

## ORIGINAL RESEARCH

# A novel perspective of Australian primary care dietetics: Insights from an exploratory study using complex adaptive systems theory

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## Abstract

**Aims:** Effective quality improvement strategies are essential to enhancing outcomes of dietetic care. Interventions informed by complex adaptive systems theory have demonstrated effectiveness in other healthcare settings. This study aimed to explore primary care dietetics practice using complex adaptive systems theory and to identify factors that individuals across the healthcare system can examine and address to improve the quality of dietetic care.

**Methods:** Qualitative analysis of semi-structured interviews of healthcare consumers and professionals involved in the provision of dietetic care. Data collection and analysis was guided by a complexity-informed conceptual framework. The Framework Method was used to code transcripts and identify themes describing primary care dietetics.

**Results:** Twenty-three consumers and 26 primary care professionals participated. Participants described dietetic care as being delivered by individuals organised into formal and informal systems that were influenced by the wider environment, including legal, economic, and socio-cultural systems. Dietitians described interactions with consumers as a learning opportunity and sought education, mentoring, or supervision to address knowledge and skill gaps. Relationships underpinned transfer of information between individuals.

**Conclusion:** Complex adaptive systems theory proved to be a useful conceptual framework for primary care dietetics. Factors identified at the macro (e.g., funding), meso (e.g., professional networks), and micro (e.g., consumer education) levels should be examined and addressed to improve the quality of dietetic care.

## KEYWORDS

qualitative research, primary care, private practice, quality of care, complex adaptive systems, systems analysis

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## 1 | INTRODUCTION

Dietitians provide nutrition care to prevent and treat disease and have demonstrated effectiveness at improving clinical outcomes associated with chronic disease.<sup>1,2</sup> Studies exploring healthcare consumer experiences of care provided by primary care dietitians have identified opportunities for improvement.<sup>3</sup> A recent study described high-quality nutrition care from the consumer perspective as being personalised, evidence-based, and integrated into broader societal systems.<sup>4</sup> Primary care dietitians can use this model when identifying opportunities to improve quality. However, there is inconclusive evidence on whether strategies that aim to improve the quality of dietetic care translate to better health outcomes.<sup>5</sup>

Quality improvement is the practice of identifying and addressing opportunities to improve care outcomes.<sup>6</sup> Lessons from the quality improvement literature highlight the importance of synergy between the quality improvement approach and context.<sup>6,7</sup> For example, reductionist approaches to quality improvement have been effective in quality improvement studies in surgical settings<sup>6</sup> where processes can be reduced to discrete steps for review and improvement. However, in other healthcare contexts, such as primary care, the system is reportedly different.<sup>7</sup> A 15-year program of organisational change initiatives in primary care concluded that traditional mechanistic approaches to quality improvement were less likely to achieve practice transformation compared to complexity-informed approaches.<sup>7</sup> On that basis, the authors called for the development of quality improvement strategies to be guided by complexity science.<sup>7</sup>

Complexity science is an umbrella term for a group of closely related complexity and systems-related theories, including complex adaptive systems theory, and has informed quality improvement efforts in various healthcare contexts.<sup>8</sup> A scoping review of 22 interventions assessed empirical evidence supporting complexity-informed interventions.<sup>8</sup> The authors acknowledged that the implicit nature of complex systems made it difficult to demonstrate cause-and-effect but recognised that interventions compatible with complexity science appeared to be effective.<sup>8</sup> Among the interventions, complexity science (or a related theory) was most frequently used to increase capacity to fulfil a given responsibility or to identify solutions to defined problems.<sup>8</sup> A wide range of positive outcomes were reported among the studies, from improved communication and collaboration to referral rates and disease management practices. However, further evidence is needed to demonstrate the value imparted by employing a complexity-related conceptual framework.

Primary care dietetics has not been explored using complexity science or a related theory. This study explored

**TABLE 1** Concepts of complex adaptive systems used in this study to explore primary care dietetics practice derived from Plsek and Greenhalgh.<sup>10</sup>

CAS concept	Description
Agents and systems	A complex adaptive system is comprised of individual agents who can be simultaneously members of multiple systems. Systems can be embedded within systems, and the systems to which an agent belongs can change. These properties mean that the boundaries distinguishing one system from the next is not fixed, that is, the boundaries are fuzzy
Self-organisation	The structure of a complex adaptive system results from interactions between the system and external environment. Changes to the environment can cause dynamic changes to the system. Self-organisation emerges from local interactions between individuals
Initial conditions	Complex adaptive systems are sensitive to initial conditions. Initial conditions are historical factors that influence agents in the present and result in non-linear behaviour
Co-evolution	Agents interact and influence each other. They evolve together. Understanding one agent must be done with reference to other agents. Describes actions that an agent takes to influence or change the actions another agent takes
Adaptation	Complex adaptive systems interact with the environment. Agents adapt their behaviour, or take different actions, in response to an event

