



# Medicine Administration in People with Parkinson's Disease in New Zealand: An Interprofessional, Stakeholder-Driven Online Survey

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## Abstract

Medicine administration errors are twice as frequent in people with dysphagia than in those without. Medicine administration is particularly critical for people with Parkinson's disease where late, or missed doses reduce medicine effectiveness and impact on the quality of life. The aim of this study was to explore the current medicine administration practices of people with Parkinson's disease in New Zealand. A self-administered online survey was developed by an interprofessional group including people with Parkinson's disease (the primary stakeholders), speech-language pathologists and pharmacists. The survey was administered using a cross-sectional study design and asked respondents about self-reported swallowing difficulties [using Eating Assessment Tool (EAT-10)], medicine regimes and strategies used to swallow medicines. Seventy-one people with Parkinson's disease responded to the survey (69% male, mean age 72 years, mean years with Parkinson's disease 9 years). Respondents reported complex daily multi-medicine consumption (mean no. of pills 11, range 2–25). Analyses showed that 57% of respondents scored outside the normal range for EAT-10 (> 3) with 57% complaining of difficulties with pills. Many respondents admitted to missing medicines and requiring external reminders. Multiple strategies for swallowing pills were described including crushing tablets, using yoghurt or fruit juice, and swallowing strategies (such as head tilt, effortful swallow, chin down and altered pill placement in the mouth). Medicine administration is complex and challenging for people with Parkinson's disease. The development of educational packages for people with Parkinson's disease, their carers and health professionals is much needed.

**Keywords** Dysphagia · Deglutition · Medicine administration · Parkinson's disease · Interprofessional

## Introduction

Swallowing of medicines can be critical in the elderly population where over 30% of people over 65 years old take more than five regular medicines each day [15]. Dysphagia makes it difficult to swallow food, fluids and medicines [4, 9, 17, 19, 20]. Taking multiple medicines gives rise to medicine administration errors [11] and medicine errors have been found twice as frequently in patients with dysphagia than in those without [10, 14, 17].

For some patients with dysphagia, recommendations may be as simple as using a safe swallowing strategy such as sitting upright or using a mildly thickened water bolus rather than a thin water bolus [4, 9, 16]. However, altering medicines such as crushing, dissolving, chewing or opening capsules can reduce effectiveness [9, 17, 39] and there are legal implications associated with this unlicensed administration of medicines [4, 17, 19, 30, 39]. Yet, such practices have been frequently reported in people with dysphagia [31]. Although there are serious implications of medicine mal-management in people with dysphagia, there remains a lack of research on targeted approaches to safe medicine administration.

Medicine administration is particularly critical for people with Parkinson's disease where there is a dependency on timely and accurate medicine use. Errors involving late, or missed doses can reduce medicine effectiveness [6, 13, 35] and have an impact on the quality of life of

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people with Parkinson's disease and their carers [6]. Many people with Parkinson's disease suffer with dysphagia adding to the complexity of safe medicine administration [8]. Studies reporting the perspectives of nurses [18] and people with Parkinson's disease [6] describe great complexity in medicine management for people with Parkinson's disease. Nurses demonstrated a lack of knowledge regarding which medicines can be crushed and regularly referred to speech-language pathologists for advice regarding swallowing of medicines, but rarely used pharmacists for support [18]. Buetow et al., through interviews with people with Parkinson's disease and their carers, found medicine errors were common but often not reported [6].

People with Parkinson's disease are more frequently admitted to hospital compared to the general population [13]. Poor medicine management is common in people with Parkinson's disease in the hospital setting [6, 13] which gives rise to side effects and reduced medicine effects [13, 35]. Gerlach et al. conducted a large ( $n = 684$ ) retrospective study investigating risk factors for deterioration of Parkinson's disease symptoms while in hospital [13]. They found that 21% of people with Parkinson's disease experienced deterioration of motor symptoms during their hospital stay, while 33% had one or more complications, and 26% received incorrect Parkinson's medicine or dose [13]. There was a significantly increased risk of deterioration in patients with Parkinson's disease who received the wrong medicine (i.e. wrong timing, and interruption of the medicine) [13].

