years ($n = 33$) and median ± IQR years of experience in hospital foodservice was 5 ± 18 years ($n = 33$; see Table 1).

Seventy categories were derived from the data and grouped according to the study aims: 20 perspectives and 50 actions. Categories were organised into themes and sub-themes. Perspective themes included personal opinion, barriers, and benefits. Action themes included a trigger for change, a cyclical design process, preparation, and monitoring and evaluation following implementation. Action themes, sub-themes and category definitions, including how each action would counter perceived barriers, and illustrating quotes are available in Supporting Information S1: Supplements 2 and 3. Action themes and sub-themes were organised to illustrate a process that outlines the steps needed for change (Figure 1).

3.1 | Personal Opinion

Most ($n = 25$) participants supported increasing the proportion of plant to animal protein foods in HPMs. Of these, seven had increased PBPFs in their own diets. Seven participants disagreed with the defined desirable future, expressing concerns that hospitals were not the right place to make changes, due to high risks of malnutrition. Those ($n = 3$) with neither a positive or negative opinion spoke objectively about their concerns and challenges to making change. Some participants shared a negative personal bias based on experience in the dairy industry ($n = 1$), disagreeing with the sustainability premise ($n = 1$) or disliking legumes ($n = 2$).

3.2 | Barriers

All participants voiced concern about increasing the proportion of plant to animal protein. Concerns mentioned most were that

TABLE 1 | Demographic characteristics of participants ($n = 35$).

Demographic characteristics	Response, *n* (%)
Age (years)	
20–29	7 (20)
30–39	6 (17)
40–49	9 (26)
50–59	6 (17)
60 and over	5 (14)
No response	2 (6)
Ethnicity[a]	
European	33 (94)
Māori	3 (9)
Chinese	2 (6)
Gender identity	
Female	29 (83)
Male	6 (17)
Role	
Foodservice dietitian	10 (29)
Foodservice manager	6 (17)
Dietetic professional lead	4 (11)
Chef or cook	4 (11)
Information technology	4 (11)
Manager (contracts)	4 (11)
Manager (other)	3 (9)
Location of role	
North Island— Auckland	6 (17)
North Island—other	14 (40)
South Island	10 (29)
National	5 (14)
Employer	
Public hospital	18 (51)
Private hospital	6 (17)
Foodservice contractor	11 (31)
Foodservice contract type[b]	
In-house	19 (54)
Contracted	18 (51)
Experience in hospital foodservice (years)	
0–4	16 (46)
5–9	5 (14)
10–14	1 (3)
15–19	2 (6)
20–24	4 (11)
25 and over	5 (14)
No response	2 (6)
Level of control over menu	
Primary	13 (37)
Partial	9 (26)
Consultation or feedback only	13 (37)

[a]Multiple ethnicities chosen by three participants.
[b]Multiple contract types chosen by two participants.

patients would not eat meals ($n = 32$); changing menus would have a negative impact on protein intake and malnutrition rates ($n = 30$); and cost of PBPF was too high to be feasible ($n = 25$). Other concerns included resistance from stakeholders, including kitchen staff, dietitians, ward staff and decision makers; resistance from either the hospital (or foodservice contractor for hospitals contracting their foodservices out-of-house); limitations in the current food production system (especially cook-chill) to produce palatable meals; meeting cultural food needs; limited resourcing, that is, money and labour; difficulty incorporating more PBPF in the current menu design; accommodating for special diets, such as low fibre, texture modified and allergen free; and unintended negative impacts on the environment.

3.3 | Benefits

Some participants identified benefits. Those mentioned most were an improvement in the nutrition profile of the menu and subsequent improvement to health ($n = 16$); lower cost of legumes compared to meat ($n = 10$); improvements in GHGEs ($n = 10$) and opportunity to use the menu as a tool to educate patients on healthy and sustainable diets ($n = 8$). Other benefits included the opportunity to improve the quality of current vegan offerings and offer more choices for certain cultural groups. Decreased food safety risk and higher shelf life of legumes compared to ABPF were also mentioned.

