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In This Issue:

Editorial

Linda Nichols
Editor

This edition begins a new journey for me and as I approach my second decade of nursing, I am honoured to be taking over the helm as Editor of the AJoN.

Thank you Vicki for your guest editorial. Change is certainly continuous and this is also true in terms of journals and publishing.

Those of you who remember the early volumes will have seen many changes over the years. In my lifetime, I have seen technology develop and I often reflect on how we managed prior to smart phones and the internet.

With this in mind I honour the early journal editors, when articles were typed and sent back and forwards via post with hand written comments that needed to be addressed.

The internet and email has changed many things we do and whilst it is not always for the better it has certainly made this job of editor and my substantive role as an academic easier.

Now we can share articles electronically using email and platforms such as Research Gate. However , not so long ago this task was completed via posted request for reprints. Academics would have calling cards printed that they would send to authors requesting a copy of manuscripts and waiting patiently for the copy to be posted them. Now our poor library staff are pressured to find and deliver archived and obscure articles in hours, not the weeks or even months that this task once took.

We take the ability to serach the internet for granted at times and often forget that this is a relatively new technology. Access to literature is now often overwhelming and perhaps it was easier in the old days when you could not be criticised for not knowing what you didn't have access to. However, like many of you I will take an electronic search engine any day over the hours I remember scanning microfiche cards.

Guest Editorial

Vicki Evans
We've come a long way….

As I approach a milestone third decade of being a Registered Nurse, everywhere around me tells me that we are surrounded by 'change' and that if you don't go with the flow, you'll be swept aside. Nursing and medicine are in continuous motion, constantly changing, formulating ways for improvement and best practice.

Some of you may remember the days of spinal surgery and the use of 'pillow packs' and log rolls for several days. Nowadays no one lies in bed. The hospital in which I work reported on the world-first vertebral artery stent. Now, stenting is hardly uncommon.

Today, the news is reporting that an Australian neurosurgeon has completed a world-first surgery removing a vertebral chordoma and successfully replacing the vertebra with a 3D-printed body part. Constant change.

So what have I learned in the seven years in the editor's role? I have learned to check and recheck, that submissions don't just come in automatically, that there are many people around to assist and that neuro nurses do great things!

In keeping with the state of constant movement, it is time to hand the editorial responsibilities over to Linda Nichols. Linda is a neuro nurse and academic from the University of Tasmania.

She was a regular provider of manuscripts for the AJoN over the years and I encourage you as members/readers to send in your manuscripts for publication. What you are doing out there makes a difference – why not tell people?

To assist Linda in her new role, I asked the question:-

> What is an Editor? The Collins Dictionary describes the editor as a person who is in charge of, determines selection and revises the final content of material for publication in a newspaper, magazine, or book.
>
> The editor's role encompasses many points including–

To find an article we now head to the internet and simply serach. The internet has become an invaluable resource, it has opened up endless opportunities for our own research, be that to publish or just to find information.

This is a huge change from 20 years ago when an academic would refer to 'Current Contents', a weekly publication that would be 100s of printed pages that was organised by field (life sciences, physical sciences or humanities).

'Current Contents' was a paper data base/ index, a compilation of the Tables of Contents of all the journals in the fields. From here researchers would spend hours reading and scanning for key words, reference numbers and citations. Then if you were really organised, these details were hand written on a card system. When I get frustrated with End Note I always try to take a deep breath and think of the alternatives.

With all these changes and the anticipated changes ahead I read and take on board Vicki's advise. For me this is another rewarding challenge in my neuroscience journey and I look forward to this next stage.

Cheers and thank you for all your support and guidance Vicki.

Linda

Publicising the AJoN and encouraging submissions.

Screening manuscripts and sending to the Review Team for peer comment.

Final decisions: Once peer review has been completed, the editor decides on final acceptance or rejection.

Communication: the editor is required to communicate to the ANNA Executive formally & informally as well as the Review Team and prospective authors.

Ethical dilemmas: Occasionally, the editor is asked to make decisions concerning ethical issues such as possible plagiarism or multiple submissions of the same material to other journals.

Administrative & Technical duties: The editor participates in numerous procedures essential to publication of the AJoN including the makeup and layout of each issue. Manuscripts are converted by the Editor from a Word document to a Publisher file and formatted before being sent to the printers as a PDF. Factors that must be considered include the quality and size of figures/tables and proofreading of the final version before the print -run.

All the best Linda!

Vicki

Movement Disorder Chapter

Australasian Neuroscience Nurses Association

Cordially invites you

to attend

PARKINSON'S DISEASE EDUCATION DAY FOR NURSES

This year the program has been expanded to include Apomorphine, Duodopa and Deep Brain Stimulation.