CAS, complex adaptive systems

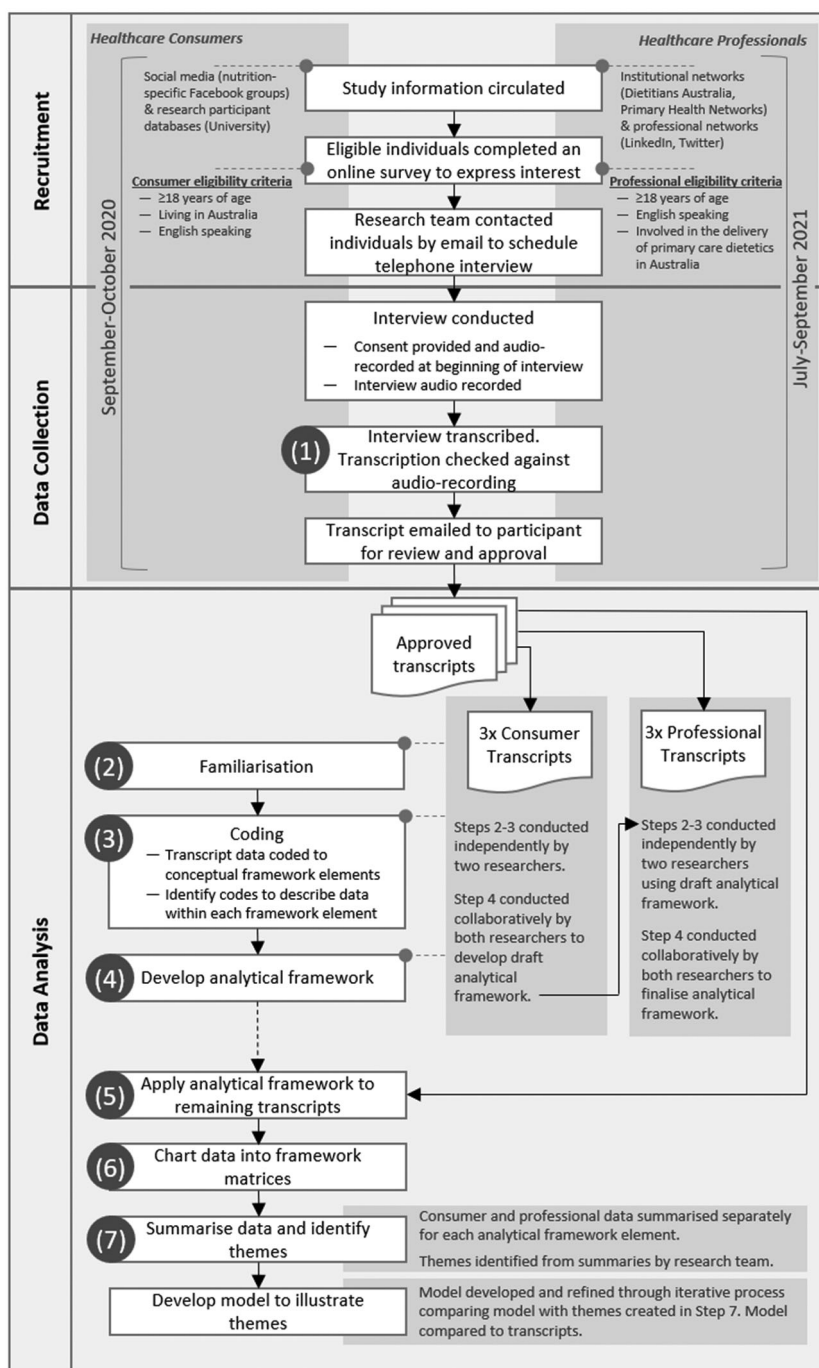
primary care dietetics using a complexity-informed conceptual framework to address two aims: firstly, to distinguish features of primary care dietetics using complex adaptive systems theory to understand whether complexity-informed approaches to quality improvement should be developed; and secondly, to identify factors that individuals across the healthcare system can examine and address to improve the quality of dietetic care.

## 2 | METHODS

This exploratory study was situated within a pragmatic paradigm. Pragmatism is a useful paradigm for research that adopts a practical world view to produce actionable knowledge.<sup>9</sup> Qualitative methods were used to explore Australian primary care dietetics to form a practical

understanding of primary care dietetics practice as a complex adaptive system. The conceptual framework (see Table 1) was developed from complex adaptive systems theory as described in the most highly cited article<sup>10</sup> in a bibliometric analysis of complexity science in health care.<sup>11</sup> The conceptual framework informed both data collection and analysis and guided the process of distinguishing features of primary care dietetics from participant experiences. Semi-structured interviews were used to document participant experiences and to explore influencing factors. The Framework Method<sup>12</sup> was

chosen to guide the analysis as it allowed the data to be organised in such a way that a practical view of primary care dietetics could be developed by integrating participant experiences using the conceptual framework. For example, data illustrating co-evolution could be compared across consumers and dietitians to explore how one influences the other in a care relationship. This study was approved by the Griffith University Human Research Ethics Committee (Ref No: 2018/167) and was reported in accordance with Standards for Reporting Qualitative Research (SRQR).<sup>13</sup>



**FIGURE 1** Methods used in this study to recruit participants and collect and analyse data. All data was collected prior to analysis. Items numbered 1–7 identify the Framework Method and comprised the following steps: (1) transcription; (2) familiarisation with transcripts; (3) coding transcripts; (4) developing the analytical framework; (5) applying the analytical framework to remaining transcripts; (6) charting data into framework matrices using participants (rows) and analytical framework elements (columns); and (7) interpreting the data to identify themes. Steps 2–4 were conducted by two researchers by first coding three consumer transcripts and then three professional transcripts. These six transcripts were selected by the lead author to maximise variation in content between the transcripts. Steps 5–6 were conducted by the lead author. A matrix was created for each of the five components of the complexity-informed conceptual framework in Step 6.

The study method is outlined in Figure 1. Agents within a complex adaptive system are influenced by internal (e.g., beliefs originating from historical experiences) and external (e.g., other agents or systems) factors. This made it necessary to document first-hand experiences from agents involved in primary care dietetics so that interactions could be explored from both sides, thereby generating a working understanding of primary care dietetics as a complex adaptive system. Agents of interest were directly (consumers, dietitians, referring practitioners) or indirectly (administration, management) involved in the delivery of dietetic care and formed two samples that were eligible for participation: (1) healthcare consumers (consumers); and (2) primary care professionals (professionals). Selection criteria for consumers were:  $\geq 18$  years of age; living in Australia; and English speaking. Consumers who had not previously received dietetic care were included to distinguish the boundary of dietetic care. Selection criteria for professionals were:  $\geq 18$  years of age; English speaking; and directly or indirectly involved in the delivery of primary care dietetics in Australia.