3.4 | Trigger

Participants spoke about triggers for hospitals changing to the defined desirable future. These could be waiting for change, making a case for change and/or being told to change.

Most ($n = 25$) thought if PBPF eating habits of the general population changed first before hospitals changed menus then the risk of plate waste and malnutrition could be avoided as PBPF would be familiar to patients. Some thought change was inevitable ($n = 18$) and by the year 2050, the general population would naturally be eating closer to the defined desirable future. Some participants had noticed change in recent years: 'Both the clients, businesses, patients are becoming more open to it.... by 2050, we're going to potentially see that change...we'll have a lot more plant-based meals available because patients will want them'. (P09) Others thought public health interventions (e.g., education programmes within and outside of schools,

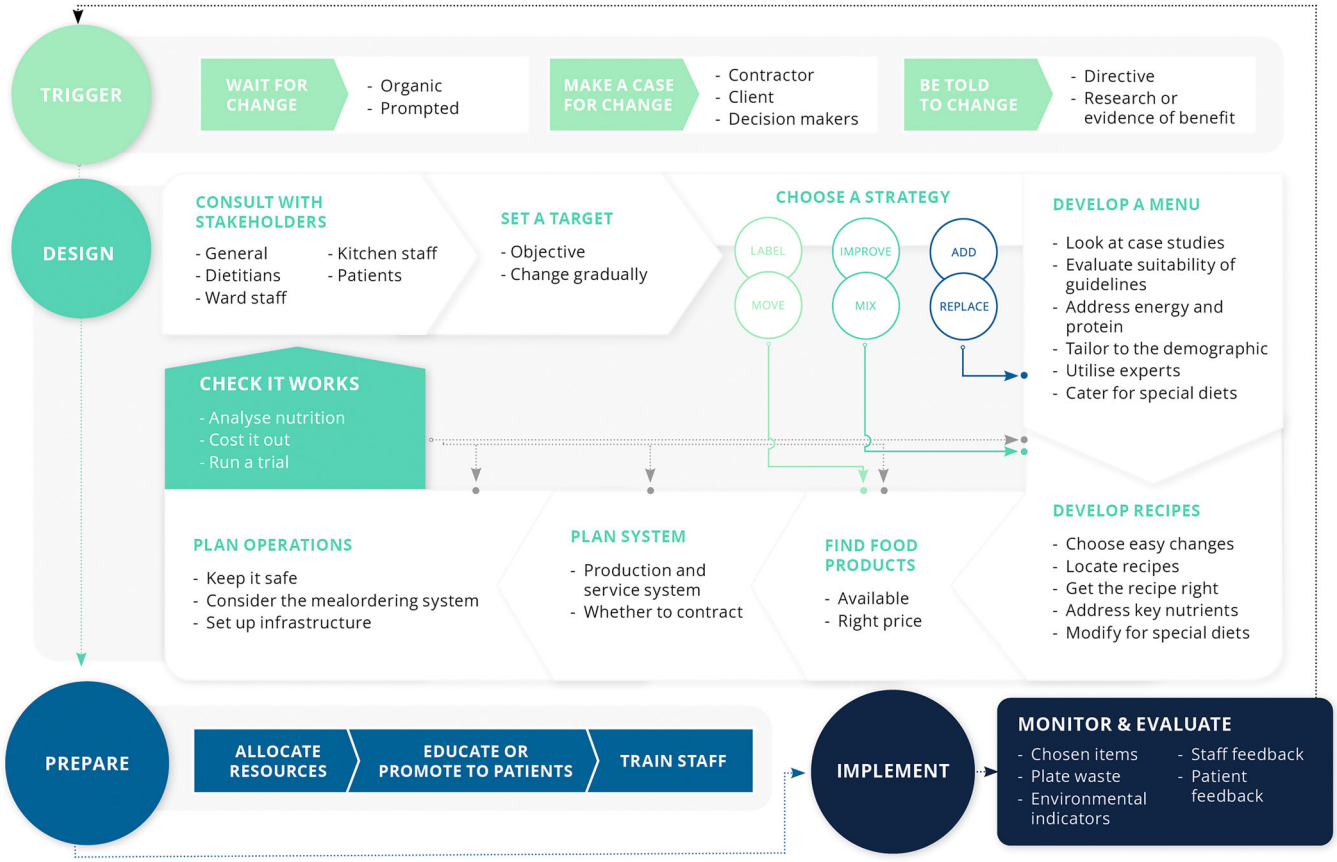

FIGURE 1 | Action required to increase the proportion of plant to animal protein in hospital patient menus according to stakeholders.