Despite this understanding of (i) the impact of dysphagia on medicine intake, (ii) the importance of medicine optimization in people with Parkinson's disease, as well as, (iii) the acknowledgement of the complexity of Parkinson's disease medicine routines, little interprofessional attention has been given to improving education to people with Parkinson's disease in this area. The aim of this study was to explore the current medicine administration practices of people with Parkinson's disease in New Zealand using an interprofessional, stakeholder-driven online survey. The study asked the following research questions: What is the prevalence of self-reported problems of swallowing medicines? How do people with Parkinson's disease in the New Zealand swallow their medicines? What are the strategies used to swallow medicines? This study is part one of a wider research programme to develop stakeholder-driven, interprofessional resources for people with Parkinson's disease and their healthcare professionals.

## Methods

This study was approved by an appropriate national ethics committee (UAHPEC/018753) and all respondents provided written informed consent.

### Survey Development

Well-designed surveys are highly structured, avoid ambiguous questions and involve a large enough number of people so that data can be representative of a wide population [24]. These factors were considered in the development of the survey. An online survey (using Qualtrics) [28] was developed to explore the current medicine administration practices of people with Parkinson's disease in New Zealand by an interprofessional working group (speech-language pathologists, pharmacists and people with Parkinson's disease as the primary stakeholders). The survey included a mixture of open-ended and multiple-choice questions and the Eating Assessment Tool (EAT-10) [5]. Open-ended questions (i.e. 'Are there any techniques that you use to swallow your tablets and capsules?') occurred early in the survey and it was not possible to return to previous pages of the survey. This was chosen to avoid priming respondents. Multiple-choice questions were used to gain demographic information (including age, gender, living situation, years since Parkinson's disease diagnosis). Respondents were asked to list all the medicines they take regularly and describe their daily medicine routine. Respondents were finally asked to indicate their most common medicine practices: (1) How do you take your medicines? Whole tablet, Half tablet, Crushed tablet, Capsule whole, Capsule opened and contents swallowed, Liquid, Other), (2) On their own without water, with less than  $\frac{1}{2}$  a glass of water, with a glass of water, with food, other, and (3) All in one go, more than one at a time, one at a time, other. The survey was independently pilot tested by three speech-language pathologists, two pharmacists, and two people with Parkinson's disease and their carers. Pilot testing was conducted to check for errors and ambiguity, and to assess for missing areas of interest. The survey was revised accordingly.

### Survey Distribution

Two key factors to consider in quantitative survey design are sample size and non-response bias [3, 24]. People with Parkinson's disease across New Zealand were invited to participate in the study. The invitation to participate in the online survey was sent out widely via social media on the Centre for Brain Research and Speech Science, The University of Auckland Facebook page as well as through

the Neurological Foundation newsletter and the Primary Care News which is distributed to General Practices and Pharmacies within Waitemata and Auckland DHB regions. The link to the survey was sent via email to all Parkinson's New Zealand field educators who were asked to circulate amongst their members. The link to the survey was also sent via email to the Chair of People with Parkinson's (PwP) Inc (a local Parkinson's group), The University of Auckland CeleBRation choir (Choir for people with neurological conditions), and The University of Auckland Movers and Shakers Gavel Club (Toast Masters Club for people with neurological conditions).

Studies suggest that personalising correspondence and explaining the study is helpful and tends to increase response rates [29, 37]. The research team personally attended local Parkinson's disease community groups and the Parkinson's New Zealand Field Educator's Conference to explain the purpose of the study to people with Parkinson's disease, their carers and field educators. To maximise accessibility to respondents, reduce chances of socially desirable answers and recruit as many respondents as possible [32], an online survey was chosen. To further support access, carers were encouraged to support people with Parkinson's disease in completing the survey and the survey was accessible via smart phone or computer. The survey was available for 12 weeks between 9th August 2017 and 31st October 2017. An email was sent out on 3rd October 2017 as a reminder to maximise participation.