Consumers were recruited using methods described elsewhere.<sup>4</sup> Briefly, this included circulating study information on social media (e.g., nutrition-related Facebook groups) and research participant databases (e.g., Griffith University). Professionals were recruited through institutional (e.g., Dietitians Australia) and professional (e.g., LinkedIn) networks. Institutions shared study information through established communication channels (i.e., e-newsletter, website). Study information was shared with professional networks and contacts encouraged to share with others. Consumers and professionals completed an online survey, which included screening items, to express interest. Professional status was verified by searching the relevant practitioner registry. Maximum variation sampling<sup>14</sup> was employed by reviewing screening criteria to increase the likelihood of achieving a heterogeneous sample. Verbal consent was given by the participant at the beginning of the interview and audio recorded. Participants received an AU\$20 voucher to compensate for their time.

Two semi-structured interview protocols were developed – one for consumers and one for professionals – to explore the same concepts but from different perspectives. For example, consumers were asked what care they had received and who was involved, while professionals were asked how they were involved in, and who they worked with to provide, care. The interview protocols and rationale are provided as supplementary material. Each protocol was pilot-tested with an individual who met the relevant inclusion criteria to check question design and sequence, and amended based on feedback.

Pilot data was not included in the analysis. The interview protocols explored experiences receiving, providing, or supporting those who provided, dietetic care. Interviews were conducted by the lead author, who is a dietitian with primary care experience, with individual participants via telephone. All interviews were audio-recorded and transcribed, with the transcript sent to participants for review and approval. The approved transcript was used in the analysis.

The Framework Method<sup>12</sup> was used to analyse transcripts in NVivo<sup>15</sup> as outlined in Figure 1. Transcript data was coded to an analytical framework before being organised into matrices. Data contained in the matrices was interpreted to identify themes. All data were treated equally throughout the analysis. A conceptual model of primary care dietetics was developed from themes using an iterative process in which the model was compared to the themes and refined. The model was then compared to the transcripts to confirm that it represented the transcript data.

Strategies were employed to improve the trustworthiness of findings; that is, the degree to which participant experiences were reflected in the findings.<sup>16</sup> Credibility concerns the degree to which findings are based in the data and is enhanced through investigator triangulation, a process involving two or more researchers to analyse and interpret data.<sup>16</sup> In this study, investigator triangulation included a collaborative approach to developing the analytical framework and including the whole research team in identifying themes from the matrices. The research team comprised dietitians who differed in years of experience and professional background, limiting the influence of individual perspectives. The lead author maintained a reflexive diary in which assumptions and preconceptions were noted and consulted during analysis.

### 3 | RESULTS

Sixty-seven consumers and 26 professionals registered their interest. Twenty-three consumers completed an interview during September and October 2020 and 26 professionals completed an interview between July and September 2021. Interviews were recorded totalling 12 h and 21 min (average 32 min; range 23–47 min) for consumers and 15 h and 13 min (average 35 min; range 20–53 min) for professionals. Moser and Korstjens describe data saturation in qualitative research as the point where no new information arises.<sup>14</sup> Data saturation was defined in the current study as the point where all elements of the analytical framework were sufficiently addressed by quality data as agreed by the research team. Data saturation was achieved for consumers but not for

**TABLE 2** Demographic characteristics of consumers ( $n = 23$ ) and professionals ( $n = 26$ ) participating in this study exploring primary care dietetic practice through a complex adaptive systems lens

Variables	Consumer		Professional	
	<i>n</i>	%	<i>n</i>	%
<b>Role</b>				
Consumer	23	100%	–	–
Dietitian	–	–	15	57.7
Director (dietitian)	–	–	3	11.5
Other Allied Health Practitioner	–	–	3	11.5
General practitioner	–	–	2	7.7
Practice manager	–	–	2	7.7
Nurse	–	–	1	3.8
<b>Experience range (years)</b>				
1–4	–	–	10	38.5
5–9	–	–	5	19.2
10–14	–	–	3	11.5
15–19	–	–	3	11.5
20+	–	–	5	19.2
<b>Gender</b>				
Female	17	73.9	22	84.6
Male	5	21.7	4	15.4
Unspecified	1	4.3	0	0.0
<b>Age range (years)</b>				
18–29	8	34.8	10	38.5
30–39	7	30.4	7	26.9
40–49	3	13.0	4	15.4
50–59	3	13.0	4	15.4
60–69	2	8.7	1	3.8
<b>Location</b>				
Queensland	13	56.5	10	38.5
New South Wales	3	13.0	7	26.9
Victoria	3	13.0	7	26.9
Western Australia	3	13.0	1	3.8
South Australia	1	4.3	0	0.0
Australian Capital Territory	0	0.0	1	3.8
<b>Chronic condition/s<sup>a</sup></b>				
Overweight/obesity	8	34.8	–	–
Coeliac disease	3	13.0	–	–
Endocrine diseases (diabetes, thyroid)	3	13.0	–	–
Cardiovascular disease	2	8.7	–	–
Eating disorder	2	8.7	–	–
Endometriosis	1	4.3	–	–
No chronic disease	6	26.1	–	–

(Continues)

TABLE 2 (Continued)

Variables	Consumer		Professional	
	n	%	n	%
Received dietetic care				
Yes	15	65	–	–
No	8	35	–	–

<sup>a</sup>n ≠ 23 as participants could identify multiple chronic conditions; percentages calculated as a proportion of 23.

professionals. Participant demographic information is outlined in Table 2. Two-thirds (15/23) of consumers had received dietetic care and most (17/23) reported living with at least one chronic condition. Professionals were predominantly dietitians (18/26), but also included a practice nurse, a physiotherapist, an exercise physiologist, and a speech pathologist.