increasing PBPF in school menus, and encouragement from health professionals) were needed to prompt change in the general population and that these would have a larger impact on health and environmental outcomes than changing diets in a hospital setting ($n = 13$).

More than half the participants discussed making a case for change by targeting the contractor ($n = 5$), client ($n = 8$) or decision makers ($n = 14$). Those working for in-house food services discussed targeting decision makers, such as funders or managers within the organisation, by making a business case to show how increasing the proportion of plant to animal protein would contribute to the hospital's sustainability goals without compromising patient outcomes.

> *Our leadership...need to be buying in so probably there'd be a business case that outlines the health benefits and the financial benefits to the organisation...we also need to include the sustainable outcomes that we're trying to achieve and the benefits.*
>
> (P01)

Those working in contractor relationships felt the other party was instrumental in supporting change. Contractor employees said the contract itself required change, particularly specifications around nutrition, as the amount of protein required for patients was prohibitive. Contract and menu changes would require approval from dietitians representing client hospitals. Hospital employees felt menu possibilities were limited due to the cook-chill or cook-freeze production system their contractor used.

About a third of participants spoke about being told to change through receiving a directive ($n = 9$) or research supporting menu changes ($n = 5$). Many participants thought a directive from an authoritative entity, for example, government, or a contracted party requirement would encourage resource allocation towards change and 'make the avenue to change much easier'. (P26) Others thought change could be required by either the contractor or hospital. Some participants wanted a policy informed by academic research showing PBPFs do not negatively impact malnutrition and wound healing. However, they were unaware if this study existed or had ethical concerns around conducting such research.

3.5 | Design

Participants described designing change as cyclical: 'a continuous cycle of make a change, test the change, try out the change, evaluate it, and you would need to do that for every single thing you changed'. (P14). The process could start at several points, though consultation with stakeholders was often the starting point, followed by setting a target for what to achieve, choosing a strategy, developing a menu and recipes, finding food products, planning the system and operations, and checking it works. To assist the reader, these sub-themes have been separated below.

3.6 | Consult With Stakeholders

Most participants said stakeholders should be consulted ($n = 29$), one explaining 'it would make a difference if everybody would be on the boat'. (P28) Patient feedback on proposed changes was highlighted, including consultation and active involvement in the design process ($n = 21$). Dietitians were seen as powerful decision makers who should be involved in recipe development, nutrition guideline review and approving any proposed changes ($n = 14$). Ward staff, such as nurses, healthcare assistants and customer-facing foodservice staff were seen as responsible for explaining menu changes to patients ($n = 13$). Kitchen staff consultation could ensure engagement and provide ideas on the most effective change approaches, particularly new recipes ($n = 7$).

3.7 | Set a Target

Some participants ($n = 4$) felt the defined desirable future was too broad and preferred setting a change target by defining objectives. For instance, the number or percentage of menu items to contain PBPFs and no ABPF. Many ($n = 16$) recommended changes occur gradually 'adding in here and there or slowly replacing' (P32) to ensure patient acceptance and maintenance over time.

3.8 | Choose a Strategy

Change strategies were categorised as label, move, improve, mix, add and replace. Some participants discussed replacing ($n = 11$) and adding ($n = 9$) before being prompted and tended to compare the two. The next step depended on which strategy was chosen (see Figure 1).

More participants felt positive about replacing ABPF in a recipe (e.g., soy patty in a burger) or changing the recipe in a meal ($n = 21$) than replacing a whole day with vegetarian meals, for example, Meatless Mondays ($n = 8$). This was largely due to concerns about patient acceptance and plate waste if no ABPF choice was provided. Some participants volunteered that they already used legumes and nuts rather than dairy in vegetarian meals ($n = 10$). An argument voiced for more restrictive strategies (e.g., removing the meat option entirely) was they would achieve change more effectively.

