May 2020 Volume 30, No. 1

Australasian Journal of Neuroscience

AJON

ANNA

Australasian Neuroscience Nurses' Association

Registered by Australia Post Publication No. NGB9480

Australasian Journal of Neuroscience

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AJON May 2020
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2020Thoughts from the Editor and ANNA Executive

Linda Nichols

University of Tasmania, AJON Editor

Our thoughts and prayers are with our nursing community; particularly those who have lost loved ones. The year 2020 is the International year of the nurse and it is heartening to see the footage of people around the world clapping, cheering and showing gratitude for our nurses and healthcare workers.

The world has never been so dependent on the resilience of nurses. We have an innate ability to deal with uncertainties and brace for shifts of unknown clinical challenges. Despite what is thrown at us we turn around and return the next day or night and do it all again. We are human, we are fearful and anxious, we do cry and weep but we are made stronger by our conviction to provide care with compassion.

The world acknowledges that nurses are the mainstay of this battle against Covid-19, and recognition is so important during this pandemic. Please keep safe, stay strong, take care of yourself as well as others and we will look back on this knowing that the world did recognise our courage and dedication to those that need our care.

Linda

DOI: 10.21307/ajon-2020-000a

2020 The Year of the Nurse

Caroline Woon

Nurse Educator, Neurosciences, Capital & Costal District Health Board New Zealand

Celebrating Florence Nightingale, the pioneer of nursing,
2020 the year of the nurse, absolutely deserving.

Covid 19 has taken the world by storm,
Life changed so much from what was known as the norm!

All around the world people are stressed and hurting,
Loss of jobs, loss of life, all quite disconcerting.

We are united worldwide as nurses in this crisis,
Demonstrating our resillience, adaptability and kindness.

Discussions and anxieties over personal protective equipment,
The world is acknowledging hospital staff for their commitment!

Neuroscience nurses, across Australasia, in this together
Flattening the curve, preventing the spread now or never!

We have always worked hard and put our patients first,
Sacrificed our safety and time to ensure patients are nursed!

But now is the time to care for ourselves and ensure we get rest,
So we can care for our patients and give them our very best.

DOI: 10.21307/ajon-2020-000b

Australasian Journal of Neuroscience Volume 30 ● Number 1 ● May 2020

Editorial

Pandemics and the neurological manifestations of viral respiratory illnesses including Covid-19.

Editor: **Linda Nichols**

Pandemics and the neurological manifestations of viral respiratory illnesses including Covid-19.

Editor: **Linda Nichols**

Christie, Vicki and Dawn raise some really valid and pertinent thoughts and as I reflect on their guest editorial in our current Global crisis, the nexus between my two own areas of specialty becomes increasingly pellucid. After leaving clinical neuroscience practice for academia, immunisation and public health intervention is the mainstay of my clinical practice. Preventative health care measures have never been so imperative. From hand hygiene, cough etiquette and the elusive Covid-19 (SARS-CoV2) vaccine we are exposed to unparalleled and extraordinary media and social media coverage (Khan, Ali, Siddique, & Nabi, 2020). The current Covid-19 health crisis is stretching our health resources, nurses and medical staff to their absolute limits. Until recently it has been neurotropic viruses such as the measles virus that have generally been associated with central nervous system pathologies. However respiratory viruses including influenza and coronaviruses are emerging with neuropathological elements (Bohmwald, Gálvez, Ríos, & Kalergis, 2018). So what do we know about the history and impact of pandemics and how do novel respiratory viruses relate to neuroscience?

Viral respiratory illnesses and pandemics have been described since as early as 412BC. We are all familiar with the 1918 H1N1 (Spanish flu) influenza pandemic, but we often forget about the 1957 H2N2 (Asian flu) or the 1968 H3N2 (Hong Kong flu) influenza pandemics that both resulted in millions of lives lost. Our next influenza pandemic did not occur for another 51 years and caught many unaware. In early March 2009 cases of a novel H1N1 influenza strain (that is believed to have originated from pigs) emerged in California and Mexico (Broadbent & Subbarao, 2011). By May 2009 the first cases of the colloquially named “swine flu” were diagnosed in Australia (Australian Government Department of Health and Ageing, 2009; Eastwood, Durrheim, Jones, & Butler, 2010). Those like myself that were working during this time will remember being individually fitted for P3 masks and getting a sticker ones name badge that indicated size and fit, with shelves filled with different shapes and sizes of masks. This is such a contrast to this pandemic, where mask shortages and equipment deprivations are being reported internationally. The H1N1/09 pandemic is described by some as being relatively benign (Kotsimbos et al., 2010). This in part is due to the launch of the H1N1 vaccination program using the Panvax® vaccine that became available a mere 6 months after the virus was first identified (Bishop, Murnane, & Owen, 2009; Eastwood et al., 2010). However, vaccination is not an easy fix and various iterations of the (H1N1)pdm09-like virus strain have been included internationally in the seasonal flu vaccinations since 2010 to keep the spread in check. No pandemic is the same and each presents unique challenges for Governments, health care services and the community (Kotsimbos et al., 2010). We are only at the beginning of this current Covid-19 journey and still in a phase where we are working to contain and sustain our resources. Protection through a potential vaccine is still a long way off and likely to take years before control is effective.

Like influenza, coronaviruses are a group of related viruses that are zoonotic and primarily cause respiratory symptoms in humans (Chen et al., 2020; Su et al., 2016). Unlike influenza, there are no antiviral drugs or vaccines to treat or prevent human coronavirus infections. Coronaviruses are relatively new, having been first discovered in animals in the 1930’s, with the common cold the first human coronavirus discovered in the 1960’s (Kirkpatrick, 1996; Su et al., 2016). Covid-19

Editorial

is the third serious coronavirus outbreak to occur in the last 20 years, following the 2003 severe acute respiratory syndrome (SARS) and 2012 Middle East respiratory syndrome (MERS) outbreaks (LeDuc & Barry, 2004; Yang et al., 2020). Influenza and coronaviruses share many similarities, including the manifestation of neurological symptoms associated with poor outcomes (Li, Bai, & Hashikawa, 2020; Mao et al., 2020; Talan, 2020). It is not clear whether these symptoms and subsequent neurological events are a direct cause of the virus entering the central nervous system, or an indirect response to an overwhelming systemic viral storm (Fitzgerald, 2020). The most likely mode of infection is either a haematogenous or retrograde neuronal route (Mao et al., 2020).

Around 73% of Covid-19 cases are reported as being mild, however for the 18% of individuals who present with severe symptoms (Tian et al., 2020), the likelihood of neurological symptoms and complications increases. Mao et al. (2020) were among the first to report the prevalence of neurological symptoms associated with Covid-19, with 36% of individuals within their hospital-based cohort experiencing neurological symptoms. Clinical neurological manifestations include mild symptoms such as headache, dizziness and ataxia, myalgia (Lai, Shih, Ko, Tang, & Hsueh, 2020; Li et al., 2020; Mao et al., 2020; Talan, 2020), as well as more significant subsequent neurological events including altered level of consciousness, stroke, seizures, encephalopathy and central respiratory failure (Chen et al., 2020; Mao et al., 2020). Post-viral immune mediated complications such as acute disseminated encephalomyelitis and Guillain-Barré syndrome are also reported (Talan, 2020). Hypoxic encephalopathy associated with viral infections is often intractable and associated with an acute and rapid neurological deterioration (Achiriloaie et al., 2016). The spread of viruses via a synapse-connected route to the brainstem, including the medullary cardiorespiratory centre, is potentially partially responsible for acute respiratory failure (Khan et al., 2020; Li et al., 2020; Matsuda et al., 2004). Rates of hypoxic encephalopathy, as high as 20% in hospitalised cohorts (Chen et al., 2020), are also similar to previous influenza studies (Newland et al., 2007).

We are only just beginning to learn about Covid-19's various manifestations and complications. Whilst it is too early to make definite statements, the neuroinvasive propensity of Covid-19 has been well documented and not unexpected from our knowledge of influenza and other coronaviruses. Defined as "the greatest medical holocaust in history" (Waring, 1964), the 1918 pandemic of Spanish flu may yet be surpassed. Covid-19 has resulted in a worst-case scenario where lives are dominated by not only loss but also by unimaginable social and economic privation. So, now is the time to advance our awareness and to share our nursing knowledge with each other. We are already seeing that Covid-19 does not limit infection to the cardiorespiratory system. While the overall mortality of Covid-19 is lower than that of both SARS and MERS, its atypical symptoms, rapid person to person transmission and international spread is making it more deadly (Chen et al., 2020). It will be our awareness and close attention to neurological manifestations that will enable swift intervention and the possible saving of lives.

Linda

Linda Nichols
Editor

DOI: 10.21307/ajon-2020-001a

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Help determine the impact of COVID-19 on neurocritical care by participating in research.

The Neuro Critical Care Society has developed an international collaborative using common data elements for a number of studies. If you are interested in collaborating with these efforts. Please see https://www.neurocriticalcare.org/research/covid-19-research-opportunities

Guest Editorial

A Neuro Reflection

WFNN Executive: Christi DeLemos, ***Vicki Evans*** *& Dawn Tymianski .*

As mortality rates decline, the global burden of neurological disease is on the rise. Stroke affects 15 million people worldwide each year, contributing to 5 million deaths and another 5 million left with permanent disability (Vos et al., 2017). By 2050, the rate of dementia is expected to triple to 115 million worldwide (Prince et al ., 2013). Over the last twenty years, we have seen dramatic advances in the treatment of neurological disease. The National Institute of Neurological Disease (NINDs) trial that tested t-PA opened the door for successful treatment of acute stroke reducing death and disability (Koroshtez, 1996). In 2015, the results of five trials that evaluated endovascular treatments showed the profound benefit of early removal of thrombus in anterior circulation strokes (Goyal et al., 2016). Lessons from Finland taught us to reorganize our care, bypassing the red tape of "checking in patients" to adopt a "door to CT" approach that substantially reduced "door to needle" times and improved outcome (Lindsberg et al., 2006). In developed countries, medical progress has promoted the growth of specialized care units and tailored treatment for stroke, traumatic brain injury, dementia and Parkinson's disease. These advances have opened the door for dedicated nursing training with certification programs like the Neuro Criticalcare Society's Emergency Neuro Life Support (ENLS) aimed at improving care in the first critical hour after any neurological emergency. However, all of these advances come at a cost.

As the care of neurological disease becomes more sophisticated, the countries that are least able to afford the equipment or mobilize highly subspecialized teams will experience a widening gap (Carroll, 2017). Treatment that relies on extensive resources may be impractical when it is accomplished at the expense of other critical services. It's impossible to consider an endovascular approach to stroke care when two patients are sharing a bed and generator power is at best, intermittent. The challenge is to surround these countries with range of solutions to provide best care within their existing resources.

A thoughtful evaluation that assumes nothing is essential. In some countries, nurses still do not perform a neurological exam. This level of evaluation still resides at the physician level. Changing patterns of care is highly political and requires an advanced working knowledge of education standards, workforce utilization and the available support for change. The acceptance and willingness to change from the inside and to see things in a different way is required. "Outsiders" cannot push something that is not supported from within. For example, if a nurse is responsible for the care of 45 patients, the overwhelming burden of basic care tasks may exclude more advanced neurological evaluation. The physical challenges of available supplies may also be a barrier. They may lack the funds to purchase or maintain neuromonitoring equipment or have access to the qualified staff needed to insert such devices. Local roles and responsibilities may differ substantially and education programs must be carefully crafted with the patient as the central focus.

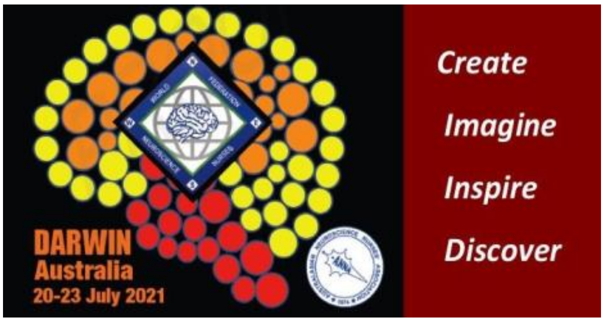
The World Federation of Neuroscience Nurses (WFNN) represents more than 8,800 members world-wide with representation from 13 countries. Initiatives over the last decade have been aimed at connecting nurses globally to promote the professional practice of neuroscience nursing, foster an open dialogue about the care of neurological disease that crosses cultures and national boundaries and support the development of professional neuroscience nursing societies. WFNN education projects have been concentrated on basic skills like the neurological examination that is the cornerstones of patient management. In partnership with the member nations, it is the Quadrennial Congress that connects nurses from across the world to share nursing research, expand the fund of knowledge and forge international friendships that raise the standard of care worldwide.

Guest Editorial

As the global burden of neurological disease rises, we must leverage professional partnerships to improve regional education. The *Australasian Neuroscience Nurses Association* and other WFNN members must work together to meet the growing challenge by improving access to basic neuroscience nursing training. Public education focused on prevention, is equally important. Key partners working in tandem with this effort include the *European Association of Neuroscience Nurses* (EANN), *Neurocritical Care Society*, (NCS), *World Federation of Neurological Societies* (WFNS), The *World Stroke Organization* (WSO), the *Movement Disorders Society* (MDS), the *World Parkinson's Association* (WPA), The *International League Against Epilepsy*, (ILAE), The *Multiple Sclerosis International Federation* (MSIF) the *World Federation of Neurorehabilitation* (WFNR) and numerous others.

In 2021, the WFNN will welcome nurses from across the world to join us in Darwin, Australia for the 13th Quadrennial Congress. The Congress represents a unique opportunity to learn from one another and advance global bank of knowledge. Share your nursing knowledge with the world! More information is available on the website at www.wfnn.org As a benefit of membership in ANNA, your membership with the WFNN is already paid. If you have developed leadership skills and you are looking for a global challenge, WFNN is accepting applications for leadership positions. Information can be found at https://wfnn.org/about.