Three themes and seven sub-themes describing primary care dietetics through a complexity lens were identified from the data by the research team, as detailed in Table 3. Illustrative quotes are provided in Table 3 and referenced throughout the following section. A model representing primary care dietetics, as described by participants, is illustrated in Figure 2.

The first theme, '**primary care dietetics is comprised of agents organised into systems embedded within systems**', described the agents and systems that, collectively, are responsible for the provision of dietetic care in primary care.

Sub-theme 1a was '*agents self-organise to form systems*'. Participants described professions involved in the provision of dietetic care as a dietitian, general practitioner (GP), nurse, specialist, allied health (physiotherapist, psychologist, occupational therapist, speech pathologist), and business services (administration, management) (Table 3, Quote 1). Participants described these agents as organising into healthcare organisations (legal entities) and care teams (networks of healthcare professionals).

Healthcare organisations varied in complexity and interconnectedness. Basic organisations were described as a sole dietitian who typically operated from a larger practice or provided services via telehealth. These dietitians performed a wide range of tasks and used basic systems to manage medical and financial records. Complex organisations were represented as dietetic or allied health practices comprising multiple healthcare and business-focused professionals. These organisations had defined organisational structures, roles and responsibilities, and defined processes for care delivery, communication, and professional development. A high degree of specialisation was described by participants, with different agents performing clinical, support, and managerial activities.

Care teams were described as existing wholly within a single healthcare organisation or spanning multiple healthcare organisations. Participants described how the consumer or healthcare professional influenced care team composition. For example, one consumer reported that their GP recommended a dietitian (Table 3, Quote 2) while another consumer chose a dietitian recommended by a family member (Table 3, Quote 3). Factors including location, technology, and organisational processes influenced movement of information within care teams. Co-located care teams transferred information directly through shared technological systems (e.g., medical record) and informal communication channels (e.g., instant messaging). Where care teams spanned across healthcare organisations, referral letters and reports were often the only method of information transfer within care teams, with the quality of information contained therein dependent on the referring practitioner.

Sub-theme 1b was '*healthcare organisations are open systems that interact with the environment*'. Professionals described systems that influenced the organisations in which they practised, including economic, legal, education, socio-cultural, science, and food systems. Funding schemes, including Medicare Benefits Schedule (Medicare), National Disability Insurance Scheme (NDIS), Department of Veterans Affairs, and community funding, influenced healthcare organisations in several ways. Dietitians who accepted clients financed by these schemes described the funders' influence on caseload, consultation fees and length, communication, and dietitian accreditation. For example, a dietitian practising within an organisation that serviced NDIS-funded consumers charged fees and prepared reports as required by the scheme. Conversely, a dietitian who saw consumers who paid fees themselves or through an insurance scheme was not required to write these reports. Funding schemes also influenced how dietitians collaborated with other professionals. One dietitian described how Medicare funding for group services treating people with type 2 diabetes motivated them to collaborate with an exercise physiologist to develop a formalised program.

Legal and regulatory systems influenced dietitians and healthcare organisations. Dietitians described the

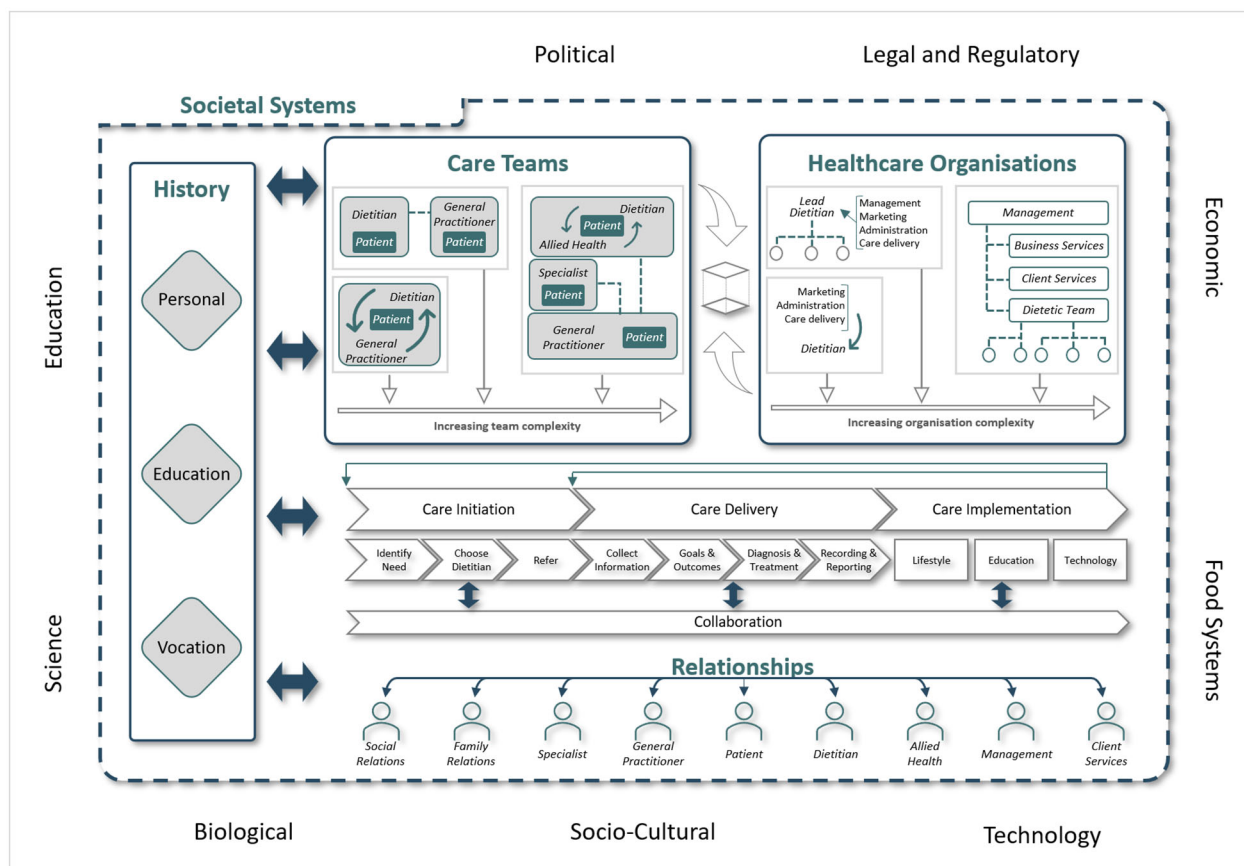
TABLE 3 Illustrative quotations for sub-themes identified from the analysis of 49 interviews of consumers and healthcare professionals