## Data Analysis

Quantitative data were analysed through excel (Microsoft® Excel for Mac Version 16.10) using descriptive statistics. Responses from the survey were tallied and reported as percentages and graphically displayed. Illustrative comments about the respondent's experiences and strategies used to take their medicines were tabulated. Medicines taken by respondents were investigated for common safety considerations (e.g. capsule cannot be opened, gastrointestinal disturbances) and number of respondents on 'at risk' medicines were tallied. Statistical analyses were completed using IBM SPSS Statistics Data Editor, version 23 (IBM Corporation, Chicago, IL). Spearman correlations were used to analyse associations between age and medicines, age and self-reported swallowing difficulties, age and how many years had Parkinson's disease, how many years had Parkinson's disease and medicines, and self-reported swallowing difficulties using the EAT-10 and medicines. A probability level of  $< 0.05$  was considered significant.

## Results

Seventy-one people with Parkinson's disease responded to the survey (69% male, mean age 72 years, mean years with Parkinson's disease 9 years) (Table 1). Sixty-eight people completed the self-reported swallowing difficulties EAT-10 survey as well as the medicine and demographic sections of the survey. When asked the question 'have you had any education about how to take your medicines in the past?', 69% reported not receiving any education about how to take their medicines.

### Self-Reported Swallowing Difficulties

57% of respondents scored outside the normal range for self-reported swallowing difficulties ( $> 3$  on EAT-10, [5] (Fig. 1). When respondents were asked to rate the statement 'swallowing pills and capsules takes extra effort', 57% reported problems with pills ( $> 0$  rating). There was no statistically significant association between age and self-reported swallowing difficulties based on EAT-10 ( $r_s = 0.006$ ,  $p = 0.97$ ), age and number of medicines taken ( $r_s = 0.1$ ,  $p = 0.42$ ), age and how many years had Parkinson's disease ( $r_s = 0.18$ ,  $p = 0.15$ ), how many years had Parkinson's disease and self-reported swallowing difficulties based on EAT-10 ( $r_s = 0.1$ ,  $p = 0.43$ ), how many years had Parkinson's disease and number of medicines taken ( $r_s = 0.01$ ,  $p = 0.91$ ) or number of medicines taken and self-reported swallowing difficulties ( $r_s = 0.064$ ,  $p = 0.61$ ).

### Self-Reported Medicine Regimes

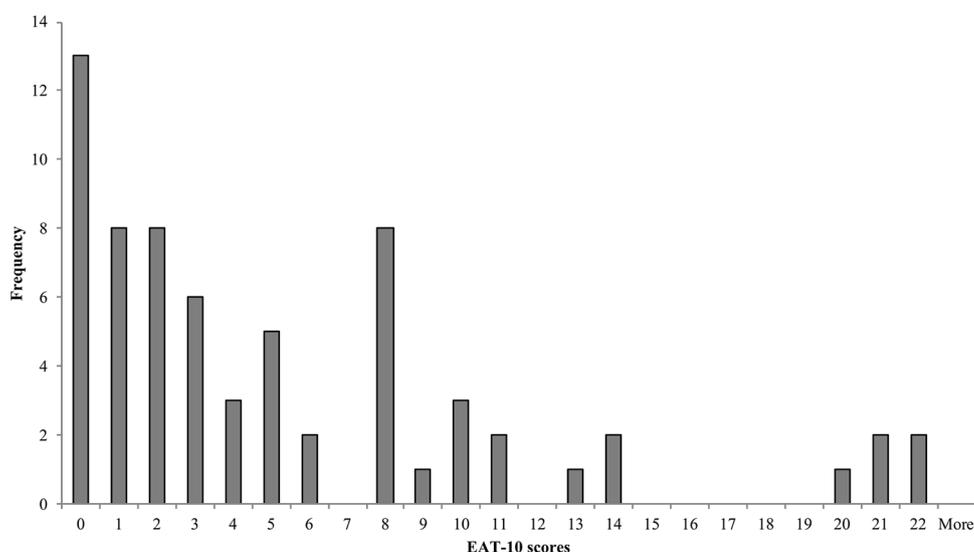
Respondents reported taking a range of medicines for Parkinson's disease as well as multiple other medicines (Table 2). Medicine regimes were varied (Table 3) and many of the respondents were taking medicines with known safety considerations (Table 4). Illustrative comments to the open-ended question, 'Are there any techniques that you use to swallow your tablets and capsules?' are displayed in Table 5.