When:	Tuesday 8th August 2017
Time:	8:30am – 4.30pm
Where:	Northern Sydney Education and Conference Centre (in the grounds of Macquarie Hospital) Wicks Road, North Ryde
Cost:	$40.00
Register by:	Tuesday 1st August 2017 (numbers will be capped this year)

Online Registration at members.anna.asn.au

Lubag Syndrome (X-linked Dystonia Parkinsonism) Case Study of Mr G. Infante

Vincent Cheah

Abstract:

Sex-linked dystonia parkinsonism (XDP) also known as Lubag Syndrome is a rare sex-linked genetic progressive movement disorder affecting almost exclusively males from the province of Capiz in the Philippines and their descendants. At the Mater Centre for Neurosciences we have recently treated two patients with XDP utilising Deep Brain Stimulation (DBS) implants. Mr G. Infante was the second patient to be treated, the first being his uncle. Mr G. Infante's case was brought to the attention of the Mater Centre for Neurosciences at South Brisbane after the success of his uncle's treatment two years prior.

In the three years from when Mr G. Infante's dystonia symptoms were first noticed, his condition progressively worsened until he was wheelchair bound. With severe chronic pain, unable to walk, difficulties talking and swallowing, Mr G's quality of life was severely impacted by XDP.

XDP is a movement disorder considered a variation to Parkinson's Disease. The difference being that the XDP starts with a long period of dystonia that eventually evolves into the tremor and associated symptoms typical of Parkinson's Disease. Due to the similarity of the conditions the patient's needs and treatment methods, both medical and surgical, are almost identical. Deep brain stimulation surgery involves implantation of electrodes into specific regions of the brain. The electrodes are then used to deliver finely tuned electrical currents in order to reduce the signs and symptoms of both neuropsychiatric and movement disorders such as Parkinson's and XDP. The high frequency electrical charges sent to deep structures in the brain stimulate or shut down nerve cells around the electrode. The areas of the brain that the electrodes target are thought to participate in the circuitry involved and effectively disrupts these processes and reduces the symptoms of the disease.

This paper presents the journey of Mr G. Infante's XDP and DBS and provides an explanation of how DBS works to improve the quality of life for patients who suffer from XDP.

Key Words: lubag syndrome, x-linked dystonia parkinsonism, deep brain stimulation.

Background:

Lubag syndrome is an extremely rare adult onset neurodegenerative movement disorder first described in Filipino males from the Panay Islands in 1975 (Lee, Maranon, Demaisip, Peralta, Borres-Icasiano, Arancillo & Reyes, 2002). The term 'Lubag' is a broad, meaning 'twisted' in the local Filipino dialect of Ilongo and also used to describe the torsion seen in children with cerebral palsy. Lubag syndrome is known as X-linked dystonia Parkinsonism (XDP) or DYT3 after the gene which produces the mutation causing XDP. XDP presents a higher male incidence as recessive mutation affects the X chromosome.

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Males, having only the one X chromosome, are more likely to express the mutation where women, having two chances to obtain a normal dominant X chromosome, are less likely to display the mutation (Dobyns, et al. 2004). Females can be carriers of the defective gene however it is rare for symptoms to be displayed and if present, they appear comparatively mild to male counterparts (Lee, et al. 2002).

Statistics reported in the Philippines state that prevalence amongst the general Filipino population is estimated at 0.34/100,000 with the highest rates being seen in the province of Capiz where approximately one in every 4000 males are affected by XDP (Lee, et al. 2002). The mutation of the gene DYT3 and its effects can be traced back over 2000 years in the Ilongo ethnic group of the Panay islands (Lee, et al. 2002). Filipinos have migrated across the globe and cases identified outside the Philippines show that maternal ancestry traces back to this ethnic group on Panay Islands (Evidente, et al. 2002).

Mr G Infante's symptoms appeared at age thirty-nine, typical of the disease which begins to effect the individual from age thirty to forty (Lehn, Airey, Olson, O'Sullivan & Boyle, 2014). In a typical case of XDP, as seen with Mr G Infante, the symptoms that lead to a diagnosis include continous muscle cramping and spasms, postural instability, blepharospasms, difficulties with speaking, swallowing, coordination and walking (Lee, et al. 2002). The sufferer will also develop focal dystonic movement which spreads and generalizes to the whole body within five years of onset (Evidente, et al. 2002). After several years the dystonic movements become less prominent and stiffening of the limbs and trunk occurs (Lehn et al., 2014). This is known as the dystonia/parkinsonism phase. As XDP is a neurodegenerative disease, as the basal ganglia degenerates over time, the symptoms of parkinsonism begin to become more prominent.