We look forward to meeting you in Darwin!



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Christi, Vicki & Dawn

DOI: 10.21307/ajon-2020-001b

The World Federation of
WFNN | Neuroscience Nurses

Sydney Neuroscience Symposium

NEW DATE!

Friday 12th February, 2021

8:30am – 5pm

Keynote Speakers:
Christi DeLemos (USA) ● Dawn Tymianski (Canada) ● Cindy Bautista (USA)

Registration - www.anna.asn.au

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Oral Care for Neuroscience patients in New Zealand – A national survey

Caroline Woon

Nurse Educator, Neurosciences, Capital & Costal District Health Board New Zealand

Aims: To understand the experience and knowledge of neuroscience nurses working in acute ward settings in New Zealand regarding oral care.
To determine what educational requirements were needed to standardise oral care.

Data sources: A systematic review of articles was conducted using Cinahl, PubMed, Cochrane and Google scholar between 2007-2019.

Methods: An online survey using Survey Monkey with three out of five units participating from the north and South Island of New Zealand using qualitative and quantitative data.

Results: 34% of nurses completed the survey from three different neuroscience wards. Oral hygiene education was provided to the majority of respondents during their initial nursing training, however this was considered inadequate and most nurses did not receive oral hygiene education since their training. It was considered that there was a lack of oral care assessment tools and guidelines available in New Zealand. A lack of evidence-based practice existed. Therefore, inconsistencies over products and frequency of care was problematic. Barriers to effective oral care included the uncooperative patient, lack of access to the mouth and a perceived lack of time to provide oral care.

Conclusion: The experience and knowledge of neuroscience nurses in this study was varied. An opportunity existed to implement an oral assessment tool and guideline which could improve the oral care of the neuroscience patient and standardize care throughout New Zealand. Oral hygiene education should be provided and available for nursing students, registered nurses, health care assistants, patients and family to ensure consistent effective oral care.

Impact: As a result of this study, a guideline and assessment flowchart were created with an online e-learning experience. This was distributed to a number of hospitals nationwide to ensure standardization of care across all neuroscience wards.

Keywords:

Oral care, neuroscience, nursing guidelines, assessment tools

Introduction

Oral care is a pertinent issue in neuroscience nursing as many patients are unable to maintain their oral hygiene due to reduced consciousness, cranial nerve palsies or limb weakness. Oral care practice is based on tradition or experience rather than evidence based (Cohn &Fulton, 2006; Coker et al., 2017). Thirteen studies on oral hygiene practice and experience in nursing were explored. Binkley et al (2004) developed a questionnaire tool which formed the basis of four surveys (Chan & Ng., 2012; Perrie & Scribante., 2011; Saddki et al., 2014; Soh et al., 2011).

Binkley et al. (2004) carried out a large quantitative survey (n = 556) which had face and content validity, was developed by a research team and conducted in 421 intensive care units in the United States.

Questions or comments about this article should be directed to Caroline Woon
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DOI: 10.21307/ajon-2020-002

Twenty-seven questions using the five-point likert scale examined attitudes, knowledge and belief, types and frequency of care provided, training and hospital provision within their questionnaire.

Three studies of neuroscience nurses were identified, from the Netherlands, USA and the United Kingdom (Cohn & Fulton, 2006; Hollaar et al., 2015; Horne et al., 2015). The USA study was small, for both nursing staff (38%, n=15) and unlicensed staff or health-care assistants (60%, n=15) (Cohn & Fulton, 2006). This was the only study to question health-care assistants as well as nursing staff. They used different questionnaires for the two groups and looked at attitudes, beliefs and preferences regarding oral care. This study recommended the use of open-ended questions to collect more information. Hollaar et al. (2015) used a questionnaire to examine the knowledge and skills of nursing staff in oral hygiene, and also educated staff using a guideline and then evaluated their knowledge by examination (n = 18). Both the above studies were small, carried out in a single hospital, so generalizability was limited. Horne et al. (2015), carried out a mixed-method survey using a combination of focus groups and telephone interviews with senior nurses on a stroke unit (n = 11). Common themes arose including oral care was a neglected area, stroke patients lacked awareness of the importance of oral hygiene and there was a lack of advice provided for them. Nurses were aware of the importance of effective oral care but lacked knowledge and education. Protocols and assessment tools were also unavailable.

There were no studies exploring oral care amongst neuroscience nurses in Australasia. Only three studies worldwide explored neuroscience nurses' experiences and practice in oral care and most were conducted in intensive care. Therefore, a need existed to explore ward nurses' experience and practice in oral care. Several common findings of the surveys regarding oral hygiene practice and experience in nursing existed which will be discussed.

THE STUDY

Methods:

Research aim

This study aimed to explore the experience and knowledge of nurses, working on acute neuroscience wards providing oral care for their patients. The findings will aim to contribute to the development of evidence based oral hygiene education to guide and standardize practice in New Zealand.

Survey design

This survey was designed as a cross sectional survey. Binkley et al (2004) permitted the use of their validated questionnaire and the original was provided. Some statements and questions were changed to reflect experiences of ward nurses providing oral care rather than critical care units and the language was also reviewed.

The survey was designed online using Survey Monkey with twenty five questions. Closed questions were used to reduce the time for completion; some contained the option 'other' so participants could make additional comments. A series of statements using the 5 point Likert scale were modified and included to reflect the ward setting. (See appendix 1).

The quantitative questions collected nominal and ordinal data. Qualitative questions were explored to gain more knowledge and scenario-based questions included as it was more realistic, allowed for deeper insight, and was suggested in a previous study (Chan & Ng, 2012). Content validity was ensured by consultation with a hospital dentist who reviewed the questionnaire. A focus group of five local neuroscience ward based nurses pre-tested the questionnaire. Telephone interviews were conducted with the educators or nurse managers who acted as gatekeepers to determine their oral care practice within their ward.

Sample

There were approximately 150 neuroscience nurses within five neuroscience wards in five hospitals in New Zealand. To maximize sample size and increase external validity, purposive sampling was used, targeting a group of people with specific characteristics or experiences. In this survey, one unit declined participation and the researchers own ward was excluded. Therefore three neuroscience wards in three tertiary hospitals in New Zealand participated. The inclusion criteria comprised neuroscience registered nurses and enrolled nurses working clinically on an acute ward. Nurses working in all ethnic groups, ages, levels of experience and genders were included. . The exclusion criteria included any health care professionals who were not nurses, any nurses working in critical care or nurses who were not working clinically.

Data collection

Questionnaires were distributed via email to the gatekeepers who were nurse educators or ward managers to all three units using Survey Monkey. A reminder email was sent once a week for four weeks to ensure a maximum sample size. After 4 weeks, there were only 22 responses, so the survey period was extended by three weeks for a total of 7 weeks. This produced 34 responses.

Ethical considerations

The ethics application for this study was reviewed by a committee of experienced academic researchers and was judged to be low risk. The Massey University Code of Ethical Conduct, Teaching and Evaluations involving Human Subjects (2015) guided the research process.

Table 1. Demographic Profile of Participants

Demographics		**N = 34**	**%**
Category of nurse	An enrolled nurse	2	5.9%
	A Registered nurse	32	94.1%
Gender	Male	3	8.8%
	Female	31	91.2%
Highest level of professional qualification	Nursing diploma	4	11.8%
	Bachelor of Nursing	13	38.2%
	Post graduate certificate	9	26.5%
	Post graduate diploma	4	11.8%
	Post graduate masters	3	8.8%
	Other (please specify)	1	2.9%
Years of nursing experience	<1 yr	1	2.9%
	1-10 yrs	18	52.9%
	11-20 yrs	6	17.6%
	21-30 yrs	6	17.6%
	31-40 yrs	1	2.9%
	41-50 yrs	2	5.9%
	Range 0.5-45 yrs		
	Mean	12 yrs	
Country of nursing training	New Zealand	26	76.5%
	Philippines	4	11.8%
	United Kingdom	2	5.8%
	Other	2	5.8%

Participants had the right to full disclosure of information. An information sheet was sent with the questionnaire to explain the rationale and ensure participants were fully informed about the research. Consent was implied when they chose to complete the survey. The information was kept securely in a password protected computer and the data was securely archived. The institutions and clinical leaders gave their consent for the research to be conducted and their research departments were fully informed.

Data analysis

The quantitative data was exported from Survey Monkey into an excel spreadsheet, further exported into the Statistical Package for Social Sciences (SPSS) and screened for incomplete information. Descriptive statistics and frequencies were used to analyze the results. This data was presented in tables and graphs. A content analysis was used to analyze the qualitative data from the questionnaire. In this study, the data from the open-ended questions were read and put into categories identifying key themes and then collated in a table with examples of common responses.

Results and discussion:

Demographics

There were 94.1% (n=32) registered nurses, 5.9% (n=2) enrolled nurses in the sample and of these 91.2% (n=31) were female (Table 1). Some nurses had nursing experience over 40 years 5.9% (n=2) but the majority worked between 1-10 years (52.9 %, n=18). The mean nursing experience was 12 years.

Oral hygiene education and knowledge perception

The majority of these nurses (64.7%, n=22) recalled having oral hygiene education during their nursing training. Adequate training was reported by 55.9–88% of nurses in other studies (Binkley et al., 2004; Chan & Ng.,2012; Saddki et al., 2014; Soh et al., 2011). Some of these nurses believed their education was adequate (40.6%. n=13) with 25% (n=8) rating their oral hygiene training as inadequate. When starting on their current ward, 57.6% (n=19) of the nurses did not receive any oral hygiene education. A total of, 60.6% (n=20) of the nurses believed their oral hygiene knowledge was good. With 65–94.7% of nurses were keen for further training or guidelines.

Statements about oral hygiene:

Attitudes

Nurses were asked to comment on a series of statements using a 5 point Likert scale of strongly disagree, disagree, neutral, agree, and strongly agree. The majority of respondents agreed that oral hygiene was a high priority when caring for their patients (agreed 50%, n=17; strongly agreed 35.3%, n=12). This is comparable to the literature where over 89% of the nurses rated oral hygiene a high priority (Azodo et al., 2013; Binkley et al., 2004; Chan & Ng, 2012; Perrie & Scribante, 2011; Saddki et al., 2014; Soh et al., 2011). Almost all nurses believed that oral care significantly impacted on their patients' clinical outcomes with 52.9% (n=18) agreeing and 26.5% (n=9) strongly agreeing. Most nurses were also satisfied with their own oral care provided to patients with 44.1% (n=15) agreeing and 26.5% (n=9) strongly agreeing. Although some nurses believed other procedures took priority over oral care (47.1%, n=16).

Professional development

Nurses were asked to comment on several statements regarding oral hygiene education and educational requirements. The majority of respondents remained neutral on whether they required more information on evidence based oral care (41.2%, n=14) or an in-service session (47.1%, n=16) with a mode of 3 for each statement. In the survey, 85% (n=29) of the respondents did not have an oral assessment tool available for use on the ward. Some respondents agreed (47.1%, n=14), and 14.7% (n=9) strongly agreed that they assessed the oral health of their patients regularly, although 42.4% (n=13) agreed and 27.3% (n=8) strongly agreed they would like an oral assessment tool to help them assess the oral health of their patients.

Management of oral care

Nearly half of the respondents said nurses were solely responsible for the oral care of patients (47%, n=16) although others 32% (n= 11) thought that nurses and health care assistants shared responsibility. With a lack of training and inability to use suction it would be inappropriate to delegate this task to a health care assistant, as it is beyond their scope of practice (Klein et al., 2017). Health-care assistants should be educated about the principles of oral care but, only nurses should provide oral care for patients with dysphagia. Neuroscience patients are a complex population with aphasia or dysphagia, an impaired ability to chew with reduced oral clearance increasing bacterial load and high risk of pneumonia and therefore should be cared for by nurses due to aspiration risk (Ajwani et al, 2017; Kwok et al 2015).

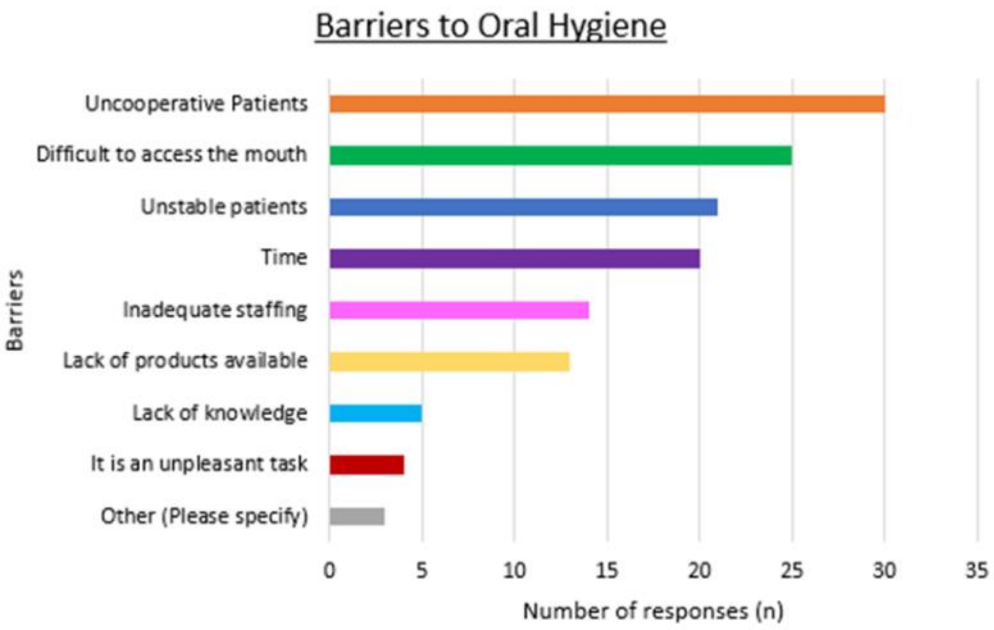
Dental teams and complications

The majority of nurses were unsure if a dental team was available in the hospital (55.88% n=19). Nurses were asked to comment on when they would contact the dental team and three people mentioned for infections and two specified brain abscesses. Some mentioned broken, loose or rotten teeth. In a study of nurses and health-care assistants, Cohn and Fulton (2006) determined that 60% were aware of a lack of expert input, particularly surrounding guidelines, and recommended that such input is important to improve care. A qualitative question was asked about the complications caused by poor oral hygiene to assess nurses' knowledge. Infection, although unspecified, was frequently mentioned (n=17) as well as thrush (n=16). Dry mouth, halitosis (bad breath) was mentioned infrequently. Poor oral hygiene leads to pneumonia, prolonged hospital stay and even death (Dietrich et al, 2017; Martino, 2005; Scannapieco & Shay 2014). There was no mention by respondents of a link with cardiovascular disease, stroke and a poorer prognosis of diabetes, as identified in the literature (Borgnakke et al., 2013; Dietrich et al, 2013).