## Discussion

To our knowledge, this is the first investigation of medicine administration between people with Parkinson's disease, pharmacists and speech-language pathologists. This investigation involves a representative sample of primarily home dwelling people with Parkinson's disease, many of whom report difficulties swallowing. As has been seen previously, these data reveal not only the complex medicine regimes of people with Parkinson's disease [2, 6, 18]

**Table 1** Demographic information (N: 71)

Demographics	Descriptive statistics
Age	Mean 72 years, range 50–87, SD 7
Gender	Male: 69 (%)
Ethnicity	New Zealand Maori (2.8%) New Zealand European (76.1%) European (14.1%) Other (7%)
Years with Parkinson's disease	Mean 9 years, range 1–30 years, SD 5
Living situation	Live with family (84.5%) Supportive living (8.5%) Live alone (7%)
Mean number of medicines taken in 24-h period	Mean 4, range 1–10, SD 6
Mean number of pills consumed in 24-h period	Mean 11, range 2–25, SD 6

**Fig. 1** EAT-10 scores for respondents (> 3 on EAT-10 considered outside normal range [5])

but also a high prevalence of difficulties swallowing pills and need for ingestion modifications. Respondents report complex daily multi-medicine consumption with up to 25 pills taken per day. Internationally, this is likely to be even more complex because in New Zealand, there are generally less medicines available for Parkinson's Disease and other conditions, due to funding arrangements of pharmaceuticals. There is often one funded brand available for a specific medicine or group. This reduces the complexity of combinations due to the reduced selection of medicines for prescribers to choose between. Many respondents described multiple self-taught strategies used for swallowing pills included crushing tablets, postural swallowing strategies, using jam, yogurt, fruit juice and pill placement in the mouth. Considerations for medicine consumption in this population are multifactorial and can perhaps be represented as a cycle of risk factors and critical outcomes (Fig. 2).

### Dysphagia and Choking Risks

Oropharyngeal and esophageal dysphagia is common in people with Parkinson's disease [7, 16, 23]. With a third of respondents reporting difficulties swallowing pills, there is an increased risk of medicines entering the airway or becoming stuck in the throat or oesophagus [1, 21, 22]. This has severe health consequences [1, 39]. In addition to the risk of asphyxiation or respiratory infection from aspirated materials, pill-induced oesophageal injury can occur when medicines get stuck and dissolve in the oesophagus [21, 39]. While an upright position and plenty of water with medicines can reduce the risk of pill-induced oesophageal injury [21, 22], there are many factors for consideration. Esophageal motility is known to slow with age [26] and in people with Parkinson's disease [33]. Saliva alterations and multi-medicines make people with Parkinson's disease vulnerable to reflux and dysmotility. In addition, it is possible that people who have difficulties