Theme and sub-theme	Illustrative quotations
<b>Theme 1. Primary care dietetics is comprised of agents organised into systems embedded within systems</b>	
Sub-theme 1a – Agents self-organise to form systems	Quote 1. “...we have now grown to more than 35 staff, including ... dietitians, exercise physiologist, diabetes educators, and reception, administration, management and accounting staff, and IT staff, to be able to deliver the services we need to ...” (P43, Director) Quote 2. “...she [the GP] had mentioned that there was a nutritionist in the medical centre ...” (P12, Consumer) Quote 3. “...my sister had seen her [the dietitian] because she had the same issue with her child, so I would have gotten a referral from my GP...” (P18, Consumer)
Sub-theme 1b – Healthcare organisations are open systems that interact with the environment	Quote 4. “...there's the standards of practice and code of practice, and so of course I have to follow that.” (P32, Dietitian) Quote 5. “...other dietitians I know working in the NDIS space that I've graduated with ... I will go to if there's a case I'm not sure about ...” (P40, Dietitian) Quote 6. “...going through the supermarket aisles and looking for the crackers that are lower carb. Then I can advise my clients what to eat.” (P26, Dietitian)
<b>Theme 2. Agents learn and adapt as they move towards their purpose</b>	
Sub-theme 2a – Agents and healthcare organisations have a history	Quote 7. “I would probably just look at the experiences and say they were not helpful; I'm not going to see another one [a dietitian].” (P15, Consumer) Quote 8. “I've always wanted to go into dietetics. I had a lot of allergies as a kid.” (P28, Dietitian) Quote 9. “Being able to grow my business ... providing more opportunities for junior dietitians. As you know allied health, especially dietetics, has been really challenging in terms of finding work after graduation ... I can provide the mentoring and support and clinical supervision so they can develop their career in the dietetics space.” (P24, Director)
Sub-theme 2b – Consumers seek and integrate information in line with their purpose	Quote 10. “... it's my health, it's my weight, it's my nutrition, and all the people around me, all they can do is advise me and give me the tools and the confidence to do it. But ultimately it's up to me.” (P8, Consumer)
Sub-theme 2c – Dietitians learn and adapt their practice in line with their purpose	Quote 11. “...if something is not working for a client, you really want to get to the bottom of why? ... What other professional development do I need to be able to help the client?” (P31, Dietitian)
<b>Theme 3. Relationships underpin information exchange between agents within the primary care dietetic system</b>	
Sub-theme 3a – Referral and multidisciplinary relationships	Quote 12. “I did a presentation ... on when is it appropriate to refer to a dietitian.” (P40, Dietitian)
Sub-theme 3b – Care relationships	Quote 13. “I found I was really comfortable with them. They made me feel at ease. I did not feel like I was being forced to do anything. I felt like they were really working with me instead of against me ... I felt like they were on board with what I was trying to achieve and what they were trying to help me achieve.” (P14, Consumer) Quote 14. “I did not feel quite comfortable with her [the dietitian] and I did not feel a connection deep enough to share...” (P7, Consumer) Quote 15. “I'm very confident in articulating that I'm not happy with something or I disagree... but I think a lot of people are not ...” (P3, Consumer)

Abbreviations: GP, general practitioner

role of Dietitians Australia, the self-regulating body for dietitians in Australia, and its impact on their practice. Dietitians Australia was described as establishing professional standards and codes of practice, and managing credentialling and continuing professional development

programs (Table 3, Quote 4). Some dietitians described Dietitians Australia as an advocate that promoted dietetics in healthcare policy. Healthcare organisations were influenced by guidelines, particularly with regards to the use of “*testimonials*” (P28, Dietitian), and resources “*to*



**FIGURE 2** Conceptual model of primary care dietetics as a complex adaptive system derived from experiences of consumers and professionals. The inner box represents primary care dietetics while the outermost box represents other systems in the environment. The dotted line between the two illustrates that agents are simultaneously members of all systems. Within the inner box, ‘history’ represents historical factors that influence agents in the present. ‘Care teams’ and ‘healthcare organisations’ represent two types of systems to which agents belong. Healthcare organisations are the legal entities within which dietitians practice while care teams are networks of healthcare professionals who work together to provide care to consumers. These systems range in complexity and maturity. The arrows connecting ‘care teams’ and ‘healthcare organisations’ illustrate that the systems are superimposed on each other. In the middle of the box is the care process, comprising initiation, delivery, and implementation. Collaboration among agents, including healthcare professionals and the consumer, occurs throughout the care process. Relationships between agents facilitate the movement of information, and the strength of relationships dictates the level of integration and communication.

set up and structure a business for private practice” (P34, Dietitian). Practice managers described other regulatory frameworks against which organisations were accredited, including the *Standards for General Practice*<sup>17</sup> and *National Safety and Quality Health Service Standards*.<sup>18</sup>

Dietitians reported engaging in education to develop knowledge and skills to improve practice through private (e.g., Dietitian Connection), not-for-profit (e.g., Diabetes Australia), and public (e.g., universities) providers. Dietitians developed social systems comprising formal and informal networks of mentors and peers to develop knowledge and skills (Table 3, Quote 5). Universities played an important role in forming these networks. Science influenced dietitians as the advice they provided was informed by scientific research, and technology systems facilitated care delivery. Dietitians described the

food system as influencing practice, with current product knowledge a prerequisite to recommending food products (Table 3, Quote 6).