Barriers

A lack of co-operation was the biggest barrier to effective oral care in this study (see graph), with issues related to low levels of consciousness, lack of bite reflex and confusion identified. These conditions were also identified in other studies (Costello & Coyne, 2008; Hollaar et al., 2015; Chan & Ng, 2012). Nurses lacked the ability to access the mouth as patients often bite down, which was the second most common barrier reported. Dale et al. (2016) carried out an ethnographic study of intensive-care nurses and their experiences of oral care and determined that it is difficult to provide oral care when the patients bite down, making access difficult. Bite blocks or tools to open the mouth need to be explored. The third most common barrier was unstable or critically unwell patients also identified as a barrier by Chan and Ng (2012).

Time was a common barrier and could be related to the nurse–patient ratio, which is 1 nurse to 4–6 patients in neuroscience wards in New Zealand, compared to 1 nurse to 1–2 patients in critical care, as in the study by Chan and Ng (2012). Costello and Coyne (2008), in their survey of nurses in the United Kingdom, also reported time as a common barrier. This could be linked with inadequate staffing, which is widely reported in nursing (Twigg et al., 2015). Improved nurse–patient ratios contribute to improved outcomes (Aiken et al., 2011). When considering time as a factor, most respondents said that oral care would take between 5 and 10 minutes. The literature reported that a lack of time restricted the provision of ef-



fective oral care (Wårdh, Hallberg, Berggren, Andersson, & Sörensen, 2003; Costello & Coyne, 2008). When recommending products, time must be a consideration and ease of product use is fundamental.

Education of staff

Professional development regarding oral hygiene emerged as an important issue from the results of the questionnaire. Several studies have identified that oral hygiene education is lacking and created a barrier to effective oral care (Costello & Coyne, 2008; McGuire, 2003; Smith et al., 2016; Talbot et al., 2005).

Knowledge and products

To assess the nurse's knowledge a series of scenarios were given to determine their choice of products and frequency of use. There were differences in timing for the use of products and this is well reported in the literature (Costello & Coyne, 2008; Horne et al., 2014). Oral care varies amongst nurses due to the large product range which is rarely evidence based (Cohn &Fulton, 2006; Coker et al., 2017). However toothbrushes and paste were commonly used throughout the scenarios, which is recommended twice daily and prevents plaque build-up, periodontitis and gingivitis (Chan & Ng, 2012; New Zealand Dental Association, 2010; Prendergast, Jakobsson, Renvert, & Hallberg, 2012; Prendergast et al., 2013).

Mouthwash featured highly in all three scenarios; 79.41% of respondents used this product for mouth care; although this is known to cause xerostomia (dry mouth) and should be avoided (Eilers, 2004; Shi et al., 2013). Foam swabs were also reported to be commonly used for mouth care (79.41%). Dale et al (2016) carried out an ethnographic study and reported the texture of these swabs are not popular and make oral care more difficult. Swabs are predominantly for comfort care and do not replace toothbrushes and are not effective for the removal of plaque or debris (Chan & Ng, 2012). In the UK mouth swabs have been removed from practice due to a patient death (Medicines and Healthcare Product Agency, 2012).

Nurses were asked if they would allow family members to carry out oral care of a patient with a poor swallow and inability to provide their own care. Surprisingly 48.48% (n=16) said they would allow them to provide care. Family members should not carry out this task for patients with poor swallow or cognition due to the risk of aspiration and pneumonia. Garrouste-Orgeas et al. (2010), carried out a study to investigate family participation in the intensive care unit and 97% (n=101) of families wanted to be involved in care. Oral care was thought to be one of the more appropriate tasks for families to provide by doctors, nurses and health care assistants. However, while 65.3% of nurses favoured family participation in oral care, some expressed concerns of adverse events during care.

In the second scenario a patient had a dry mouth and lips, and was unable to provide their own care, a common situation in neuroscience patients. Toothpaste and toothbrushes were used mostly 12 hourly. Mouthwash and swabs featured again in this scenario and, therefore, would add to the problem of dry mouth. Artificial saliva was used by a third of the respondents for dry mouth, but this can cause a coating to form on the tongue and patients find this unpleasant or perceive more difficulty with swallowing as a result (Furness et al., 2011). A dry-mouth toothpaste and gel, such as the Oral7® product neutralizes the mouth and prevents the build-up of plaque, which was considered locally and recommended by dentists. The gel acts as saliva in the mouth and can be used regularly with patients' mouths easier to clean as a result.

A patient with a full set of dentures was mentioned in the last questionnaire scenario. One-third of the respondents mentioned the use of denture tablets once daily. This should occur at night time, when dentures are removed for soaking in a sealed container to prevent the occurrence of denture stomatitis and reduce the risk of pneumonia (Coker et al., 2017; Iinuma et al., 2015; Gendreau and Loewy, 2011). Coker et al. (2017) reported that patients refuse to have their dentures removed while in hospital mostly because they don't want to be seen without them, and they did not find that these patients developed denture stomatitis. However, wearing dentures overnight doubles the risk of pneumonia according to Iinuma et al. (2015).

Availability of products was addressed by the questionnaire. Toothbrushes, toothpaste, foam swabs, mouthwash and artificial saliva were provided in all of the three hospitals. However, the availability of denture-cleaning tablets was low and needed to be addressed.

Thrush was the most commonly mentioned complication nurses encountered in practice, present in immunocompromised hospitalized patients, those with dysphagia, patients taking steroids or antibiotics, or patients with xerostomia (Kragelund et al., 2016). When asked about the oral complications that can occur in their patients, respondents commented about dry mouth and a dry or coated tongue. It is unclear whether this is attributed to the use of saliva substitutes.

Guidelines and tools

One hospital used a universal guideline, not specific to their department or neuroscience, but the other two units did not. In the survey, most nurses agreed that they would like to have an oral assessment tool. No national guidelines were available to standardize care and thus variations occurred in oral care. Currently, oral assessment tools exist for oncology and neuroscience intensive care, but none are available for use with ward-based neuroscience patients (Eilers et al., 1988; Prendegast et al., 2013). There is also a lack of guidelines for oral care in neuroscience patients and there is a need for more research in this area (Hollaar et al., 2015). A nationally available assessment tool and guideline would be beneficial.

Quality of results and limitations

Generalizability was not possible, due to the small sample size (34%) The recruitment period had to be extended due to the poor uptake of the questionnaire from 4 weeks to 7 weeks. Bias has to be considered, as those nurses more interested in oral hygiene would have been more likely to participate. The individual wards were not identifiable.

Conclusion:

This research was the first oral care survey of neuroscience nurses in New Zealand. It was important to determine the knowledge and experience of these nurses to discover what was lacking and what was required to improve care. Although the sample size was small, it was still possible to demonstrate a variety of practices and knowledge along with a lack of guidelines or oral assessment tools in use and therefore a lack of consistency in practice. Nurses reported that oral care was a high priority. Adequate education had been provided in nursing training, however there was a lack of oral hygiene continuing education on the ward. Nurses are pivotal in their provision of oral care and education is fundamental to ensure they understand their role and the implications of ineffective oral hygiene. Health care assistants also provide oral care but require further education. Nurses should be responsible for the oral care of patients with dysphagia to prevent complications. Collaboration between dentists, and nurses could be improved allowing improved referral processes.

Mouthwash featured in the scenario responses and respondents appeared unaware of the consequence of xerostomia. Furthermore, oral swabs are a health and safety concern and should be removed from practice and replaced with a toothbrush for all oral care. Further education is required for xerostomia. A lack of denture paste and denture tablets existed in the ward environment and was highlighted nationwide with a range of products for implementation. Infection and thrush were the most reported complications, and education could be provided about the best care for these complications.

Recommendations

The development of an easy to use and quick to complete oral assessment tool and guideline would standardize care. The main oral health problems are dry mouth, poor swallow, and dentures. The guideline needs to identify products useful for these conditions. Education should be provided regularly for all nurses and health care assistants in how best to provide oral care.

Since the completion of this study, the oral care online learning package has been developed for use for health care assistants, nurses and speech and language therapists. A guideline (see appendix 1) and flowchart has been implemented with a positive response. A standardized approach should be used to improve care with collaboration between hospitals.

Conflict of Interest statement

“No conflict of interest has been declared by the author(s).”

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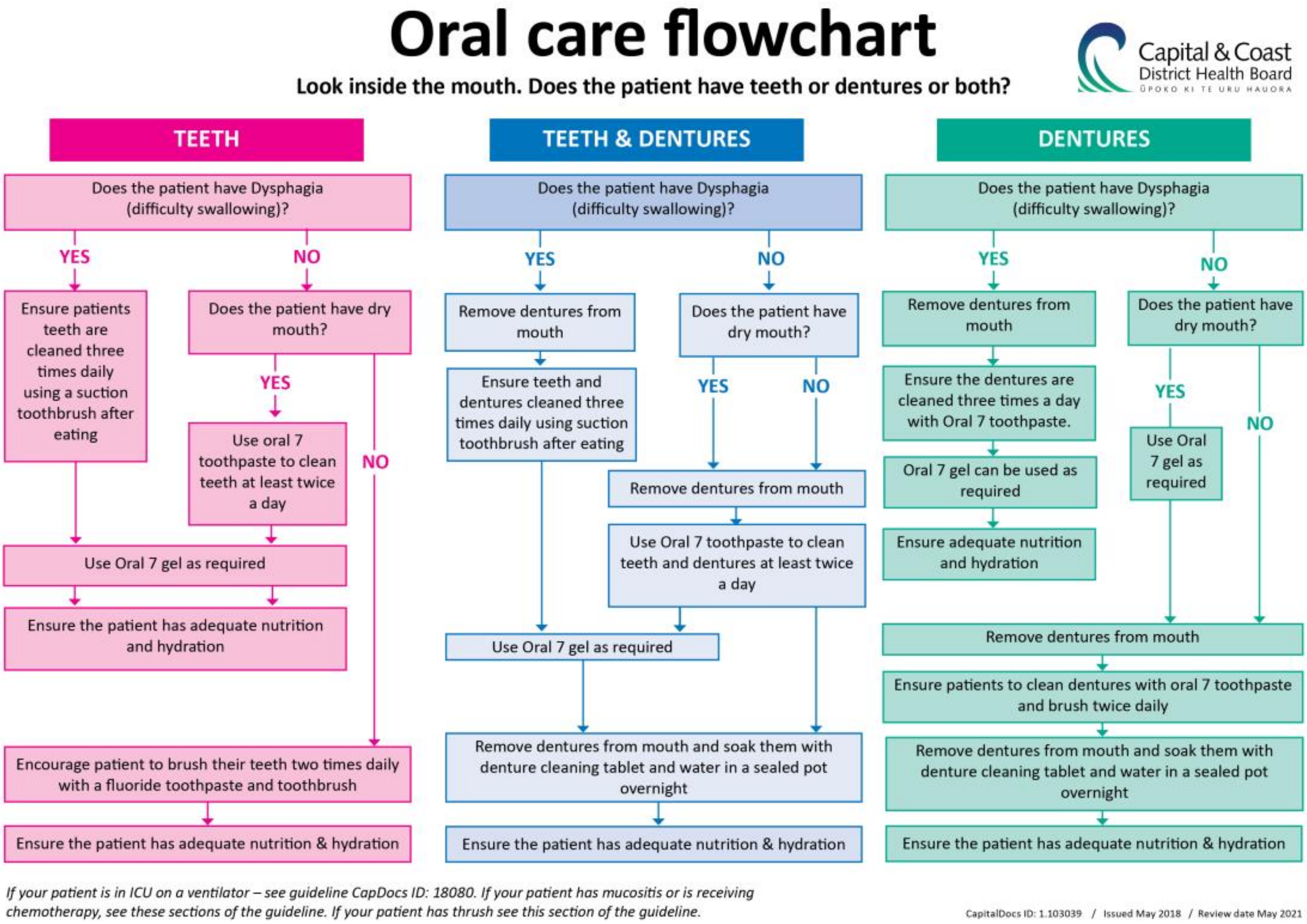

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Appendix 1: Oral hygiene Questionnaire for Nurses

Information sheet

Neuroscience nurses knowledge and experience of oral hygiene in acute care.

A questionnaire for nurses working in acute neuroscience areas

You are invited to participate in a study about nurses knowledge and experience of oral hygiene in acute neurosciences. This project is being carried out by Mrs Caroline Woon who is a masters student at Massey University.

The purpose of the research is to determine the knowledge and experience of nurses working in the acute neuroscience wards or units within New Zealand. As a result, the importance of oral hygiene for these patients will be highlighted with some key points for implementation to improve care in your area.