**Table 2** List of medicines taken by respondents

Medicines for Parkinson's disease		
Amantadine (symmetrel)	Entacapone (Entapone)	Levodopa + Benserazide (Madopar capsule, Madopar dispersible tablet, Madopar HBS modified release capsule)
Levodopa + Carbidopa (Sinemet, Sinemet CR)	Pramipexole (Ramiapex)	Ropinirole (Apo-Ropinirole)
Selegiline (Apo-Selegiline)	Tolcapone (Tasmar)	
Other medicines		
Amlodipine (Apo-amlodipine)	Amitriptyline (Arrow-amitriptyline)	Apomorphine (Apomine)
Aspirin (Aspec)	Atorvastatin (Lorstat)	Candesartan (Candestar)
Cilazapril (Apo-Cilazapril)	Citalopram (PSM Citalopram)	Clonazepam (Paxam, Rivotril drops)
Clopidogrel (Arrow- Clopid)	Domperidone (Prokinex)	Donepezil (donepezil-Rex)
Doxazosin (Apo-Doxazosin)	Escitalopram (Apo-Escitalopram)	Fludrocortisone (Florinef)
Docusate and senna (Laxsol)	Metoprolol (Betoloc CR)	Midodrine (Gutron)
Nortriptyline (Norpress)	Omeprazole (Omezol)	Orphenadrine (Norflex)
Paracetamol (Pharmacare)	Quetiapine (Quetapel)	Quinapril (Arrow-Quinapril)
Simvastatin (Arrow simva)	Solifenacin (Vesicare)	Zopiclone (Zopiclone Actavis)
Budesonide + formoterol inhaler (Symbicort)		

swallowing fluids, avoid water and particularly the mixed consistency task of managing medicines and water together. Fear of choking may lead to the descriptions in these data of pills being taken without water or by moistening the mouth only. Increased education on the consequences of poor water consumption and alternative strategies is imperative.

### Medicine Alterations

One of the common types of medicine administration errors is unauthorised crushing of tablets [14, 18]. People with swallowing difficulties struggling to swallow their medicines in whole form are known to make modifications such as those described in the current study [9, 10, 19]. Many medicines should not be crushed or opened and alteration of medicines should only be carried out following pharmacist and medical practitioner authorisation [9, 19, 30]. There are some commonly used medicines in our cohort that should not be crushed because of high risk of adverse reactions such as Sinemet CR, Madopar HBS and Metoprolol CR [38]. Madopar capsules, Madopar HBS and Sinemet CR are slow-release Parkinson's disease medicines and must be taken in its whole form not crushed, broken or chewed to gain benefit from the slow-release action [27]. Slow-release antihypertensive tablets if crushed result in individuals receiving the total dose

immediately, causing a sudden drop in blood pressure, instead of slowly delivering the dose over the intended time frame of the slow-release formulation [38]. One respondent sucked their slow-release metoprolol. While, the majority of the respondents in this study reported taking pills in its whole form, 30% reported halving tablets, one respondent reported dissolving Madopar HBS in water and two respondents reported crushing Sinemet CR. Providing education around medicine administration and management for people with Parkinson's disease, carers and health professionals to enable effective management and safe use of medicines and overall condition is critical.

### Medicine Education

Education around medicine administration to people with Parkinson's disease and their health professionals has received little attention in New Zealand [6]. Interestingly, the results of this current study suggest that it is difficult to predict who will experience swallowing difficulties and who will have more medicines to swallow based on age or number of years they have had Parkinson's disease. The majority of survey respondents reported no previous education regarding medicine administration. While some degree of education was likely provided at Neurologist and General Practitioner appointments, and at the point of medicine collection, clearly the information had not been