> *If you offered a meat option and a legume-based option, I suspect most people would still pick the meat one. So, if you really wanted to shift to, to, you know, the kind of proportions you're talking about, I don't think you could offer both because I don't think you'd get there.*
>
> (P06)

Mixing legumes with meat, for example, lentils in beef bolognaise and chickpeas in chicken curry was suggested to increase the proportion without eliminating ABPF ($n = 10$). 'It would be a bit better accepted if the whole meal is something that they are familiar with. And then it's just a slight change rather than the whole meal being something completely different'. (P21). Most thought adding options would be better accepted by patients and result in less waste than replacing ($n = 25$).

> *Because we only have an average stay of two nights, the menu's not huge anyway. So, if I'm replacing when you've only got five, I'm not even sure I've got five meat options on there, it would actually be quite a big move for us. So, I think I'd probably go add, then seeing what meat dish was suffering for it and then remove that as opposed to just make a decision to remove one of the meat dishes in a replacement.*
>
> (P24)

The most common 'add' strategy volunteered was offering existing vegetarian or vegan menu items to all patients on the standard menu in addition to usual ABPF-based options ($n = 5$) and several said they were already doing this ($n = 12$). Alternatively, if adequate resources were available, the proportion could be increased by developing and adding new PBPF-based meals to the standard menu ($n = 4$). Climate-friendly labelling was seen as effective by a third of participants ($n = 11$). Those who did not like 'climate friendly' labelling described it as difficult to define and unlikely to be chosen because patients deprioritise climate change. 'Dish of the Day' was thought feasible in certain situations, for example, being the default menu item, in room service models, and with static menus ($n = 15$). Moving menu items with PBPFs already on the menu before ABPF-based items, either visually or verbally, was thought effective by two-thirds of participants ($n = 22$).

> *...actually, choosing the vegetarian or vegan option first and saying would you like the lentil and something like dhal with rice ....and they'll go no thanks, and they'll wait to see what the next thing...the chicken and something dish or the whatever the next dish is. So, it may be a case of ordering the priority or the ranking of the items on the menu system...So, the first option might always be offered as the plant-based option.*
>
> (P31)

'Improve' strategies suggested focused on making vegetarian dishes currently doing well on the menu more attractive and appealing to a wider audience ($n = 4$).

3.9 | Develop a Menu

Menu development actions were looking at case studies, evaluating suitability of current nutrition guidelines, addressing energy and protein content, tailoring menus to the demographic, utilising experts and catering for special diets. Some ($n = 5$) thought case studies and recipes from other hospitals would provide ideas on how to overcome obstacles. Several ($n = 9$) felt nutrition guidelines should be developed or changed, so that nutrient targets recipes and menus need to meet are achievable.

> *They may need to review those KPIs (key performance indicators) in settings and say 'Hey, okay, we're going to*

have to reduce the overall target for protein to be able to achieve this.' It might not be ideal in terms of...those tradeoffs, patient health and people's requirements in a hospital setting or is it you know, sustainability and overall impact.

(P20)

To address energy and protein, which may be lower in menus with more PBPF, some said snacks could be offered universally, irrespective of malnutrition risk ($n = 4$) or changes could target patient groups at lower risk of malnutrition ($n = 7$).

I think we, we've had sort of discussions about identifying those patients in hospitals...who are the malnourished or that risk of being malnourished, that sorta 60% compared to patients who are not in that group and having sort of like two hospital diets, one being a standard sort of diet and one being a high energy high protein so they wouldn't be have to be referred necessarily, but there'd be some way of knowing which that was. And if you had those two categories, you could probably experiment with far more (plant) based proteins in the standard group rather than the high energy high protein group.