You have received this questionnaire from you charge nurse manager or educator and is anonymous. This anonymous questionnaire will take up to ten minutes to complete.

You are under no obligation to complete this questionnaire. You have the right to decline any particular question. Please complete this questionnaire on survey monkey, the link is provided below.

The results are collated and individual nurses cannot be identified. The data collected will be kept on a password protected computer.

If you wish to obtain a copy of the results of this research, please email caroline.woon@ccdhb.org.nz.

This project has been approved through the Massey Ethics approval application process as well as approval by the Maori Research committee at the local hospital and your local hospital research department.

Neuroscience nurses knowledge and experience

Are you:

An enrolled nurse
A Registered nurse

Are you:

Male
Female

Do you work on:

A Neuroscience ward
A neuroscience high dependency unit
A neuroscience Intensive care unit.

What is your highest level of qualification?

Nursing diploma
Bachelor of Nursing
Bachelor of Nursing (Pacific)
Post graduate certificate
Post graduate diploma
Post graduate masters

How many years of experience do you have as a nurse?

0-5 years
6-10 years
11-15 years
16-20 years
21-25 years
More than 25 years

Which country did you qualify as a nurse?

In your nursing training did you have education about oral hygiene?

Yes
No
Can’t remember

Did you feel it was:

Good
Adequate
Poor

Did you have oral hygiene training when you started on this ward or unit?

Yes
No
Can’t remember

Did you feel it was :

Good
Adequate
Poor

Do you think your knowledge of oral hygiene practices is:

Good
Adequate
Poor

Do you have an oral hygiene assessment tool on your ward?

Yes
No
Unsure

Please indicate how strongly you agree or disagree with the following statements

I believe oral hygiene is a high priority for my patients

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

The oral cavity is a difficult area to clean

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

I find cleaning the oral cavity to be an unpleasant task

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

I believe that good oral care has a significant impact on patient's clinical outcome

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

I am satisfied with my oral care practices

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

I have been given adequate training in providing oral care

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

I need more information on research-proven oral care standards

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

Attending an in-service on proper oral care is a priority for me

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

There are often other procedures my patients require more urgently than oral care

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

I assess the oral health of my patients regularly

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

I would like an oral assessment tool to assist me to assess oral health

Strongly disagree
Disagree
Neutral
Agree
Strongly agree

What barriers have you experienced to providing oral care for your patients?

Uncooperative patients
Lack of products available
Time
Other (please specify)
Unstable patient
Lack of knowledge
Difficult to access the oral cavity
Inadequate staffing
It is an unpleasant task

What products do you routinely use for oral hygiene?

Manual Toothbrush
Electric Toothbrush
Vaseline/Vitamin A
Artificial saliva
Coconut oil
Foam swab
Toothpaste
Cocoa butter
Denture cleaning tablets
Gauze
Mouthwash
Sodium bicarbonate
Soap

Describe what oral care, what products you would use and how often, you would provide for:

A patient with their own teeth who is unable to perform their own oral care…..

A) and has difficulty swallowing

Frequency

Once daily
4 hourly
Twice daily
2 hourly
8 hourly
1 hourly

Products

Manual Toothbrush
Electric Toothbrush
Vaseline/Vitamin A
Artificial saliva
Coconut oil
Foam swab
Toothpaste
Cocoa butter
Denture cleaning tablets
Gauze
Mouthwash
Sodium bicarbonate
Soap

B) has a dry mouth and lips and is unable to perform their own oral care

Frequency

Once daily
Twice daily
8 hourly
4 hourly
2 hourly
1 hourly

Products

Manual Toothbrush
Foam swab
Gauze
Electric Toothbrush
Toothpaste
Mouthwash
Vaseline/Vitamin A
Cocoa butter
Sodium bicarbonate
Artificial saliva
Denture cleaning tablets
Soap
Coconut oil

C) A patient who has a full set of dentures

Frequency

Once daily
Twice daily
8 hourly
4 hourly
2 hourly
1 hourly

Products

Manual Toothbrush
Foam swab
Gauze
Electric Toothbrush
Toothpaste
Mouthwash
Vaseline/Vitamin A
Cocoa butter
Sodium bicarbonate
Artificial saliva
Denture cleaning tablets
Soap
Coconut oil

Please circle which of the following are available in your ward/area

Toothbrush
Foamstick
Gauze
Toothpaste
Mouthwash
Vaseline/Vitamin A
Cocoa butter
Sodium bicarbonate
Artificial saliva
Denture cleaning tablets
Soap
Coconut oil

Please list any other products available for you to use for oral care

Is there a dental team in the hospital?

Yes
No
Unsure

When would you contact the dental team about your patient?

In your ward who is responsible for providing oral care for patients?

DR
Nurse
HCA
Student

What complications can be caused through poor oral hygiene?

How confident do you feel with doing the following?

A) Cleaning the teeth of your patients

Not at all confident
Not sure
Confident
Very confident

B) Caring for dentures

Not at all confident
Not sure
Confident
Very confident

C) Assessing oral care needs

Not at all confident
Not sure
Confident
Very confident

D) Giving oral care advice to your patients

Not at all confident
Not sure
Confident
Very confident

E) Giving oral care advice to your colleagues

Not at all confident
Not sure
Confident
Very confident

Thank you for your time and help with this project


REAL DRY MOUTH RELIEF
ORAL 7
Xylitol
boost the benefits of your saliva
WITH Active ENZYMES
MOISTURISING TOOTHPASTE
MOISTURISING MOUTHWASH
MOISTURISING MOUTH GEL

Newton's Laws, G-forces and the impact on the brain

Vicki Evans [1].

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Abstract

The thrill to go fast and push boundaries is something that many seek. From John Stapp's rocket sled at Edwards Air Force Base in the late 1950's to todays' Formula 1 drivers, the "need for speed" is broadcast across TV screens weekly. So too are the horror stories of crashes, many at over 300km/hr. Yet "need for speed" continues. It appears that the higher and faster the rollercoaster, the better. This leads to several questions. How does the brain stand up to speed and G-forces? Do Newton's Laws still have reference in today's world?

There has been much attention in the general press on the possibility that high G-force roller-coasters are inducing brain injury in riders. However, research does not wholeheartedly support this notion, but rather the risk of brain injury from a rollercoaster is not in the rides, but in the rider – caused by previously undetected brain or neck conditions. That said there is some truth that high G-forces do affect the brain at a chemical and structural level.

This paper will discuss the mechanism of head injury at speed and generally what Newton's Law means in a neurological setting in todays' world. Formula 1 racing and rollercoaster rides will be evaluated within a neuroscience context.

Key Words

Concussion, head injury, Newton's laws, Formula 1, roller-coasters

Introduction:

When thinking about head injury, one needs to first understand forces and the way they impact the body. Gravitational force, or G-force, is the force of gravity on a particular body – a measurement (in G's) of acceleration that causes the perception of weight. It has significant applications in scientific & engineering fields especially regarding racing cars, fighter jets, large engines and roller-coasters.

It is interesting to note (see table below) that the force of gravity whilst just standing on the earth, increases markedly with a slap on the back. Then further when in a car or a roller-coaster and even more if having sustained a concussion.

In today's modern age, Sir Isaac Newton's theories and laws are still included in the curriculum taught to students at school. From his theories of optics and calculus, to his groundbreaking work on the laws of motion and gravity, which formed the basis for modern physics, he dominates the fields of science, astronomy, physics and the natural world, proving invaluable to centuries of mathematicians, engineers and scientists.

In health, the **Valsalva manoeuver** is a technique of force used to equalise pressure (Pstras et al, 2016). People perform the Valsalva manoeuver regularly without knowing it. For example, it is used to increase colonic pressure to induce a bowel movement and it may also be beneficial when used intentionally to try to regulate heart rhythms. It is also used when experiencing a change in altitude to help equalise the ears by forcing them to 'pop', such as when scuba diving or in aeroplanes. The main side effect of performing the Valsalva manoeuver is hypotension and resultant forces impacting intra-ocular, intra-abdominal and intra-cerebral pressure.

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DOI: 10.21307/ajon-2020-003

These forces are also produced in the acts of vomiting, coughing and sneezing. As neuroscience nurses, the knowledge regarding the impact of these forces is known to be troublesome in relation to the consequences of these forces on intra-cerebral pressure and the homeostasis of the brain. It should be kept in mind that the involuntary act of sneezing has ramifications from a G-force perspective. The act of sneezing with an open mouth has a force of 2.9G's. Yet holding in a sneeze internally redirects the force and this can result in eye injury, ruptured ear drum, herniated nucleus pulposis (herniated disc) and throat injury (Yang et al 2018).

Table 1: How Many G's?

Standing on the Earth	1G
Rollercoasters	3.5-6.3G
A slap on the back	4.1G
Formula 1 racing car	5G
The luge at Whistler	5.2G
'Plopping' into a chair	10.1G
Sneezing (open mouth)	2.9G
Concussion	80-100G

Adapted from Slade (2009)

Newton's First Law: (Inertia). An object will remain at rest, and an object will remain in motion, unless acted upon by an unbalanced force. For example, a fast car hits a brick wall. The car stops…but the person does not. Since an object at rest stays at rest, rollercoasters have to be pushed or pulled along the track. In this way, potential energy is stored for the entire ride. At the top, the rollercoaster is put into motion and will not stop until the brakes are applied at the end of the ride.

The world's fastest rollercoaster is the *Formula Rossa* rollercoaster in Ferrari World, Abu Dhabi, United Arab Emirates. It is 53m high and has a maximum speed of 240km/h via a hydraulic slingshot launch. In this way, acceleration is 0 to 240km/h in 4seconds. The G-force is 4.8G, requiring the rider to wear goggles for eye protection.

Newton's Second Law: (Force = mass x acceleration). This law explains how the velocity of an object changes when it is subjected to an external force. This is felt when going down hills. The coaster cars and your body have mass. The gravity provides acceleration, which causes force. The rider feels the force as it moves the cars along the track. The track directs the force and the cars. In positive G's, the body feels heavier – at the bottom of the hills, turns and loops. For example, a 70kg person at 2G's would have the perception of 140kg and at 3G's it would feel like 280kg. Whereas with negative G's, the body feels weightless – at the top of the hills.

Newton's Third Law: (Action/reaction). For every action (force), there is an equal and opposite reaction. For example, as your body is pushed down into the seat of the rollercoaster, the seat pushes back.

Newton's Laws permiate throughout engineering and science fields and are still current in today's practice. It was **Dr John Stapp,** a United States Air Force Colonel, flight surgeon, physician, biophysicist, and pioneer in studying the effects of acceleration and deceleration forces on humans, who put Newton's Laws to the test on the human body.

At New Mexico's Air Force Base, December 10, 1954, John Stapp was strapped into the *Sonic Wind* rocket sled. His arms and legs were secured. There was no windscreen, so he wore goggles, a mouthguard and a helmet. The sled was powered by nine solid fuel rockets and it fired and propelled him more than 3,000 feet in a few seconds. He came to an abrupt stop and experienced a force equivalent to 46.2 G. Not without injury, he walked away with the world land speed record, 632 miles/hour, which he still holds today, giving him the title of "the Fastest Man on Earth" (Atwell, 2017). However, the blood vessels in his eyes had burst, rendering him temporarily blind. He also sustained bilateral wrist and rib fractures.

The outcome of these experiments allowed for the development of improved pilot harnesses and aircraft seats, modern crash-test dummies, the ejection seat and high-altitude pilot suits. Stapp's research improved aircraft safety and also led to the development of the shoulder seat belt. In September 1966, President Johnson, with John Stapp present, signed the Highway Safety Act, in which it was required that all new cars, as of 1968, sold in the USA, be fitted with seat belts (Ryan, 2015).

When thinking of acceleration, the picture that formulates is usually of a sports car doing 0 to 60 in six seconds. However, acceleration is any change in the velocity of an object – going faster, slowing down or changing direction. Therefore, on a rollercoaster, the G-forces are felt when rounding tight bends and thrown against the side of the seat (a change in direction) just as much as when falling from height (accelerate) or screeching to a stop (decelerate). The thrill is felt, but there is no fainting, because the rollercoaster was designed to be within the G-force tolerance of the average person. However, the amount of tolerable G-forces differs by individual and it also depends on several factors: the direction in which the G-forces are felt, the amount of G's involved, and how long those G's last (Evans, 2002).

At sea level, or 1 G, humans require 22 millimeters of mercury blood pressure to pump sufficient blood from the heart to the brain. In 2 G's, twice that pressure is needed, in 3 G's, three times, and so on. Even with a G-force of 4 or 5, the heart struggles to summon the necessary pressure. Blood pools in the lower extremities and the brain fails to be adequately oxygenated. Most people then faint.

Fighter pilots can handle greater head-to-toe G forces—up to 8 or 9 G's—and for longer periods by wearing anti-G suits. These specialised suits use air bladders to constrict the legs and abdomen during high G's to keep blood in the upper body. Fighter pilots can further increase their G-tolerance by training in centrifuges, which create artificial G's, and by learning specialised breathing and muscle-tensing techniques. Magnitude and duration of the forces are as critical as direction. Whilst John Stapp showed that people can withstand much higher G-forces than had long been thought, there is a limit to what most people can tolerate.

There is a limit to what humans can take. Tragically, Princess Diana proved that.

Princess Diana was a catastrophic example of how G-forces affect the human body. It was estimated that the G-forces on her chest were around 70 G's and 100 G's on her head. The acceleration caused a fatal tear in her pulmonary artery. If Princess Diana had been wearing a seatbelt, the G-forces would have been less and she may have lived. (Operation Paget Report, 2009).

While **Formula 1** (F1) racing drivers may feel around 5-G's, under heavy braking, they can experience over 100-G's if a crash causes them to decelerate quickly over a short distance.