**Table 3** Illustrative examples of daily medicine regimes

Respondent	No. of pills per day	No. of medicine types per day	Illustrative comments of daily medicine regimes from respondents
23	2	1	'Madopar is taken at times GP recommended. I remember 10 am but frequently forget 4 pm. I take morning pills for other complaints as soon as I awake and take evening pills when preparing for bed. Due to number of pills I need to take for other problems, Specialist and GP not keen for me to take a lot of Parkinson's pills. I also have Essential Tremors which are my main concern and embarrassment—especially for dining out'
2	11	6	'I have PEJ and feed through tubing overnight. To begin with all meds crushed dissolved and put through tubing. Now I manage to take meds and small amounts food by mouth. Hopefully PEJ may be removed eventually. I lost 20 k weight and amount tube feeding depends on my weight which is checked every 2 weeks. I take meds after breakfast and after evening meal. I take midday sinemet with lunch'
34	16.5	4	'with water 7 am 1 sinamet 100 +1.5 rpix 9 am 1 sinamet 100 11 am 1 sinamet 100 + 1.5 rpix 1 pm 1 sinamet 100 3 pm 1 sinamet 100 + 1.5 rpix 5 pm 1 sinamet 100 + 1 rpix 7 pm 1 sinamet100 9 pm 1 sinamet 200 2 am (approx) 1 sinamet 100 5 am (approx) 1 sinamet 100'
19	24.5	7	'Tip current dose onto non-roll surface. Pick up pill, one or two to swallow together. Time: 7 am Sinamet 100/25 (yellow) 2 pills- Parkinson's Sinamet 200/50 CR (blue) 1/2 pill Parkinson's Paracetamol 500 mg 2 pills Back pain Breakfast Aspirin 100 mg 1 pill blood thinner Vesicare 5 mg 1 pill bladder control 10 am: same as 7 am 4 1/2 pills 2 pm: same as 7 am 4 1/2 pills 6 pm: Sinamet 100/25 (yellow) 2 pills Parkinson's Bedtime: Vesicare 5 mg 1 pill- Bladder control Escitalopram 10 mg 1 pill- Anxiety Doxazosin 2 mg 3 pills- bladder control Paracetamol 500 mg 2 pills- back pain Total pills = 24 1/2 pills'

retained. Many respondents reported relying on their carers for reminders to take their medicines exposing the key role of carers in medicine administration and management. Of note, although many respondents knew the dose and form of their medication, some did not. This is of concern because there are many different forms of medicines for Parkinson's Disease, and it is important that they know what they are taking, and when and how to take it.

Reassuringly, there is now international momentum for safer medicine administration. The World Health Organisation (WHO) launched 'Medication without Harm' as

their third WHO Global Patient Safety Challenge in 2017 [36]. This campaign aims to reduce severe avoidable medication-related harm by 50% in 5 years through education, healthcare initiative, real-life stories and resources for patients and their health professionals. Researchers have investigated the readability of on-line Parkinson's disease information and found only 1% of the top 100 webpages was fully comprehensible [11]. The internet is convenient and easily accessible, but information is only helpful if people can understand the content and there are risks with misunderstandings. McCarthy et al. also

**Table 4** Parkinson's disease medicines registered in New Zealand with safety considerations

Safety considerations		Medicines listed by respondent/s with documented safety risks	Number of respondents who listed this medicine	Percentage of respondents who listed this medicine (%)	
Gastro-intestinal trauma risks	Gastro-intestinal disturbances	Amantadine (Symmetrel)	18	25	
		Entacapone (Entapone)	8	11	
Pharmaceutical alteration risks	Capsule must not be opened	Levodopa + Benserazide (Madopar capsule)	6	8	
		Levodopa + Benserazide (Madopar)	12	17	
	Must be taken at same time each day in relation to food	Levodopa + Carbidopa (Sinemet)	67	94	
		Levodopa + Benserazide (Madopar dispersible tablet)	6	8	
	Can be dispersed in 10 ml water or cordial but not juice	Levodopa + Carbidopa (Sinemet)	53	75	
		Levodopa + Carbidopa (Sinemet CR)	41	58	
	Do not crush	Tolcapone (Tasmar)	8	11	
		Amantadine (Symmetrel)	18	25	
		Levodopa + Benserazide (Madopar capsule)	6	8	
		Levodopa + Benserazide (Madopar HBS)	6	8	
Side effects relevant to dysphagia and nutrition		Decreased appetite	Pramipexole (Rampipex)	5	7
			Ropinirole (Apo-Ropinirole)	6	8
	Nausea/Vomiting	Tolcapone (Tasmar)	8	11	
		Entacapone (Entapone)	8	11	
		Pramipexole (Rampipex)	5	7	
		Ropinirole (Apo-Ropinirole)	6	8	
		Levodopa + Benserazide (Madopar)	12	17	
		Levodopa + Carbidopa (Sinemet)	67	94	
	Taste disturbances	Levodopa + Benserazide (Madopar)	12	17	
		Levodopa + Carbidopa (Sinemet)	67	94	
Dry mouth	Levodopa + Benserazide (Madopar)	12	17		
	Levodopa + Carbidopa (Sinemet)	67	94		
	Entacapone (Entapone)	8	11		
	Amantadine (Symmetrel)	18	25		
		Selegiline (Apo-Selegiline)	2	3	