(P12)

Some participants ($n = 4$) in contract relationships discussed tailoring menus to various demographics by allowing interchangeable options, for example, younger patients may prefer wraps and salads, typically seen as being easier to incorporate PBPF, and older patients may prefer hot ABPF-based meals. Several ($n = 6$) thought engaging culinary experts, for example, staff chefs, celebrity chefs and commercial meal kit companies, would improve acceptability of dishes, particularly when the menu planner's PBPF cooking knowledge is limited. A few ($n = 3$) said alternative menu items may be required to cater for special diets, for example, alternatives to legumes and nuts for low fibre or PBMA for low salt.

3.10 | Develop Recipes

Recipe development actions were choosing easy changes, locating recipes, getting the recipe right, addressing key nutrients and modifying for special diets. A few ($n = 3$) thought looking for easy changes would alleviate resource and expertise requirement, for example, substituting vegetarian sausage for traditional sausage in the same recipe. Locating recipes using PBPFs adapted for large-scale foodservice was highlighted ($n = 6$). Proposed sources included internet searches, food companies and kitchen staff.

...we've asked people like are there go-to recipes that you know of that are already good or do you already have some in the archives that someone's researched once upon a time or shoulder tap people in the food service that are already obviously vegan or vegetarian and they know really good recipes for things, then do the trial.

(P22)

Getting the recipe right minimises plate waste by having a palatable taste ($n = 12$), look ($n = 4$) and texture ($n = 3$) and being familiar to patients ($n = 13$).

Vegetarian versions of familiar foods...lentil spag bol versus spag bol. Like it's always something familiar, so people know what to expect, but if you suddenly presented them with lentil loaf, well, if you don't have a point of comparison, what's that going to be like?

(P22)

Some highlighted recipes should be scalable ($n = 5$) and reproducible with the available production system ($n = 5$). A high number of phase changes involved in cook-chill/freeze systems means using wet dishes, preparing separate items and combining at retherm, for example, sausage and sauce, and using legumes rather than tofu or PBMA works best. The key nutrient of most interest ($n = 34$) was protein, followed by iron ($n = 8$), zinc ($n = 5$), calcium ($n = 4$) and vitamin B_{12} ($n = 3$). Protein could be addressed by choosing high protein ingredients, for example, black bean patty instead of kumara rosti ($n = 3$), counting protein in the entire meal rather than only the 'main', for example, using peas or sweetcorn as a vegetable, ground nuts in sauce, legumes in baked desserts ($n = 3$), pea protein fortification ($n = 11$) and increasing portions ($n = 10$).

The volume of lentils you're going to need is going to be significantly more than you would get from chicken breasts. So, you can't give someone 400 grams of lentils as a meal, because they're not physically going to be able to eat that. So, it's looking at how you could develop those recipes and making sure you were, you're meeting those requirements.

(P20)

Though increasing portion sizes in hospitals was voiced as a solution to deliver more protein by several participants, there was concern unwell people with poor appetites may be unable to eat the portion sizes required. Mixed views were shared regarding fortification with pea protein. Those who discussed it, thought fortification necessary to meet protein requirements, also noting its cost effectiveness. However, they thought fortification was unlikely to reflect foods eaten at home. 'If we are cooking in our home kitchen, we don't fortifiy our products. So therefore, when you get that type of fortification on your plate, things the look and the texture of a product really changes'. (P25) Ethical and effectiveness concerns were raised if patients were unaware of fortification in sauces, for example, unwell patients may pick out lumps and discard sauce.

If you could look at fortifying meals with things like pea proteins...that could help bring the cost down. I think supplementation and fortification of meals would have to be something that would be looked at quite seriously ...It would be from a cost saving point of view, they wouldn't be wrong about that, but it would be for a set benefit.

(P20)

Participants discussed modifying recipes for soy or nut free ($n = 5$) and texture-modified special diets ($n = 8$) because many PBPFs would not be suitable. Suggestions for recipes included purchasing and serving allergen-containing foods individually wrapped to minimise allergen cross-contamination, using ground nuts or nut butters to achieve the correct modified texture, and using 3D printing to improve presentation of texture-modified foods.