The second theme, ‘agents learn and adapt as they move towards their purpose’, described the evolutionary nature of consumers and dietitians, including their history, learning and adaptation, and the purposes that drove change.

Sub-theme 2a was ‘agents and healthcare organisations have a history’. Consumers and dietitians described previous experiences that influenced their behaviour, including personal, educational, and vocational experiences. Consumers reported that prior education helped them to understand the importance of nutrition, which motivated them to seek information and support when personal concerns arose. Health-related experiences influenced how the consumer



engaged with dietetic care. For example, one consumer reported how a negative childhood experience with a dietitian made them resistant to engaging a dietitian as an adult (Table 3, Quote 7). Similarly, a consumer who had a positive experience receiving dietetic care after a diabetes diagnosis proactively sought a dietitian when they needed weight management advice.

Dietitians were influenced by personal health-related experiences, with several dietitians reflecting that it motivated them to choose a career and specialisation in dietetics (Table 3, Quote 8). Vocational experiences played a key role for dietitians, where unsuccessful attempts to gain employment in a hospital setting led some to venture into primary care, while, for others, experiences in hospital settings validated their preference for primary care. Dietitians who established healthcare organisations acknowledged that the lack of opportunities for novice dietitians motivated them to establish their business and create opportunities for these dietitians to gain experience (Table 3, Quote 9). Experiences working in other healthcare organisations motivated some dietitians to establish their own businesses, believing that they “*could do it better*” (P22, Director).

Sub-theme 2b was ‘*consumers seek and integrate information in line with their purpose*’. Consumers described being responsible for their health and sought information that supported this purpose (Table 3, Quote 10). Information came from a range of sources, including family and social relations (e.g., online groups), educational organisations (e.g., websites, not-for-profit organisations), and healthcare practitioners (e.g., dietitian, GP). Consumers incorporated information into their lifestyle. For one consumer, this involved educating teachers at their child’s school, while for another, it required them to have “*fun with it [advice]*” (P7, Consumer) to make changes sustainable. Consumers who felt that their needs were not met by the dietitian often terminated the relationship, with some consumers continuing to seek information through self-directed research, other programs, or another dietitian.

Sub-theme 2c was ‘*dietitians learn and adapt their practice in line with their purpose*’. Dietitians primarily described their purpose as “*helping people*” (P38, Dietitian) and meeting “*a need in the community*” (P22, Director), while engaging in enjoyable, flexible, and viable work, and improving and caring for themselves and their peers. Dietitians reported that first-hand interactions with consumers were a key driver of professional development. Knowledge and skill gaps were self-identified based on these interactions, and education sought to fill these gaps (Table 3, Quote 11). Dietitians learned from observing other healthcare providers, both in a professional capacity and as a consumer themselves. Dietitians

learned through formal and informal feedback mechanisms. Formal feedback included consumer surveys and clinical supervision, which involved an experienced dietitian observing a less experienced dietitian to provide feedback. Informal feedback included verbal feedback from consumers and healthcare providers, self-reflection, and practice measures (e.g., number of review appointments).

The third theme, ‘**relationships underpin information exchange between agents within the primary care dietetic system**’, described the relationships between agents and their role in the exchange of information among agents.

Sub-theme 3a was ‘*referral and multidisciplinary relationships*’. Healthcare professionals highlighted the importance of relationships among care team members. Dietitians reported that collaboration in multidisciplinary teams was driven by the GP but that cultivating relationships with healthcare providers improved communication and facilitated referrals. Dietitians educated healthcare providers on their specialisation, approach, and when to refer (Table 3, Quote 12). Referring practitioners described technology (e.g., directory) and other practitioners as ways to find a dietitian. Dietitians reported that being co-located or within the same healthcare organisation as the referring practitioner promoted strong relationships. Referring practitioners described how they considered communication from the dietitian alongside consumer feedback to evaluate dietitian competence, which had the potential to influence their referral practices. Dietitians established relationships with consumers by having an in-person (e.g., events) and online (e.g., website) presence. Consumers attempted to learn about the dietitian from other consumers by reading “*Google reviews*” (P12, Consumer) or listening to others’ experiences.

Sub-theme 3b was ‘*care relationships*’. The relationship between the consumer and dietitian impacted information sharing and tailoring of care. Consumers reporting positive relationships described how this influenced care, including a willingness to engage in goal setting and proactively collecting information to inform care (Table 3, Quote 13). Some consumers felt that it was the dietitian’s responsibility to develop the relationship by listening and getting to know them. Consumers who did not feel a strong connection with the dietitian said that this led them to withhold sensitive information (Table 3, Quote 14). Consumers described instances where the dietitian recommended strategies but did not ask for input. In these instances, consumers either did not feel comfortable, or like it was not their role, to communicate their thoughts with the dietitian. Other consumers described feeling comfortable to challenge and

critically analyse the information provided by the dietitian (Table 3, Quote 15).

## 4 | DISCUSSION

This study described primary care dietetic practice using complex adaptive systems theory. Primary care dietetics comprised a wide range of healthcare professionals that self-organised into healthcare organisations and care teams to deliver dietetic care. Professionals and consumers interacted with, and were influenced by, the wider environment in different ways, with economic, legal, educational, and social systems being key influencing factors.