highlight health literacy as a risk factor for poor patient understanding. They found patients with poorer health literacy recalled less of their doctor's advice than those with better health literacy [25]. They offered the following advice on medication education: information should be

accessible and be free of medical jargon, and a simple written summary should be provided of all information discussed over the counter at the pharmacy or during conversation with the doctor.

**Table 5** Illustrative comments to the open-ended question, 'Are there any techniques that you use to swallow your tablets and capsules?'

Theme	Illustrative comments
Difficulties with pills	<p>'Often worry i have inhaled some fluid when taking. Find it difficult to swallow partic. small ones, get lost as tongue doesn't assist with swallowing'</p> <p>'...If I am low, I have difficulty swallowing and taken tabs/capsules with custard or yogurt'</p> <p>'sometimes due to swallowing, I need more water, sometimes less!'</p> <p>'Only minor effects with swallowing, restricted to large capsules (not Sinemet)'</p> <p>'Madopar is crushed'</p> <p>'I take other pills and one solution to counter side effects of Sinemet, e.g. constipation'</p> <p>'Sometime when I don't have water swallow dry but not very well'</p>
Strategies	<p>'I manage best with thicker things like jam yoghurt honey'</p> <p>'pills taken with either honey or small drink of a fruit smoothie, have to concentrate and tilt head to swallow them'</p> <p>'with juice or milk, something thicker than water. Sometimes yoghurt can be helpful'</p> <p>'I have an alarm to remind me to take medicines during the day and I usually take them with a glass of water'</p> <p>'I rely on memory and always carry a small container of tablets with me'. Avoid taking 30 min either side of taking food'. Swallow whole,do not chew only minor effects with swallowing, restricted to large capsules (not Sinemet)'</p> <p>'If I am out I sometimes take meds with a lollie as this increases my saliva which gets meds through to the gut'</p> <p>'A watch with times prepared in it'</p> <p>'Madopar rapid is dissolved in water for 5 min'</p> <p>'lean forward to aid swallowing'</p> <p>'With a glass of water, sometimes with yogurt or stewed apple. Amitriptyline with a teaspoon of yogurt or stewed apple because it tastes revolting it doesn't go down the throat the first time, with water! I throw my head back-gets the best results'</p> <p>'Head back for tablets (forward for capsules)'</p> <p>'Small ones together, larger ones- one at a time'</p> <p>'If my throat feels "mucousy", I use canned baby food or pureed apple, this always works well. I always try to do effortful swallows, if something is either stuck or think it may get stuck'</p>

## Limitations

Reliance on self-reports from people with Parkinson's about their medicine regimes risks reporting errors. However, self-reports are rich in 'real-life' medicine administration experiences and strategies from the stakeholders themselves. Future research should consider medicine administration practices at multiple-time points to track changes in medicines, swallow ability and strategies used to take the medicines. It is likely medicine administration changes with changes in disease stage and life situations. Additionally, future research should consider the use of qualitative methods such as face-to-face interviews with people with Parkinson's disease, carers or with the prescribers and pharmacists, to gain more comprehensive and reliable information of the medicine administration and management.