The weekend of May 1st 1994, during the San Marino Grand Prix, was Formula 1's worst race weekend in history. That weekend of racing in ***Imola***, Italy, saw the death of Austrian, Roland Ratzenberger in practice and that of Brazillian, Ayrton Senna the following race day.

"God has had His hand over Formula 1 for a long time.
This weekend, He took it away".
Niki Lauda – Reuters, 1994.

Niki Lauda spoke these words in 1994 after Ratzenberger crashed at over 306kph during qualifying and 24hrs later, Senna died when his car slammed into a concrete wall at 220kph. Both died as a result of catastrophic head injuries. Following these deaths, F1 underwent many changes from car design to fuel and tyres. There hadn't been any deaths on the F1 circuit since 1994, but that came to an end in 2015 during the Japanese Grand Prix, when 25yr old driver Jules Bianchi crashed at 258kph and sustained severe head injuries. He succumbed to these injuries a few months later. The G-force sensor located in his earplugs recorded a 92-G impact (Bednall, 2014), much greater than the human body is designed to withstand.

G-forces act on **blood and blood vessels**. Just as they push the body into the seat, they also push the blood back away from the brain and toward the feet. Therefore, astronauts wear a **pressurised G-suit** that prevents blood pooling in the extremities. This is similar to anti-thrombotic stockings that can be worn for long-haul flights. If G-forces are brief, the effects on the body will be less. It is when G-forces linger, or are sustained, that causes concern. Hence, during launches of the space shuttle, controllers keep the shuttles' acceleration low—no greater than 3-G's, so as not to unduly stress the astronauts.

The eyes are especially susceptible to G-forces and some of the first signs of problems in the cockpit arise from partial loss of vision. Pilots know it as 'greyout' – greying of vision due to reduced blood flow to the eyes. This can serve as a warning of the decreased blood flow to the head. Consciousness is maintained but blood flow to the eyes is compromised. However in some studies, half the pilots experienced unconsciousness at the same time as the loss of vision, therefore a pilot cannot rely on visual disturbances to warn them of unconsciousness.

'Blackout' or loss of consciousness occurs when cerebral blood flow is reduced. In many centrifuge studies, the pilots were amnesic to the events of losing and gaining consciousness. Symptoms may include convulsive movements and slumping in the seat. This could be dangerous if falling against the controls. However, it is an individual experience whether or not consciousness is maintained. Tolerance is related to the rate of onset of acceleration and to the duration of exposure. Individual tolerance depends on factors such as the height of the person, age, elasticity of the blood vessels, training, the responses of the heart and blood vessels, and general health. G-forces can also detach a retina.

What do some animals have that humans don't?

Drake et al (2016) describe that the bighorn sheep, as a part of fighting and mating, routinely experience violent impacts to the head without negative consequences to their brains or horns. Their horns consist of a bony material and a trabecular mesh-like structure which absorbs the impact that occurs during ramming. The woodpecker too has significant internal structures that absorb the impact of pecking a tree at over twenty times per second. Their secured hyoid bone, uneven beak and tight cranial cavity absorb the shock. It is from studying these two animals in particular, that the researchers have developed improved mouthguards, helmets and flight data recorder cases. The European Organisation for Civil Aviation Equipment Committee, an international body on which the Australian Transport Safety Board (ATSB) was represented, revised the standards of flight data recorders in 2003. Today, these flight data recorders are able to withstand an acceleration of 3,400 Gs (3,400 times the force of gravity) (ATSB, 2014).

So where does the literature stand with regard to brain injury and rollercoasters?

In 2002 Smith & Meaney suggested that the human body can withstand very large G-forces when they occur over very short periods of time, which is the current thought today. They suggested that the loss of consciousness is from restriction of blood flow rather than mechanical injury to the brain. Their studies illustrated that to injure the brain, there needs to be greater linear force (G's) as well as rotational force. They went on to say that neck or back injuries would be far more likely than brain injuries from rollercoasters.

Again, the thought in 2003 was that the risk of brain injury from a rollercoaster is not in the rides, but in the rider – caused by previously undetected brain conditions or spine injuries from the force in the turns. *(Brain Injury Institute of America, 2003)*

Yamakami et al (2005) and Roldan-Valadez et al (2006) described anecdotal case reports of potential causal relationships of patients suffering brain bleeding around the time of riding a rollercoaster. This is now not supported by epidemiological or scientific data.

Although Roldan-Valadez et al (2006) presented a paediatric patient with a subdural haematoma, fourteen days after having ridden a rollercoaster, the causative element cannot be correlated entirely to the rollercoaster. The results are also limited as there was only one individual in this study.

Pfister, et. al., (2009) also agreed that it's not the ride, but the rider and said that there was an extremely low risk of TBI due to head motions induced by roller coaster rides. Similarly, Kuo et al (2017) suggested that rollercoaster rides do not present an immediate risk of acute brain injury. However, head motion and brain deformation during rollercoaster rides are highly sensitive to individual subjects - who already are predisposed to brain injury.

However, in 2018 there was a growing concern about the G-force that is exerted on people as they ride these faster rollercoasters, as the desire to go faster is ever-present. In October 2018, New Jersey, USA became the first state to limit G-forces on theme park rides.

The American Association of Neurological Surgeons has assembled a national committee of neurosurgeons, NASA scientists and engineers that are now looking at how the stress of G-forces from rollercoasters might affect the brain, specifically how the brain is bounced around inside the skull on these rides. The committee has not yet reached any conclusions *(ABC news, July 2018).*

Zhu et al (2014) describes the studying animals such as the barbary sheep and woodpeckers have given insight into how these animals cope with extreme force impacts. Inspired by the woodpecker's head, researchers have developed a casing for aircraft flight recorders that can withstand a G-force of up to 60,000-G's (previously 3,400 G's).

Conclusion:

Being wrapped in cottonwool is not an option. Sport and fun are synonymous. The desire to go fast is thrilling and it seems that the faster the rollercoaster, the better! Keeping a child safe is a parent's obligation and companies have that same obligation of safety. As demonstrated by Stapp in the 1950's, humans can be subjected to high G-forces and survive, as long as it is for a short duration. Magnitude and duration are as critical as direction, when it comes to forces. Safety is paramount in industries where G-forces are found – engineering, space travel, F1 racing and theme parks. With this in mind and knowing the mechanism of injury, F1 responded with changes to car design and changes to rules and procedures following driver injury.

Rollercoasters that generate G-forces for the pursuit of fun-filled terror must be conscious of the pressure that is placed on the human body during these rides. Safety mechanisms and short duration of twists, turns and speed, must be taken into account and adapted for the safety of all.

With this knowledge of G-forces, people are better placed to judge whether or not to put their bodies through these forces. It must also be clear that if a person knows or suspects they might have a brain or neck injury, then obviously it is unwise to participate in an activity that could compromise their health. Warnings at each ride are placed for a reason, informed knowledge and decision-making as well as coverage for litigation purposes. These must be taken seriously, as it is a fine line between being well and unwell.

Neuroscience nurses play a role in teaching the public – through seminars, school educational sessions and governments and companies have an obligation for public safety. Although life is becoming a minefield of "Safe Operating Practices" and every product has a warning attached, fun activities are encouraged, just within reason. The brain, within its' hardened case, is protected but also vulnerable to changes in pressure and force. Pre-existing conditions of the brain or neck, whether known or not, plays a role in injury from rollercoasters and theme park rides. Some obligation must rest with the individual. That is, the issue remains with the rider - their health and informed decision on whether or not to ride.

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Purposeful collaboration: Enriching lives for people with Parkinson's disease

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This project was presented at the 2018 ANNA conference. Funding to support the author's conference attendance was received from Parkinson's New South Wales and Mid North Coast Local Health District.

Abstract

Background: Individuals with Parkinson's disease (PD) have more hospital admissions, longer hospital stay, more complications and worse outcomes compared with similar patients without PD. Limited understanding about PD among healthcare professionals and medication management are key issues for individuals with PD.

Methods: This study presents a collaborative clinical practice improvement project that was implemented in a hospital in New South Wales, Australia (September 2015 to May 2018) to resolve issues for patients with PD on admission to hospital. Innovative interventions were implemented to address specific issues identified in the study setting, including an emergency department patient tracking icon, early referral to pharmacists and measures to ensure on-time medication administration and avoidance of contraindicated medications. Qualitative and quantitative data were collected through focus group discussions with PD support group members, surveys involving nurses and patients/carers and a chart audit. Data were analysed using descriptive statistics.

Results: These initiatives resulted in practice improvements including identification of 100% of patients with PD presenting/admitted to hospital within 4 hours of presentation/admission, a 19% increase in patients receiving medications on time, an 89% reduction in prescription of contraindicated medications and reduced length of hospital stay. In addition, 80% of patients/carers reported they were very satisfied with their medication management.

Conclusion: Patient safety was improved and clinical staff expressed satisfaction with care provision. The initiatives were also standardised across the hospital in a clinical guideline for the care of patients with PD.

Keywords: Parkinson's disease, time critical medications, collaboration, leadership.

Introduction:

Parkinson's disease (PD) is a progressive neurological disorder caused by the loss of dopamine producing cells in the substantia nigra, which is located in the basal ganglia. As dopamine assists with transmitting and modulating signals in the brain, ongoing dopamine depletion causes motor, autonomic and cognitive impairments (Magrinelli et al., 2016). PD is characterised by motor symptoms that are associated with movement (e.g. bradykinesia, rigidity, postural instability, tremor) (Magrinelli et al., 2016), and non-motor symptoms (e.g. mood/cognitive problems, depression, pain, sleep problems) (Schapira et al., 2017). Motor symptoms are considered the clinical manifestation of dopamine insufficiency and used for PD diagnosis (Chenoweth, Sheriff, McAnally, & Tait, 2013; Queen, 2017; Schapira, Chaudhuri, & Jenner, 2017). However, non-motor symptoms can become more debilitating than motor symptoms as PD progresses (Chenoweth et al., 2013; Schapira et al., 2017).

A recent epidemiological study indicated up to 212,000 people (1 in 117 people aged over 50 years) are living with PD in Australia, with more than one million caregivers, family and friends directly impacted by the condition (Ayton et al., 2019).

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DOI: 10.21307/ajon-2020-004

The associated economic burden in 2014 was almost $1.1 billion and accounted for 53% of all health system costs (Deloitte Access Economics, 2015); this burden is expected to rise. Nursing home and inpatient hospital care comprise the largest component of these costs (Bohingamu Mudiyanselage et al., 2017; Deloitte Access Economics, 2015; Oguh & Videnovic, 2012).

The insidious onset, no known cure, and progressive nature of PD mean it is challenging to treat and requires a multidisciplinary approach (Bramble, Carroll, & Rossiter, 2018). In the inpatient context, a lack of specialist knowledge and low adherence to PD medication regimens can result in poor clinical outcomes such as extended recovery time, worsening symptoms, falls and morbidity (Cohen & Smetzer, 2015; Donizak & McCabe, 2017; Grissinger, 2018). These adverse events can result in longer hospital stay, representations and re-admissions, and increased health system costs (Donizak & McCabe, 2017; Harris & Fry, 2017). Other concerns include shortfalls in the care provided and the lack of knowledge about PD in the healthcare team (Gill & Kitson, 2016).

A recent Australian study by Harris and Fry (2017) suggested education and orientation programs should be more specific to PD and identified a need for evidence-based clinical guidelines to support earlier detection and management of PD in the inpatient setting. Greater collaboration among the healthcare team (including pharmacists) was also needed to improve medication administration practices and avoid potential adverse events (Harris & Fry, 2017). It is important to identify a person with PD at presentation/admission to hospital so staff can be alerted to that person's particular needs (e.g. time-critical medications). An early warning system means strategies can be implemented to ensure medications are available without delay (Aminoff et al., 2011; Gerlach, Winogrodzka, & Weber, 2011; Harris & Fry, 2017). This paper presents a collaborative clinical practice improvement project that was implemented to raise awareness about PD among healthcare professionals, facilitate inter-professional collaboration to address medication issues and improve the care journey for patients with PD.

Project Background

This collaborative project aimed to streamline hospital admission for individuals with PD by resolving identified problems. It also aimed to address increasing frustration and concerns among hospital staff and the local PD support group regarding care provision for patients with PD. Staff at the study hospital were also concerned about poor understanding of the complexity of PD (e.g. prolonged medication delays can be life threatening), extended length of hospital stay for patients with PD and reported adverse medication-related events. These concerns were consistent with issues reported in the literature (Donizak & McCabe, 2017; Oguh & Videnovic, 2012).

In New South Wales (NSW), Australia, a part-time Parkinson's Clinical Nurse Consultant (CNC) services four hospitals (a 292-bed regional base hospital and three peripheral hospitals) along with nursing homes, community visits and a multidisciplinary clinic, without specific neurology support. This project was motivated by the Parkinson's CNC in response to concerns raised by clinicians and consumers.

Project Aim

In the study hospital it was considered important to identify individuals with PD on presentation to the emergency department and improve staff knowledge and medication administration practices (Aminoff et al., 2011; Gerlach et al., 2011; Harris & Fry, 2017). Specifically, this project aimed to ensure that: individuals with PD presenting to the study hospital were identified within 4 hours of presentation/admission; essential medication was available in the emergency department; patients received medications on time; and contraindicated medications were not administered. The study outcomes included patient/carer satisfaction with medication management, reduced adverse events/incidents, and identification of individuals with PD on presentation to hospital.

Methods:

Following engagement with hospital and community stakeholders, a clinical practice improvement team was formed to address identified problems relating to effective PD care provision. The reporting of this study was consistent with the SQUIRE guidelines (Ogrinc et al., 2016).