Currently XDP has no cure, treatment is aimed at alleviating the symptoms to improve quality of life for sufferers. Unfortunately the treatment options, particularly in the Phillipines, are both limited and expensive. It is often the case that sufferers are isolated and unable to access treatment or support due to the financial burdens of both living with the disease and the treatments themselves. In early stages of the disease options include the use of benzodiazepines and anti-cholinergic agents, and Botox injections to relieve focal dystonia. Allied health services including speech, physiotherapy and occupational provide benefits to assist the individual to improve and maintain symptoms and function in daily life. Dependent on the availability of finances, the symptoms and age it is possible for patients to undergo lesioning surgery or deep brain stimulation (DBS).

Figure 1.

Inheritance Pattern of Lubag Syndrome (X-linked Dystonia Parkinsonism)

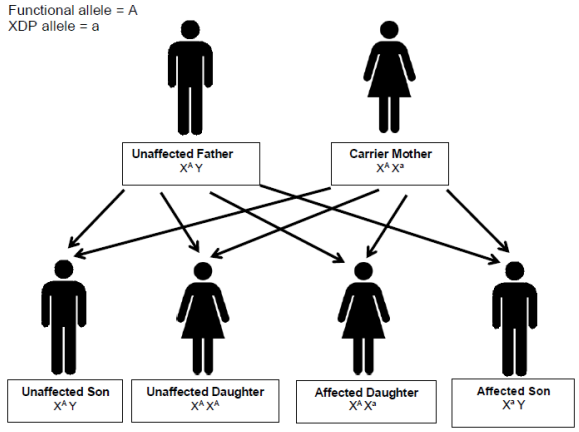

Figure1. Inheritance patterns of Lubag Syndrome (XDP) showing the inheritance from an unaffected father and a carrier mother.

While the underlying mechanisms of DBS are not yet fully understood, it allows changes in brain activity to be made in a controlled manner (Herrington, Cheng & Eskandar 2016). Prior to DBS surgical lesioning was the primary surgical intervention for Parkinson's Disease (PD) and dystonic conditions. This involves the insertion of a heated electrode into structures within the basal ganglia, destroying cells within a very small area and disrupting electrical brain signals to reduce symptoms. The disadvantage of this procedure is XDP and PD are degenerative diseases that progressively worsen over time and while destroying small parts of the basal ganglia can relieve symptoms, damaging too much can lead to a significant further loss of function. DBS aims to provide the same results as lesioning without permanently destroying brain cells (Okun, Zellman, 2017). DBS consists of 3 elements: electrodes, extension cables and an impulse generator.

The cost of DBS surgery can range from $35,000 to upwards of $70,000 for bilateral procedures (Okun, Zellman, 2017). The electrodes are placed in targets within the basal ganglia, the location depending on symptoms. As both PD and XDP affect similar regions the DBS brain targets include the globus pallidus internus, sub-thalamic nucleus (Okun, Zellman, 2017). These structures are targets as they relay the sensory and motor signals to the cerebral cortex. The impulse generator creates a small charge at a high frequency >100 Hz (Beuter, Anne, & Modolo, 2009). This high frequency disrupts electrical activity in the target area creating a 'temporary lesion'.

By interrupting these unwanted signals to the key brain areas DBS is able to alleviate symptoms. Due to the dystonia that is present with XDP after successful implantation and stimulation there is a latency effect or lag that does not occur in those patients with PD. This lag is due to the brain reorganising itself through neuro-modulation, synaptic plasticity and then finally anatomical reorganization (Beuter, Anne, & Modolo, 2009). Another benefit of DBS for XDP is that as symptom progression occurs, frequencies of the impulse generator can be adjusted. Current technological advancements have seen wireless technology incorporated into DBS devices so that medical professionals are able to remotely assess and treat patients.

Case Study: Mr G. Infante

Mr G. Infante is a forty-nine year old Filipino male diagnosed with XDP at forty-six years of age. Mr Infante has a notable family history of XDP with one blood and three half brothers to the same mother, a carrier of the XDP mutation. Mr Infante's father is of German decent and does not carry the XDP mutation. Mr Infante's three half-brothers all suffer from XDP however his biological brother is yet to show any signs. Mr Infante had a normal birth and unremarkable developmental milestones during childhood and early adulthood. At thirty-nine years of age he developed subtle shuffling and slowing of gait. Mr Infante ignored these symptoms at the time, considering them as fatigue related to work.