## Further Directions

Medicine management is a complex issue for people with Parkinson's disease. Encouraging people with Parkinson's

disease to take on an active role in their medicine management and overall condition has potential to optimise health and quality of life [34]. People with Parkinson's disease may benefit from greater understanding of their medicines and more guidance in medicine management [6, 12, 25]. Medicines for Parkinson's Disease are ideally tailored to individuals' needs and preferences. It would be interesting to further examine personal preferences, to determine if people would rather take their medicines at a different frequency to suit their lifestyle. Some may prefer frequent dosing to provide better symptom control; while others may be willing to manage poorer symptom control in return for reduced complexity of dosing regimen. Phase two of this research programme is to develop an education resource in collaboration with people with Parkinson's disease, speech-language pathologists and pharmacists. The aim of this resource is to empower, inform and enable safer medicine practices.

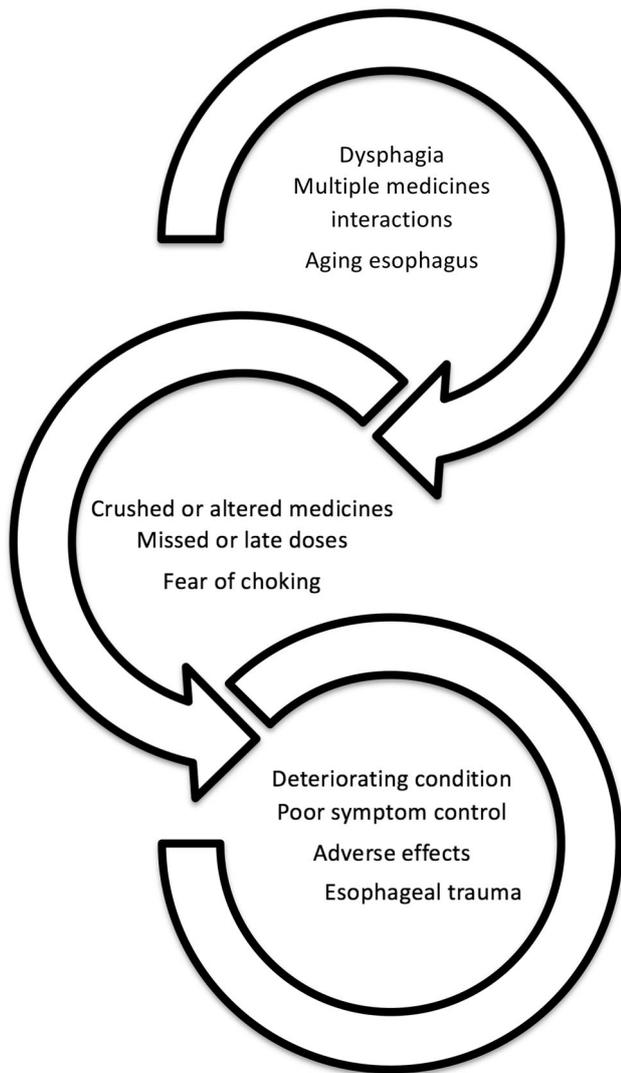


Fig. 2 Considerations for medicines

## Conclusions

Medicine administration and swallowing safety is complex for people with Parkinson's disease. The findings from this study provide an understanding of the current medicine administration practices in people with Parkinson's disease in New Zealand. This will help to inform the safe administration and management of medicines through education and training. Healthcare professionals, patients and their family members must work in a collaborative manner to promote safe administration of medicines, decrease medicine administration-related errors and increase quality of life for people with Parkinson's and their family members. Pharmacist and speech-language therapist guidance should be sought for all people reporting difficulties swallowing medications, to ensure that recommendations regarding

safe swallowing can be translated into safe medicine administration practice.

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## Compliance with Ethical Standards

**Conflict of interest** All the authors have no conflicts of interest and nothing to declare.

**Ethical Approval** This study was approved by an appropriate national ethics committee (UAHPEC/018753) and all respondents provided written informed consent. All procedures were in accordance with the ethical standards of the institutional ethics committee and with the 1964 Helsinki declaration.

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