Project Setting and Implementation Team

This project was conducted from September 2015 to May 2018 at a regional teaching hospital in New South Wales, Australia. The hospital provides a range of services including emergency medicine, general medicine, surgical, obstetric, paediatric, rehabilitation and intensive care services. Specialist services include an acute stroke unit, a coronary angiography unit, a renal unit, a mental health unit and oncology and radiotherapy services. The project was conducted in collaboration with the local Parkinson's Support Group and Parkinson's NSW. The multidisciplinary project implementation team was recruited from across the study hospital (e.g. emergency, medical and surgical wards, and the hospital quality unit) and comprised a range of clinicians including doctors, nurses, a speech pathologist, a dietician, occupational therapists, physiotherapists and pharmacists. The team was co-led by the CNC, an occupational therapist and a pharmacist, and supported by the hospital executive. The project team included two members of the local PD support group to ensure consumer engagement throughout.

Participants

Purposive sampling was used to recruit participants for the project-specific surveys. This sampling method captured individuals who had experienced the phenomenon under investigation (Yin, 2016). An opt-out method was used for hospital staff and patients/ carers that did not want to participate. Participants were directly approached and provided with information about the project. Two focus group discussions were held with members of the local PD support group, one before and one after project implementation (25–30 people in each group). Focus group participants were identified and recruited through the support group coordinator. The inclusion criteria for the focus groups were membership of the support group, and a diagnosis of PD or a carer for a person with PD. Those that were not members of the support group were excluded.

The number of nurse participants ranged from 12–29, depending on the intervention measured. The inclusion criterion for nurse participants was nurses working in that ward/ unit. Survey completion was voluntary. In addition, patient/carer (n=16) satisfaction with medication management was assessed post-implementation using a short anonymous survey. Patient/carer participants were recruited during admission to hospital using convenience sampling. Patients/carers were eligible to participate if they had a length of stay >1 day. Discharged patients were excluded. Participants were informed that the survey was voluntary, and they could choose whether or not to participate.

Interventions

Specific interventions (discussed below) were introduced to address identified issues. The project followed the clinical practice improvement methodology described by the NSW Clinical Excellence Commission, which offers a framework that allows clinicians to '*review, identify and understand causes of the failure and design solutions to continuously improve processes of patient care*' (NSW Health, 2019).

The project process involved assessing the local context, Plan-Do-Study-Act cycles, audit and feedback, benchmarking and regular practice education support (Gill & Kitson, 2016). This supported improved delivery of safe clinical care and enabled the team to build understanding of the underlying problems and gain insight into how to implement improvements. Clinical champions across the hospital were also used to educate others, advocate for change and translate new knowledge into routine clinical practice (Gill & Kitson, 2016; Mabey, 2013). (See Figure 1).

Grand Rounds

To raise awareness of PD among hospital staff, education materials were developed through PD 'Grand Rounds'. In this setting, Grand Rounds are weekly hospital-wide multidisciplinary education sessions. For this project, the Grand Rounds were filmed so all staff could access the education material. In the Grand Rounds, the multidisciplinary project team provided education regarding the key points and interventions required for a person with PD when in hospital. The Grand Rounds also included a patient story to demonstrate improvements in care from one admission to the next.

Alert System: PD Icon and Automated Referral to a Pharmacist

A system was developed to alert emergency department staff to the arrival of patients with PD to support the project target of identifying patients with PD within 4 hours of presentation. Changes were made to the emergency department patient tracking board so a person with PD was identified with a green PD icon. This was coupled with an automated notification system to alert the Parkinson's CNC and initiate referral to the pharmacist.

Medication Management

Four strategies were developed to address identified medication issues. First, PD medications were made available in the emergency department to support administration of time-critical medications and avoid medication delays. This intervention aimed to ensure timely access to these medications, including after hours. Second, a pictorial alarm clock was introduced at the bedside to note critical medication times for inpatients. This was considered important as standard hospital medication round times may not match individualised medication plans for people with PD. Third, stickers for time-critical and contraindicated medications were developed for pharmacists to use on patients' medication charts to remind staff and support the necessary practice change. These stickers provided visual cues to highlight the importance of administering medications on time and identify the top three medications that should not be given to patients with PD. Finally, a clinical algorithm was developed to support switching a person's medication when their ability to swallow was compromised.

Data Collection

Qualitative data from the focus group discussions were collected in field notes. The focus groups were facilitated by the hospital quality coordinator, who asked open-ended questions around hospital admission of patients with PD (e.g. '*Taking PD medications while in hospital is important, can you tell me of your experiences with these medications in hospital?*'). All focus group participants were encouraged to speak freely and openly. One focus group was held before project implementation and one was held post-implementation. Information obtained from the first focus group assisted in developing the project interventions. The post-implementation focus group provided opportunity for feedback on the interventions. Both focus groups were held in an accessible community venue and lasted around 60 minutes.

Quantitative data from nurses were collected via short self-administered paper-based surveys designed by the project team. The surveys were distributed after implementation of each intervention and collected nurses' perceptions of that intervention. For example, the survey distributed following PD medications being made available in the emergency department included questions such as '*Has access to the medication been beneficial in providing patients their medications on time*?' Response options for items in all staff surveys were 'yes', 'no' and 'not applicable'. A free text area was provided so staff could offer any further comments. Before each survey, a member of the project team liaised with the nursing unit manager to advise them of the survey and seek their assistance in communicating with staff. The surveys were left on the ward/unit for nurses to complete on a voluntary basis. Completed surveys were returned via a confidential return box located on the ward/unit.

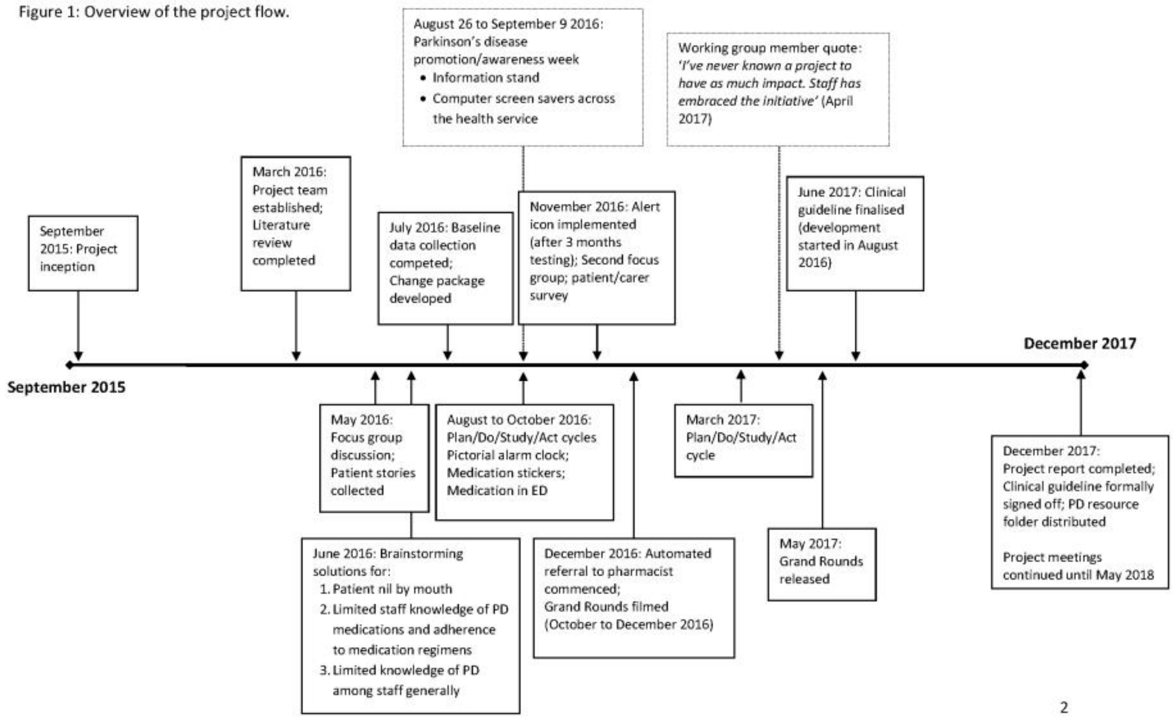


Figure 1: Overview of the project flow.

Data from patients/carers were collected using a paper-based survey (two items) administered post-implementation. One item assessed if the patient had received their medications on time, with responses on a five-point likert scale from ‘never’ to ‘always’. The second item evaluated patients’ satisfaction with their medication management, with responses on a five-point likert scale from ‘very satisfied’ to ‘very dissatisfied’.

The chart audit monitored and evaluated changes in practice following the project implementation. The audit was conducted before the project (January to June, 2016) and post implementation (September to December, 2016). Information collected covered: identification of a patient as having PD on admission; adverse events (e.g. aspiration pneumonia, falls, contraindicated medications given); current medications charted on admission; medications administered on time (yes/no/not documented); and pharmacist review after admission to the emergency department.

In total, 22 charts were reviewed. The chart audit was conducted by the project team co-leaders. Charts were included in the audit if they were for patients with a diagnosis of PD as determined by a neurologist, geriatrician or rehabilitation/medical physician, and identified in the hospital electronic medical record system or by hard copy records. In addition, length of stay data were collected from hospital records for September 2015 (commencement) and 2016 (the year after project commenced).

Data Analysis

Qualitative data obtained from the focus group discussions were analysed using thematic analysis. Quantitative data were analysed using descriptive statistics. Any survey questions with missing data were excluded from the analyses. The chart audit data represented approximately 20% of patient admissions (the hospital admits >100 patients with PD each year), but no power calculation was used to determine the sample size. These data were entered into a Microsoft Excel spreadsheet, and descriptive statistics (frequencies and percentages) were calculated. Any missing data from the chart audit were managed by cross checking the data with paper/electronic medical records.

Ethical Considerations

As this was a quality improvement project, formal ethics approval was not required. However, approval to conduct the project was obtained from the study hospital executive. For nurse and patient/carer participants, return of a completed questionnaire was considered as provision of consent. All patient data were de-identified and aggregated before analysis.

Results:

The project interventions resulted in a number of improved outcomes. The qualitative data obtained from the focus groups are discussed first, followed by the main results for each of the interventions.

Focus Group Discussions

The main themes that emerged from the pre-implementation focus group included medication management, basic care, the human factor and communication. Concerns were voiced about the inadequacies and shortfalls of the hospital system. These data were used to inform the project interventions.

The post-implementation discussion provided opportunity to gather feedback from group members on the interventions. The main themes that emerged from this discussion were increased awareness among hospital staff of the specific needs of people with PD from the start of the care journey, the importance of medication timing and improvement in the overall care experience. The different comments made by participants in the first and second focus group discussions reflected the interventions. For example, a comment from the first focus group was:

> *‘The staff in emergency don’t seem to know very much about Parkinson’s and the importance of medication timing; it took hours for the staff to get the medication from pharmacy for my husband, and by the time he had it his symptoms were at their worst—very rigid and tremulous—and he was so anxious’.*

The feedback from the second focus group was markedly different:

> *‘The staff in emergency and the wards have a very good understanding of Parkinson’s. From the moment we presented to hospital, the staff knew my husband had Parkinson’s without even asking, the medications were given on time every time, much different from his other admission’.*

Interventions:

Staff Education: Grand Rounds

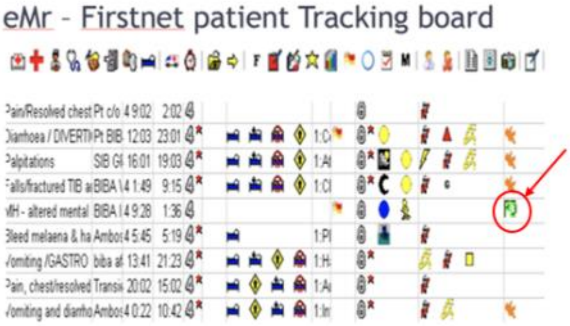
The Grand Rounds lead by the multidisciplinary project team focused on the key points and interventions required for a person with PD when in hospital. The session was filmed and uploaded to the health service's electronic health education platform, which was available to all employees. The session was available for viewing by groups and on an individual basis. As at 16 March 2020, the production has been viewed 66 times. Although formal feedback was not collected from staff, anecdotal evidence indicated that education provided, 'a comprehensive overview of PD, the importance of medications on time and the care of patients when in hospital'. A separate version of this education session was produced for the general public and broadcast twice via radio locally and around Australia, with the goal of raising public awareness about PD.

Alert System: PD Icon

The target was to identify patients with PD within 4 hours of presentation to hospital. PD was first identified as a problem in the electronic medical records, and then tagged to the specific patient. An alert was triggered, a green 'PD icon' (Figure 2) displayed on the patient tracking board in the emergency department to identify a patient with PD.

This resulted in marked improvement in identification of patients with PD. Post-implementation, 100% of patients were identified on presentation to hospital (Table 1). This enabled earlier and increased referrals to pharmacists, which in turn helped to prevent medication-related incidents.

Figure 2. Parkinson's disease tracking icon (red circle).



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Pain/Resolved chest Pt c/o 4 9:02  2:02
Diarrhoea / DIVERTI Pt BIB 12:03  23:01         1:C
Palpitations      SIB GI 16:01  19:03           1:A
Falls/fractured TIB a BIBA \4 1:49  9:15        1:C
MH - altered mental BIBA I 4 9:28  1:36
Bleed melaena & ha Ambo 4 5:45  5:19            1:P
Vomiting /GASTRO biba a 13:41  21:23            1:H
Pain, chest/resolved Transi 20:02  15:02        1:A
Vomiting and diarrho Ambo 4 0:22  10:42         1:In
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Medication Management

Four initiatives were implemented to improve clinical practice around the administration of medications to patients with PD. First, PD medications were made available in the emergency department to avoid medication delays. Post implementation, 100% of staff members were satisfied that this change had assisted in reducing medication delays and risk for medication errors (Table 1).