3.11 | Find Food Products

Products need to be available in the range and quantity required by a large-scale foodservice ($n = 23$) and affordable ($n = 18$). In contrast to legumes and nuts, only a small range of PBMAs, for example, burgers, sausages, are available from large-scale suppliers. Participants noted, while legumes cost less, PBMAs may be preferred by patients and contain more protein relative to weight.

> *I think the price would have to come down quite a long way for us to be encouraged to buy a plant-based protein. At the moment, with it being a lot more expensive, generally than your cheaper cuts of meat or even your mince, it's just not, it wouldn't be viable as a product. I don't know if you get the same amount of protein in a plant-based product as you do in a meat-based product. Because if you don't, you've got to give a bigger portion. So therefore, it's going to cost you even more to get that minimum protein within that portion.*
>
> (P16)

In contrast to ABPF, PBMAs contain multiple ingredients, including allergens, for example, soy. To simplify menu planning, participants said PBMA products would ideally contain few ingredients 'because the more ingredients we have, the less versatile recipes are'. (P23). Participants noted supply shortage issues in recent years. Purchasing from local companies could mitigate risk but many thought local production for PBMA products had not upscaled adequately to cope with volume demands of hospital foodservice. Most raw legumes and nuts are not grown locally and importing products increases risk of shortage due to more steps in the supply chain.

3.12 | Plan System

System planning actions were considering change to the existing production and service system ($n = 16$), and whether to use a contracted foodservice or operate in-house ($n = 9$). Participants thought a cook-fresh production system would accommodate foods amenable to PBPF, for example, salads, wraps and burgers that are typically unavailable with cook-chill/freeze production systems. Participants who had trialled PBMAs in cook-chill/freeze systems said products deteriorated and the resulting dish was unpalatable.

> *Currently most of our plant-based options are not through the cook chill method and I think that's because they don't, they may not cope as well with that life...if that cook-chill method wasn't the best method to preserve the sensory characteristics, then you might need to look at changing that model.*
>
> (P03)

Legumes can work well in cook-chill/freeze systems, but participants experienced with those dishes said it was difficult to get visual variety in the final dishes due to the need for dishes to be wet. Participants who had experience with a room service model felt it was easy to make changes without dissatisfying patients because of the large number of items on the menu. Compared to a contracted operation, participants felt an in-house operation may be more open to change due to a focus on patient care, smaller supply requirements and 'a lot more freedom to change our menu.' (P32) However, participants said being part of a multi-site contract provides access to centralised resources, which can support a higher quality menu and recipe development, and reduced product costs because 'as a national contractor...we have more buying power'. (P25)

3.13 | Plan Operation

Operation planning actions discussed were keeping food safe ($n = 10$), setting up infrastructure ($n = 11$), and considering the meal ordering system ($n = 4$). Nuts are a common food allergen and, if incorporated into more recipes, management strategies to minimise cross contamination may need to increase. Some participants preferred to focus on legumes, whereas others suggested storage practices to minimise cross-contamination.

> *I quite like weigh-up areas and you weigh them out last and you do your big clean after that. And I'm used to allergens like almonds as an example and almond flour being locked in actually a nut box literally, which would be color coded red, and we'd have people do it at the end of the working day.*
>
> (P17)

More storage or different equipment may be needed (e.g., tinned legumes require dry storage and meat requires cold storage), production scheduling may need to change (e.g., dried legumes require soaking before cooking) and specialised equipment (e.g., pressure cooker) may be needed to expedite the process. Electronic menu ordering systems provide good allergen control by disallowing allergen-containing items to be offered to allergic individuals. Electronic self-select systems provide the opportunity to label or highlight PBPF. Some who used a spoken system said patients may only be offered the first couple options and thought a self-select system may prompt patients to choose from a wider variety.