Participants described how public and private funding schemes influenced the delivery of dietetic care. An investigation into the effect of payment mechanisms on healthcare provider behaviour identified payment rate and accountability as two mechanisms that influenced behaviour.<sup>19</sup> Similarly, several studies of Australian dietitians reported using strategies to accommodate the Medicare scheduled fee, including reducing the consultation length or charging a gap fee,<sup>20–22</sup> and are consistent with strategies described by dietitians in the current study. However, such strategies reportedly have detrimental effects on effectiveness<sup>22</sup> and quality of care.<sup>20</sup> Concerns about the Medicare items were raised shortly after the items were introduced, with Forster and colleagues describing how misalignment (e.g., between the typical cost of allied health services and scheduled fee) presented allied health practitioners with a dilemma.<sup>23</sup> Dietitians in the current study described providing services under other funding schemes, including NDIS and community funding. The impact of these schemes, which differ from the Medicare scheme, have not been explored and require further research to identify which payment models deliver quality consumer outcomes at a reasonable cost.

Communication and collaboration within care teams was described as influencing the consumer perspective of care quality. A scoping review identified technological and organisational factors, including documentation and processes, as enabling individuals to deliver team-based care.<sup>24</sup> Access to practice software facilitated collaboration in the current study, but few participants described formal processes for engaging with the care team, even when co-located with the referring practitioner. Power imbalances between professionals were identified in a thematic synthesis as a barrier to interprofessional collaboration.<sup>25</sup> In the current study, dietitians described collaboration as being driven by the GP, with some experiencing good engagement and others receiving no engagement beyond

the referral. Communication and competence have been identified as important in addressing power imbalances and trust.<sup>26</sup> GPs in the current study described dietitian competence, as determined by communication and consumer feedback, as important. Financial incentives also impact collaboration,<sup>25</sup> with one instance of formalised collaboration – a group program for diabetes – described in the current study as viable due to Medicare funding. Collaboration between care team members is key to quality care, but the effectiveness of collaboration is affected by organisational, professional, and financial factors. Funding schemes should encourage collaboration among care team members and opportunities for technology to facilitate collaboration across healthcare organisations need to be explored.

Supervision, mentoring, and peer networks were described by participants as important factors that supported primary care dietitians to provide quality care. Mentoring plays an important role in early career development<sup>27</sup> and is an opportunity for dietitians to enhance confidence and competence.<sup>28</sup> Primary care dietitians have described receiving support from team members (both dietitians and other professions), networks and peer groups, and professional supervision,<sup>29</sup> which echoes findings from the current study where all dietitians reported receiving support from at least one of these sources. Dietitians operating in sole practice largely relied on peers and mentoring from experienced dietitians, while clinical supervision was only provided when inexperienced dietitians were part of a healthcare organisation that provided it. New Zealand dietitians in a study by Paulin emphasised the need for supervision for dietitians working in private practice to address professional isolation.<sup>30</sup> Policies and infrastructure are important to support primary care dietitians to access supervision and mentoring, and to establish peer networks. Primary care dietitians should proactively seek supervision and mentoring to enhance competence and care quality.

The qualitative methodology and sample used in this study both strengthen and limit the findings. The degree to which the findings communicate study participants' experiences was enhanced through in-depth approaches to data collection and analysis. However, limitations may exist regarding the transferability of findings to some consumer and professional groups involved in primary care dietetics. Study participants were predominantly young (18–39 years) and identified as female, and most consumers reported living with at least one chronic condition. As such, the findings are more likely to resonate with individuals who identify with these characteristics. While we sought to collect perspectives from a diverse sample, some groups were either not represented (e.g.,

Aboriginal or Torres Strait Islander and non-English speaking people) or underrepresented (e.g., males, older people). Further research is needed to test the findings with groups that were underrepresented, or not represented, in this study.

This study explored primary care dietetics by applying complex adaptive systems theory to consumer and primary care professional experiences of dietetic care. This is the first study to describe the complex arrangement of individuals and systems that interact to provide dietetic care and the findings have implications for individuals involved in dietetic care across the healthcare system. At the macro level (e.g., healthcare system), funding was described as an important factor that influenced collaboration among care teams and highlighted the importance of appropriate funding models for high-quality dietetic care. At the meso level (e.g., Dietitians Australia), social networks, experiences, and regulations informed dietetic care and highlighted opportunities to enhance quality through these mechanisms. At the micro level (e.g., dietetic practice), many factors that influenced consumers, other healthcare professionals, and dietitians were identified. Dietitians can examine and address these factors to improve the quality of care they provide. For example, consumers described themselves as seeking and integrating knowledge from multiple sources. Dietitians can use this knowledge to expand their consumer education to include techniques to evaluate the quality of information from other sources. Complex adaptive systems theory proved to be a useful conceptual framework for primary care dietetics and identified factors that can be examined and addressed to improve the quality of dietetic care.

### AUTHOR CONTRIBUTIONS

All authors contributed to the conceptualisation and design of the study. AK collected data. All authors contributed to the analysis and interpretation of results and to writing the manuscript. All authors critically reviewed the manuscript and approved the final version submitted for publication. The authors acknowledge Dr Bryce Brickley for contributing to the analysis of transcripts in this study.

### CONFLICT OF INTEREST

There are no conflicts of interest to declare.


### DATA AVAILABILITY STATEMENT

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

### ETHICS STATEMENT

Griffith University Human Research Ethics Committee (Ref No: 2018/167).