Table 1. Summary of main pre- and post-implementation differences (chart audit)

Intervention	Baseline	Post-implementation
Identification of patients with PD within 4 hours of admission	90%	100%
Automated referral to pharmacist for patient review on admission	27%	31%
Prescription and administration of contraindicated medications	44%	16%
Contraindicated medications identified on medication charts (post-implementation)	-	94.7%
PD medications administered on time	44.4%	63.2%
Time critical stickers used on medication charts (post-implementation)	-	68.4%

The second medication management intervention was the introduction of a pictorial alarm clock at the bedside to highlight critical medication times for inpatients (Figure 3).

Figure 3: Medication management interventions. A: Pictorial alarm clock. B: Stickers for medication charts.

Post-implementation, all staff (100%) reported the clock had highlighted the importance of on-time medications (Table 2). In addition, 93% of patients/carers reported they were satisfied that medications were received on-time. The chart audit showed an increase in administration of PD medications on time from 44% at baseline to 63% post-implementation (Table 1).

The third medication management initiative involved a newly introduced practice where stickers were placed on patients' medication charts to highlight time-critical and contraindicated medications (Figure 3). The chart audit following this initiative showed the administration of contraindicated medications reduced from 44% at baseline to 16% post-implementation (Table 1). After the introduction of these stickers, there was 68% compliance with the time-critical stickers and 95% compliance with the contraindicated stickers (Table 1). Over the study period, the number of reported medication incidents was reduced from 11 to 5 (Table 3). In addition, 100% of staff agreed the stickers highlighted the importance of on-time medications, and 64% reported the initiative had resulted in changes to their practice (Table 2).

Table 2. Nursing staff responses to the medication management intervention surveys

	Yes n (%)	**No n (%)**	**Not applicable n (%)**
Contraindicated sticker (N=24)			
Have you cared for a patient with Parkinson's disease in the last 2 months?	23 (95.8)	1 (0.4)	
Have you seen the contraindicated medication sticker?	16 (66.7)	8 (33.3)	
If yes, did the sticker highlight the importance of NOT administering the listed medications?	16 (66.7)	0	8 (33.3)
If yes, did the sticker result in a change of practice?	9 (37.5)	5 (20.8)	8 (33.3)
Did you know that these commonly prescribed meds were contraindicated for people with PD?	18 (75)	6 (25)	
Did the sticker result in a change of knowledge?	10 (41.6)	8 (33.3)	6 (25)
Time-critical sticker (N=19)			
Have you seen the time critical sticker?	15 (78.9)	4 (21)	
If yes, did the sticker result in a change of knowledge?	5 (26.3)	10 (52.6)	4 (21)
If yes, did the sticker result in a change of practice	5 (26.3)	10 (52.6)	4 (21)
Are the stickers user friendly?	18 (94.7)		1 (5.3)
Medications available in the ED (N=12)			
Are you aware that medications are available in the ED?	11 (91.7)	1 (8.3)	
If yes, were you able to identify the correct medication for the patient?	9 (75)		3 (25)
If yes, has access to the medication been beneficial in providing the correct medication for the patient?	9 (75)		3 (25)
Should these medications be available in the ED on a permanent basis?	12 (100)		
Has the initiative *raised your awareness* of Parkinson's disease?	10 (83.3)	2 (16.7)	
Pictorial alarm clock (N=18)[a]			
Did the alarm clock highlight the importance of the need to administer the meds on time?	18 (100)		
Did the alarm clock result in a change in practise?	8 (44.4)	7 (38.9)	3 (16.7)
Is the alarm clock picture user friendly?	14 (77.8)		

ED, emergency department; PD Parkinson's disease.

[a] Although 29 nurses completed this survey, responses are only included for the 18 nurses who had seen the alarm clock because of missing data.

Finally, a clinical algorithm was developed and implemented to support switching a person's medication when their ability to swallow was compromised and they were nil by mouth (Figure 4). This was part of a clinical guideline that covered the changes implemented throughout the project and aimed to standardise PD care in the study setting (Bramble et al., 2018; Gerlach et al., 2011; Harris & Fry, 2017). Formal and informal monitoring of guideline compliance was implemented to ensure these changes were sustainable. Issues with non-compliance, patient and carer complaints and any reported adverse events were discussed and peer reviewed during regular team meetings over the subsequent 12 months.

In addition to the specific interventions noted above, the project contributed to a reduced average length of stay for patients with PD. Hospital records showed that in 2015, there were 101 episodes of care for secondary diagnoses of PD, with a mean length of stay of 8.97 days.

Further Improvements:

In 2016, there were 149 episodes of care for secondary diagnoses of PD, with a mean length of stay of 6.22 days (Table 3).

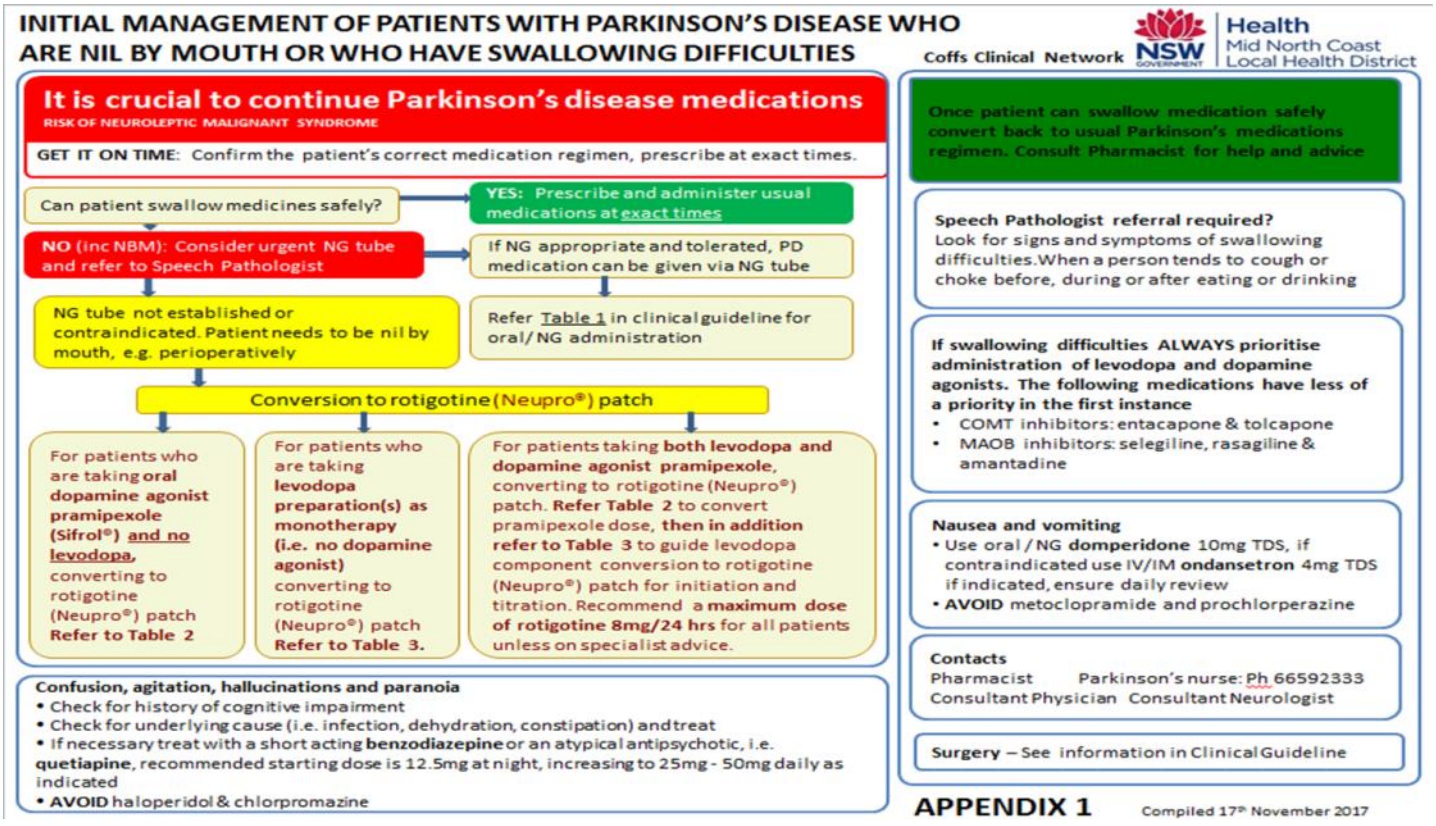
Patients/carers expressed satisfaction with medication management (Table 4) following the interventions.

Table 3. Medication incidents and length of hospital stay before and during the project period

	2015	2016	2017
Number of patients with Parkinson's disease admitted	101	149	112
Number of reported medication incidents	11	6	5
Length of hospital stay (days)[a]	9	6	8

Focus group participants also reported satisfaction with the improved care journey. Team facilitators were available to provide specific education to each ward as needed. This education covered the components of the clinical

Figure 4: Clinical algorithm for patients that are nil by mouth.



INITIAL MANAGEMENT OF PATIENTS WITH PARKINSON'S DISEASE WHO ARE NIL BY MOUTH OR WHO HAVE SWALLOWING DIFFICULTIES

Coffs Clinical Network

NSW Government Health Mid North Coast Local Health District

It is crucial to continue Parkinson's disease medications

RISK OF NEUROLEPTIC MALIGNANT SYNDROME

GET IT ON TIME: Confirm the patient's correct medication regimen, prescribe at exact times.

Can patient swallow medicines safely?

YES: Prescribe and administer usual medications at exact times

NO (inc NBM): Consider urgent NG tube and refer to Speech Pathologist

If NG appropriate and tolerated, PD medication can be given via NG tube

Refer Table 1 in clinical guideline for oral/ NG administration

NG tube not established or contraindicated. Patient needs to be nil by mouth, e.g. perioperatively

Conversion to rotigotine (Neupro®) patch

For patients who are taking **oral dopamine agonist pramipexole (Sifrol®) and no levodopa,** converting to rotigotine (Neupro®) patch **Refer to Table 2**

For patients who are taking **levodopa preparation(s) as monotherapy (i.e. no dopamine agonist)** converting to rotigotine (Neupro®) patch **Refer to Table 3.**

For patients taking **both levodopa and dopamine agonist pramipexole,** converting to rotigotine (Neupro®) patch. **Refer Table 2** to convert pramipexole dose, **then in addition refer to Table 3** to guide levodopa component conversion to rotigotine (Neupro®) patch for initiation and titration. Recommend a **maximum dose of rotigotine 8mg/24 hrs** for all patients unless on specialist advice.

Confusion, agitation, hallucinations and paranoia
- Check for history of cognitive impairment
- Check for underlying cause (i.e. infection, dehydration, constipation) and treat
- If necessary treat with a short acting **benzodiazepine** or an atypical antipsychotic, i.e. **quetiapine**, recommended starting dose is 12.5mg at night, increasing to 25mg - 50mg daily as indicated
- **AVOID** haloperidol & chlorpromazine

Once patient can swallow medication safely convert back to usual Parkinson's medications regimen. Consult Pharmacist for help and advice

Speech Pathologist referral required?
Look for signs and symptoms of swallowing difficulties. When a person tends to cough or choke before, during or after eating or drinking

If swallowing difficulties ALWAYS prioritise administration of levodopa and dopamine agonists. The following medications have less of a priority in the first instance
- COMT inhibitors: entacapone & tolcapone
- MAOB inhibitors: selegiline, rasagiline & amantadine

Nausea and vomiting
- Use oral / NG **domperidone** 10mg TDS, if contraindicated use IV/IM **ondansetron** 4mg TDS if indicated, ensure daily review
- **AVOID** metoclopramide and prochlorperazine

Contacts
Pharmacist Parkinson's nurse: Ph 66592333
Consultant Physician Consultant Neurologist

Surgery – See information in Clinical Guideline

APPENDIX 1 Compiled 17th November 2017

Table 4. Patient/carer satisfaction (N=15)

Item	**Responses**			
	Always n (%)	Sometimes n (%)	No n (%)	Don't know n (%)
Parkinson's disease medications received on time?	12 (80)	2 (13.3%)	-	1 (6.7)
	Dissatisfied n (%)	Neither satisfied nor dissatisfied n (%)	Somewhat satisfied n (%)	Very satisfied n (%)
Satisfaction with mediation management	-	-	3 (20)	12 (80)
Free text comments (examples)	'I don't know much about my medications, just a new diagnosis' 'They were pretty good. Wife explained to hospital staff that it was important that the meds be given on time' 'Different medication to what he has at home. In hospital he was given a white tablet where he has capsules at home'			

[a] The categories 'Very dissatisfied' and 'Somewhat dissatisfied' have been combined in the table.

guideline, including identification of patients with PD, medication management (e.g. time-critical PD medications, contraindicated medications), and managing patients who were nil by mouth.

Discussion:

This paper presents a collaborative clinical practice improvement project that aimed to improve patient safety through reducing medication-related errors for patients with PD. More broadly, this project raised awareness of PD among healthcare professionals, improved and standardised clinical practice in relation to provision of care for patients with PD and improved patients' journey through care.

The interventions focused on: a patient safety perspective that bridged departmental and professional barriers, continuation of exact personal medication regimens, identifying and avoiding contraindicated medications and alternatives for when a person was nil by mouth. These changes ensured on-time administration of medications, which is thought to reduce symptom aggravation and risk for falls (Donizak & McCabe, 2017; Gerlach et al., 2011; Grissinger, 2018).