3.14 | Check It Works

Actions to check the change will work were conducting a nutrition analysis to ensure guidelines are met ($n = 13$), costing it out to ensure the change fits within the budget ($n = 5$), and running a trial with either patients or staff ($n = 17$) with 'lots of

recipe testing and development and checking consumer acceptance...because if they're not eating it, it's a complete waste of money'. (P12)

3.15 | Prepare

Participants thought food budgets should increase to purchase nuts, tofu and PBMA ($n = 17$). If the change included an increased workload or a change in the production or service system, further staff resourcing may also be allocated ($n = 19$). Participants felt patient acceptance would be increased if they were informed about menu changes through education or promotion ($n = 12$), for example, tastings. Staff training was highlighted by most participants ($n = 20$). Suggested training topics for foodservice staff included how to cook new recipes for cooks, portioning for tray line or service staff, and allergen management for all kitchen staff. Training for ward staff or foodservice staff with direct patient contact may have a stronger focus on rationale for changes because 'it would be the nurses that would field the questions from the patients'. (P30)

3.16 | Monitor and Evaluate

Monitoring and evaluation were thought to be critical to determine effectiveness of implemented change and included quantitative measures, for example, number of PBPF menu items chosen by or delivered to patients ($n = 3$), plate waste ($n = 7$), environmental indicators ($n = 3$) and qualitative measures, for example, staff ($n = 2$) or patient feedback in satisfaction surveys and complaints ($n = 21$). As one participant put it, 'It's all good and well sending food out but there's no nutrition in food that's not eaten'. (P14)

4 | Discussion

This was the first study to explore perspectives of a range of HPM content experts on protein sources and actions required to increase the proportion of plant to animal protein on HPMs as part of a broader goal to mitigate the food system's contribution to climate change. Most supported increasing the proportion of plant to animal protein foods and identified actions as a trigger for change, a cyclical design process, preparation, and monitoring and evaluation following implementation.

Malnutrition resulting from inadequate energy and protein intake was a primary concern associated with serving more PBPF and less ABPF. Theoretically, there is a risk of increasing malnutrition because plant protein sources are less anabolic than animal protein sources [44], have been associated with reduced lean muscle mass in middle aged and older adults [45] and eating the required larger volumes would be difficult for those already prone to poor appetite and intake. For example, Nutrition Standards for Adult Inpatients in New South Wales Hospitals (Australia) stipulate at least one main dish per day is either solid meat, for example, roasts or fish, or contains at least 15–20 g of protein within a 120 g portion size [46], which would require 200 g of most legumes [47] and 120–200 g of most PBMA [48] without additional protein fortification, for example, pea protein in sauces.

While re-designed menus and recipes could provide adequate protein using PBMA and/or fortification, the greatest risk to malnutrition is not nutrient content of the meals, but food waste (patients not eating the food because they don't like it). Patient consultation, tailoring menus to the demographic, utilising culinary experts and running trials, for example, taste testing are therefore essential to the design process. Participants were concerned serving more PBPF would increase plate waste. Hospitals already experience high levels of plate waste (around one-third of food served [49]) and it is unclear this would increase if more PBPF were served. There is opportunity for research to evaluate the impact of diets with a higher proportion of PBPF on plate waste and malnutrition indicators, for example, muscle mass, in acutely unwell patients. Measuring plate waste may be more helpful than assessing malnutrition indicators, which are unlikely to change during typically short hospital stays.

For change to be possible, menu standards and procurement guidelines must change. New Zealand has no national menu standards or procurement guidelines for HPM, but standards used by a large foodservice contractor have strict protein criteria for 'main dishes' which are near impossible to meet without including ABPF. While New Zealand guidelines suggest reducing meat and dairy [50], there is currently little incentive for hospitals to use their limited resources on menu and recipe re-design or expensive PBMA. Ora Taiao (New Zealand Climate and Health Council) has recommended mandatory, specific and enforceable 'sustainable food' procurement criteria be produced for all government-funded health sector food contracts [51], for example, servings of ABPF or number of plant-based meals offered per day or week. Existing nutrition criteria for HPM focus on nutrient intake and malnutrition without considering broader issues, such as GHGE or waste. Targets for ABPF and PBPF would incentivise hospitals to allocate resources on changing menus and removing dish-based protein criteria in favour of meal-based criteria would make it possible to design palatable meals without relying on ABPF for protein.