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### REFERENCES

- Mitchell L, Ball L, Ross L, et al. Effectiveness of dietetic consultations in primary health care: a systematic review of randomized controlled trials. *J Acad Nutr Diet*. 2017;117(12):1941-1962.
- Williams LT, Barnes K, Ball L, Ross L, Sladdin I, Mitchell L. How effective are dietitians in weight management? A systematic review and meta-analysis of randomized controlled trials. *Healthcare (Basel)*. 2019;7(1):20.
- Ball L, Davmor R, Leveritt M, Desbrow B, Ehrlich C, Chaboyer W. The nutrition care needs of patients newly diagnosed with type 2 diabetes: informing dietetic practice. *J Hum Nutr Diet*. 2016;29(4):487-494.
- Kirkegaard A, Mitchell L, Ball L, et al. The quality in nutrition care (QUINCE) model: development of a model based on Australian healthcare consumer perspectives. *Fam Pract*. 2021. Oct 22:cmab136. doi: <https://doi.org/10.1093/fampra/cmab136>. Epub ahead of print.
- Kirkegaard A, Ball L, Mitchell L, Brickley B, Williams LT. Quality improvement strategies enhance primary care dietetics: A systematic review and meta-analysis. *J Hum Nutr Diet*. 2021 Nov 1. doi: [10.1111/jhn.12963](https://doi.org/10.1111/jhn.12963). Epub ahead of print. PMID: 34725871.
- Nicolay CR, Purkayastha S, Greenhalgh A, et al. Systematic review of the application of quality improvement methodologies from the manufacturing industry to surgical healthcare. *Br J Surg*. 2012;99(3):324-335.
- Crabtree BF, Nutting PA, Miller WL, et al. Primary care practice transformation is hard work: insights from a 15-year developmental program of research. *Med Care*. 2011;49(Suppl):S28-S35.
- Brainard J, Hunter PR. Do complexity-informed health interventions work? A scoping review. *Implement Sci*. 2016; 11(1):127.
- Kelly LM, Cordeiro M. Three principles of pragmatism for research on organizational processes. *Method Innov*. 2020; 13(2):205979912093724.
- Plsek PE, Greenhalgh T. Complexity science: the challenge of complexity in health care. *BMJ*. 2001;323(7313):625-628.
- Churrua K, Pomare C, Ellis LA, Long JC, Braithwaite J. The influence of complexity: a bibliometric analysis of complexity science in healthcare. *BMJ Open*. 2019;9(3):e027308.
- Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. 2013;13:117. doi: [10.3389/fendo.2020.00352](https://doi.org/10.3389/fendo.2020.00352)

13. O'Brien BC, Harris IB, Beckman TJ, et al. Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med*. 2014;89(9):1245-1251.
14. Moser A, Korstjens I. Practical guidance to qualitative research. Part 3: sampling, data collection and analysis. *Eur J Gen Pract*. 2018;24(1):9-18.
15. QSR International Pty Ltd. *NVivo*. 12th ed. QSR International; 2020 (released in March 2020).
16. Korstjens I, Moser A. Practical guidance to qualitative research. Part 4: trustworthiness and publishing. *Eur J Gen Pract*. 2018;24(1):120-124.
17. The Royal Australian College of General Practitioners. *Standards for General Practitioners*. 5th ed. 2017. Accessed September 27, 2021. <https://www.racgp.org.au>
18. Australian Commission on Safety and Quality in Health Care. *National Safety and Quality Health Service Standards*. 2017. Accessed September 27, 2021. <https://www.safetyandquality.gov.au>
19. Kazungu JS, Barasa EW, Obadha M, Chuma J. What characteristics of provider payment mechanisms influence health care providers' behaviour? A literature review. *Int J Health Plann Manage*. 2018;33(4):e892-e905.
20. Cant RP. Today's profession: views and practices of private practice dietitians re Medicare chronic disease management program. *Nutr Diet*. 2010;67(2):77-83.
21. Jansen S, Ball L, Lowe C. Impact of the Medicare chronic disease management program on the conduct of Australian dietitians' private practices. *Aust Health Rev*. 2015;39(2):183-189.
22. O'Connor R, Slater K, Ball L, et al. The tension between efficiency and effectiveness: a study of dietetic practice in primary care. *J Hum Nutr Diet*. 2019;32(2):259-266.
23. Foster MM, Mitchell G, Haines T, Tweedy S, Cornwell P, Fleming J. Does enhanced primary care enhance primary care? Policy-induced dilemmas for allied health professionals. *Med J Aust*. 2008;188(1):29-32.
24. Levis-Peralta M, Gonzalez MDR, Stalmeijer R, et al. Organizational conditions that impact the implementation of effective team-based models for the treatment of diabetes for low income patients - a scoping review. *Front Endocrinol (Lausanne)*. 2020;11:352. doi: [10.3389/fendo.2020.00352](https://doi.org/10.3389/fendo.2020.00352).
25. Rawlinson C, Carron T, Cohidon C, et al. An overview of reviews on interprofessional collaboration in primary care: barriers and facilitators. *Int J Integr Care*. 2021;21(2):32.
26. McDonald J, Jayasuriya R, Harris MF. The influence of power dynamics and trust on multidisciplinary collaboration: a qualitative case study of type 2 diabetes mellitus. *BMC Health Serv Res*. 2012;12:63. doi: [10.1186/1472-6963-12-63](https://doi.org/10.1186/1472-6963-12-63)
27. Heafala A, Mitchell LJ, Williams LT. Studying the transition from graduate to health practitioner: the Griffith Dietetics Graduate Outcomes Survey. *Nurs Health Sci*. 2021;23(3):723-732.
28. Blair M, Mitchell L, Palermo C, Gibson S. Trends, challenges, opportunities, and future needs of the dietetic workforce: a systematic scoping review. *Nutr Rev*. 2021;80:1027-1040.
29. Beckingsale L, Fairbairn K, Morris C. 'Two working together is so much better than just one': professional support needs of primary healthcare dietitians. *Nutr Diet*. 2016;73(3):220-228.
30. Paulin V. Professional supervision in dietetics: a focus group study investigating New Zealand dietitians' understanding and experience of professional supervision and their perception of its value in dietetic practice. *Nutr Diet*. 2010;67(2):106-111.

## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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