Throughout this project, the team had to radically rethink their approach from the presentation and admission of patients with PD by redefining and improving service delivery to meet the needs of patients with PD, their carers and hospital management (Stalter & Mota, 2018). Both consumers and staff reported they were satisfied with the changes implemented as a result of the project. After the project, patients with PD were identified 100% of the time, and administration of medications on time improved from 44%–63%, the ultimate goal to reach 100% with the proposed introduction of an electronic medication management system. In addition, medication incidents and adverse events were reduced, with the team focused on reducing these events to zero.

The practice changes that occurred in response to this project became core business and were incorporated into a clinical guideline for the care and management of patients with PD at presentation and admission to hospital, with the aim of maintaining meaningful long-term sustained change with improved outcomes (Aminoff et al., 2011; Gerlach et al., 2011; Harris & Fry, 2017). These results are promising and reflect the recommendations and conclusions of other research relating to the care and management of patients admitted to hospital with PD (Aminoff et al., 2011; Chenoweth, Sheriff, McAnally, & Tait, 2013; Chou et al., 2011; Cohen & Smetzer, 2015; Donizak & McCabe, 2017).

The interventions, project process and changes in practice described in this paper have gathered interest in other healthcare settings (both nationally and internationally) following presentations at national (Carroll, 2018a) and international (Carroll, 2018b) conferences. Key elements have been incorporated into the study hospital's new Electronic Medication Management System (NSW Health, 2018), including electronic prompts for contraindicated and time-critical medications. Initiatives such as the time-critical prompts were subsequently incorporated in the Rural Electronic Medication Management model across six Local Health Districts in NSW.

Other unintended outcomes following the project included the Parkinson's CNC becoming a full-time role at the study institution and a second Parkinson's CNC role being established in the region. Issues regarding provision of care for people with PD identified and addressed in this project highlighted the competencies required for the Parkinson's CNC role (e.g. leadership, facilitation/ education skills, person-centred care, collaboration, evidence-based practice and quality improvement). The literature suggests that nurses who display strong leadership and facilitation skills can lead practice change, challenge systems and boundaries and improve performance and standards (Stalter & Mota, 2018).

Strengths and Limitations:

A major strength of this project was the engagement of a collaborative quality improvement team to develop and lead the interventions. The interventions introduced have proved to be simple, cost effective and easy to replicate, and staff and consumers expressed satisfaction with the changes. Limitations of this project included the small sample size used for the chart audit (representing around 25% of admissions) and the staff surveys. In addition, the project would have benefited from statistical support, as no power calculation was used to determine sample sizes.

Conclusion:

This clinical practice improvement project showcases the benefits of a collaborative team approach to solving issues for people with PD presenting and admitted to hospital. The changes in practice described in this paper have been formalised in a clinical guideline to standardise PD care in the study setting.

Broader Implications of the Project:

In April 2018, the project co-leaders made a submission to NSW Health and Education Training Institute regarding implementation of state-wide PD education. This was successful in June 2019 and resulted in a multimedia education project for nursing and allied health staff (NSW Health, 2020a). The Parkinson's CNC also collaborated with the NSW Health Clinical Excellence Commission in updating the NSW Health Safety Notice for management of medication for patients with Parkinson disease to guide actions by Local Health Districts/Networks (NSW Health, 2020b).

A collaborative research project has also been established to explore the effectiveness of the PD specialist nurse role for people with PD in the wider Australian context. Finally, the project was the catalyst for a three-stage research project commissioned by Parkinson's NSW in collaboration with Charles Sturt University. Stage one involved developing evidence-based models to support best practice nursing services for people with PD in regional NSW (Bramble et al., 2018). Stage two comprised investigating a model of care for people living with PD and comparing the impact of two specialist PD nurses in regional NSW (Rossiter, Bramble, Matheson, Carroll, & Phillips, 2019). A pilot retrospective analysis was also conducted to explore the cost effectiveness of specialist PD nurses, with the Parkinson's CNC as the initiating researcher (Bramble, Wong, Rossiter, Carroll, & Schwebel, 2019). Stage three focuses on the role of community groups supporting people living with PD (Carroll, 2019).

Conflicts of interest:

The authors have no conflicts of interest to declare in relation to this article.

Acknowledgements:

We would like to thank Parkinson's NSW for their support and guidance throughout the project. Special thanks also go to the consumers and staff who gave their time so generously for this project.

Funding:

In negotiation with Parkinson's NSW and the local Parkinson's Support Group, funding was made available by Parkinson's NSW for an additional 8 hours/fortnight in 2016 to allow the Parkinson's CNC to co-lead this project.

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2020
INTERNATIONAL YEAR
OF THE NURSE AND
THE MIDWIFE

Vale Sharryn Byers

Lynette Wallace

The Australasian Neuroscience Nurses Association recently lost a valued member and more importantly a great friend in Sharryn Byers. Sharryn was a long serving member of the association, a passionate Neuroscience nurse, patient and nursing advocate. She was a highly committed ANNA executive member over many years at both federal and state levels and was a proud life member.

Sharryn was more than just a run of the mill member who paid her annual fees. She fell into Neurosurgical nursing early in her career and fell in love with the specialty – a love that never left her.

I first met Sharryn in 1990 in Alice Springs, the year Nimodopine made its first big break onto the scene to treat SAH. This was Sharryn's second meeting and also mine, although my first was the previous year and Sharryn's was 2 years prior. Barb Lester, a dear friend of the association, often reminded me that her first introduction to Sharryn was that of a very loud, eloquent and outspoken young nurse with enormous potential, one to watch.

Since 1990 Sharryn seldom missed a meeting, she also seldom missed a Neurosurgical Society meeting, which in those times were held back to back in the same venues. I know this because I too attended them and we quickly formed a strong friendship which lasted 30 years. Along with some other dear friends, Mary Lomas, Barbara Lester, Naomi Moody (Winter) and Eithne Mallon (Irving). We all met through our belonging to ANNA and were blessed to travel to all ends of Australia and New Zealand and internationally with Sharryn. We enjoyed many intrepid times together. Lenore Saville (from Qld) dubbed us intrepid because we drove everywhere possible, camped under the stars and made the most of our times together. These annual jaunts were professionally rewarding and often hilariously entertaining.

When we met Sharryn she was the Nurse Unit Manager of Neurosurgery at Westmead Hospital. Sharryn had already developed a great passion for learning and teaching/mentoring. She always questioned why things were done the way they were and, where needed, ensured practices were challenged and adapted. Always done with clear evidence, tact and careful coercion if needed. She was never one to blend into a crowd or not express an opinion. She was to the end a loud and proud Neuroscience nurse.

Through Sharryn's investigative mind and determination to provide best practice she developed a love of research and presented many times at ANNA meetings, winning both the Tonnie Keonin and NSA prizes on more than one occasion. In past years the NSA prize winning paper was represented to the surgeons at their meeting and Sharryn's papers were always of such a high standard and clinically significant value that they always generated questions and comment from our surgical colleagues.

Those of you who may not have known Sharryn well may not know that those memorable papers were often only finalised in the early hours of the morning (0300) or rising early to ensure her data was up to date and her slides were in the correct order and accurate. We of course plied her with Bombay Sapphire or wine of any colour while she tirelessly read through the final drafts.

Questions or comments about this article should be directed to Lynette Wallace C/O the Editor

DOI: 10.21307/ajon-2020-005

When I first saw Sharryn present, overhead projectors with plastic sleeves were the audiovisual of choice. With technological advancements we moved through Kodak Slides, CD's and Memory sticks right up to current day emailing of papers. Sharryn was always our IT guru as she had a great capacity to work through technology and solve problems. I recall well her assisting the NSA with their fledgling IT needs at their meetings.

As an ANNA member, Sharryn held many executive posts and sat on many committees and conference organising working parties at both state and federal level. She was part of the association's first multi state executive, using email, skype and the old fashioned telephone to stay in touch. She was always one to demonstrate the ethos that 'the more you put in the more you got back'. Through participation at these levels Sharryn and I, along with many others, have become lifelong friends and will continue to share many fond memories of times together.

All ANNA members are also members of the World Federation of Neuroscience Nurses Association, Sharryn was also an avid attendee and presenter at these meetings and travelled widely. At the meeting in Opatia, Croatia, she was mentioned in a keynote speech as a world leader in her field along with Joanne Hickey, Linda Littlejohns, Virginia Prendergast and our own Vicki Evans-Roach. This meant the world to Sharryn, who had held these leaders in high esteem and was humbled to be mentioned in the same light as her own heroes.

Conference adventures: Sharryn and I along with Mary, Barb and Naomi attended many conferences frequenting many wineries and amazing places along the way. International driving on the wrong side of the road, staying in the quaintest of B&B's which only Sharryn could source.

Sharryn was never a morning person and on our journeys would sleep the first driving leg and take the last leg. I was the early riser and would constantly need to drag her out of her bed to hit the road. She was always last to be ready.

During the many years we all spent together children and grandchildren were born and weddings were had. Sharryn's son Michael was her greatest achievement and we all knew of Michael's adventures and loves. Sharryn was able to see Michael marry his soul mate Sarah just weeks before she passed away, this was her greatest thrill and she valiantly stood at his side resplendent in her favourite colour (Green).

I was also privileged to get to know Sharryn's brother William and sister in law Anita and their three amazing children. She was particularly close to Emma, her niece who also sadly passed away recently. Both Emma and Sharryn were thrilled to see Emma's brothers, Sharryn's nephews, having children of their own. Sharryn loved her family to the moon and beyond and their closeness was so clear to all who knew them.

Sharryn also had a passion for cooking, cake making and decorating. She always made the family wedding cakes and Christmas cakes and we joked prior to Sharryns passing that the fruit would have been soaking in brandy somewhere at home and they needed to ensure it was found and used.

In the weeks prior to Sharryn's passing she was able to stay at home with the help of family, friends and colleagues who stayed overnight and around the clock to ensure she could stay at home as long as possible. I know you all know who you were, but Sharryn was very grateful for all the care and love she was shown. I recall calling one day to find she was holding court with Kylie Wright and Maureen Edgtton-Winn. She called me back later to tell me she had had a lovely afternoon. I know there were many more such visits from ANNA friends and colleagues.

In Sharryn's work life she was an amazing mentor and friend to her staff. I was privileged to meet many of her work colleagues, who were all heartbroken at the thought that she was not going to be there to help and guide them. Many told me how she encouraged them to apply for their jobs and present papers or even teach junior colleagues at the bedside. The Executive DON of Nepean came to visit and was also saddened to know she was losing a friend. She told me that Sharryn was one of her greatest inspirations.
Sharryn's battle with cancer was a long and brave journey. She had fought and won the first battle only to have the beast return.

Sharryn fought on her own terms and always told us that she would know when it was time to leave. She died on November the 19th 2019 in her much loved Nepean hospital surrounded by her family and with the full knowledge that she had achieved all she could and had lived and amazing life. Many of you will appreciate that Sharryn's family were chatting among each other telling anecdotes and sharing Pizza, Beer and wine in her last minutes. This was as it should have been, Sharryn would have loved to partake.
It was my greatest privilege and honour spend Sharryn's last two days at her side. My heart broke for her family, friends and colleagues, and for all of us who knew her. As we were packing Sharryn's belongings we discovered a signed text in her locker for the ward staff. Sharryn had clearly planned to give this to them but had not had the chance.

At Sharryn's funeral many members and friends travelled to the most amazing church, chosen not for its religious sensitivity but its amazing architecture. A long and enjoyable reception overlooking the water and with wine flowing was a great tribute to Sharryn where there were countless stories and memories exchanged. Sharryn would have been with us in spirit and looking down from above. We have lost an amazing lady and it was a privilege to know her and count her as my friend.

Lyn

Calendar of Events

2020:

- **Stroke Society of Australasia**, 30th Anniversary Conference, 8th—11 September, **Postponed**
- **Neurosurgical Society of Australasia**, Annual Scientific Meeting, 22nd—24th September, Sheraton Grand Mirage Resort, Port Douglas Queensland
- **ANNA** Annual Conference, 11th—13th November, venue TBA. https://www.anna.asn.au/

2021:

- **Sydney Neuroscience Symposium** 12th February, Royal North Shore Hospital, Sydney Australia.
- **WFNN Congress**
  20-23rd July, Darwin Australia.
  www.wfnn.org

Post Scholarship Requirements

Successful applicants presenting an oral paper **must** submit a full written paper to be published in the *Australasian Journal of Neuroscience* as part of their award requirements before the end of the next financial year . The successful applicants name will be forwarded to the Journal Editor for follow-up.

The Louie Blundell Prize

This prize is in honour of our colleague Louie Blundell and will be awarded for the best neuroscience nursing paper by a student submitted to the Australasian Neuroscience Nurses Association (ANNA) for inclusion in the Australasian Journal of Neuroscience by the designated date each year. The monetary value of the prize is AUD$500.

Louie Blundell, was born in England, and although she wanted to be a nurse she had to wait until after World War II to start her training as a mature student in her late twenties. Later she and her family moved to Western Australia in 1959. She worked for a General Practice surgery in Perth until a move to the Eastern Goldfields in 1963. Subsequently, she worked at Southern Cross Hospital and then Meriden Hospital. During this time she undertook post basic education to maintain her currency of knowledge and practice, especially in coronary care.

Louie was also active in the community. She joined the Country Women's Association and over the years held branch, division and state executive positions until shortly before her death in 2007. She was especially involved in supporting the welfare of students at secondary school, serving on a high school hostel board for some time.

She felt strongly that education was important for women and was a strong supporter and advocate of the move of nursing education to the tertiary sector, of post graduate study in nursing and the development of nursing scholarship and research, strongly defending this view to others over the years.

For further details and criteria guidelines please visit the ANNA website at **www.anna.asn.au**

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The *Australasian Journal of Neuroscience* is indexed in the Australasian Medical Index and the Cumulative Index of Nursing and Allied Health Literature CINHAL/ EBSCO.

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Abstracts Open: 1st April, 2020
Abstracts Close: 1st November, 2020
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