PBMA were thought by participants to be more acceptable to patients than legumes and nuts, which has been echoed by researchers alongside their amenability to micronutrient fortification [52]. However, concern was voiced regarding high cost, allergen content and usability in cook-chill/freeze production systems. Though product choice is growing in the grocery sector [48], lack of competition in the large-scale foodservice market contributes to high prices for those products available. If availability of ABPF was limited through a policy directive or resourcing and incentive were provided, this could drive PBMA product development in the commercial sector which would decrease cost of products and expand the number of products available.

A range of strategies could achieve a higher proportion of PBPF in hospital menus. Participants initially had a narrow view of possible strategies centred around replacing or adding menu items and many did not consider 'nudging' strategies, such as moving menu items or labelling, until prompted at the end of

the interview. The most popular strategies among content experts were replacing ABPF with PBPF in familiar recipes or replacing entire menu items and adding PBPF options to the menu, but moving the position of PBPF before ABPF items on the menu was also favoured and may be a practical strategy as it does not require any recipe re-design. While hospital plate waste can be improved by changing production or service models, for example, room service [53], strategies that don't require recipe re-design (move, label) may be a pragmatic first step where cook-chill/freeze production systems are established. Previous research has suggested presenting vegetarian meals first and away from meat may work well in environments were customers have free choice, for example, restaurants, but this has not been tested in hospitals [26].

There are advantages and drawbacks of each of the strategies that need to be considered. For example, replacing all ABPF with PBPF may result in a large procurement change, but contribute to malnutrition. Adding menu options may mitigate malnutrition risk (because preferred ABPF remain a choice) but increase production waste. A pragmatic solution for hospitals is to choose a strategy that fits with their foodservice and risk appetite and trial it. Realistically, maintaining some ABPF (particularly meat) on the HPM is important until consumers become more familiar with PBPF, and production systems and culinary staff are geared towards PBPF.

Enacting change in complex hospital organisations requires careful and well-designed change management [54]. The steps, including the cyclical design process, identified have commonalities with change management models, for example, ADKAR (awareness, desire, knowledge, ability) [55], McKinsey 7-S (strategy, structure, systems, shared values, style, staff, skills) [56] and quality improvement cycles, for example, PDCA (plan, do, check, act) [57]. While similarities with proven models suggest it will be effective, the process is unique because it is based on perspectives of field content experts, as a way to address known barriers and move forward. Policy makers wishing to increase the proportion of plant to animal protein in HPMs and hospitals wanting to manage the change may use the process identified in this study to plan pathways and communicate those plans to decision makers.

A strength of this study was participants represented New Zealand geographically and included views from the private and public sector and various foodservice models. However, some opinions may not represent hospitals outside New Zealand, particularly where private healthcare makes up a sector majority or where population diets contain substantially more or less ABPF or PBPF. Though a range of roles were represented, most participants were qualified dietitians and early in their hospital foodservice career, likely influenced by recruiting from the primary researcher's professional networks. While nutrition was a concern for all participants, those who discussed nutrition most were dietitians. A larger sample of non-dietitian content experts may have elicited more sustainability, culinary or systems perspectives. Gathering patient perspectives would offer further insight into which strategies would optimise acceptance and could be an area for future research.

The food system needs to change to decrease contribution to greenhouse gas emission and increasing the proportion of plant to animal protein in HPM could be part of that. Our study found most hospital foodservice content experts supported the change, but all voiced concern, particularly regarding patient acceptance, malnutrition and cost. Participants described steps to change patient menus, including a cyclical design process. Hospitals or policy makers wishing to increase the proportion of plant to animal protein in HPMs may use the process identified in this study to enact change. Future research should trial changes to patient menus that increase the proportion of plant to animal protein and evaluate the effect on greenhouse gas emissions, plate waste, malnutrition indicators, cost and patient satisfaction.

Author Contributions

Garalynne Stiles: conceptualisation, methodology, formal analysis, investigation, data curation, writing – original draft, funding acquisition. **Jorja Collins:** conceptualization, writing – review and editing, supervision. **Kathryn Beck:** conceptualization, writing – review and editing, funding acquisition, supervision.

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Ethics Statement

Ethics approval was granted by the Massey University Human Ethics Committee: Northern, Application NOR 22/49.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Peer Review

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.