At age forty-one Mr Infante's symptoms worsened and he developed a resting tremor, dystonic posturing of his upper left limb, as well as torticollis; typical of the progression of the disease process. By the age of forty-six, a continued deterioration of symptoms led to constant tongue protrusion causing dysarthria and dysphagia. During this period Mr Infante also suffered worsening chronic back pain, decline in gait with frequent falls, dysphagia that progressed to the point of significant dietary modification and weight loss from 85.7 kilograms to 68 kilograms in three months. When Mr Infante came to Australia for treatment he was wheelchair bound and required maximum assistance for his everyday needs.

The story of how Mr Infante came to the Mater Centre of Neurosciences is quite remarkable. Following successful DBS implantation for XDP, Mr Infante's uncle discussed his case with neurologist Dr Alexander Lehn and neurosurgeon Dr Sarah Olsen to see if they could help to treat his nephew. In a generous humanitarian gesture, the Mater Executive Board approved funding for Mr Infante and his wife to travel from the Philippines to the Mater Private Hospital in South Brisbane for assessment at the Movement Disorder Clinic headed by Dr Lehn. After initial assessments of Mr Infante both Dr Lehn and Dr Olsen wanted to help but were faced with challenges regarding the costs of DBS equipment, theatre time and rehabilitation as Mr Infante was not an Australian citizen. In an incredible stroke of luck, on the day Mr Infante was assessed at the clinic a representative of St Jude Medical, the manufacturers of DBS equipment, was visiting the hospital. Upon hearing of Mr Infante and the struggles that he and his wife had faced while dealing with this debilitating condition, the representative was moved. Phone calls were made and remarkably the DBS equipment, worth upward of $30 000, was donated to Mr Infante's cause. Dr Olsen and Dr Lehn had agreed without hesitation to perform the implantation surgery and the Mater Private Hospital Brisbane organised the donation of the theatre time and services of Mater Centre for Neuroscience and associated teams to improve the quality of life for Mr Infante.

Mr Infante was successfully implanted bilaterally into the globus pallidus internus. Following surgery Mr Infante spent a few days in the intensive care unit before returning to the neurosurgical ward. CT scans showed no bleeding and electrode placement was accurate. The first stimulation was around two weeks post-surgery with positive results showing two to three weeks later. Daily physiotherapy, speech therapy and occupational therapy helped Mr Infante make the slow and steady journey towards independence. Through time in the rehabilitation unit Mr Infante slowly regained his ability to walk with minimal assistance, together with improved fine motor skills and speech.

The improvement seen in Mr Infante was remarkable and highlights the significance of DBS therapy in those individuals who suffer from XDP. Mr Infante came to the Mater in a wheelchair and left walking with only minor aid. He is very grateful to the Mater Private Hospital South Brisbane for the DBS treatment that significantly improved his quality of life for himself and his wife. Mr Infante is currently residing at home in the Philippines with regular contact with neurologist Dr Lehn.

Figure 2.

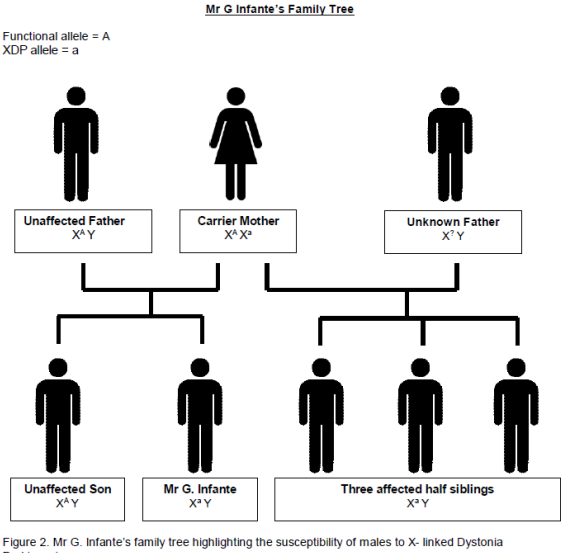

Figure 2. Mr G. Infante's family tree highlighting the susceptibility of males to X- linked Dystonia Parkinsonism.
Information provided by Mr G. Infante (2016).

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Mr G. Infante and his wife Leah Infante for giving permission to present his case at the ANNA 2016 conference. He wishes his name to remain unchanged in hopes more work can be done to help sufferers of Lubag Syndrome.

Neurologist Dr Alexander Lehn for his expertise, professionalism and mentorship.

Joan Crystal Nurse Unit Manager at the Mater Centre for Neurosciences providing the opportunities to present this case at ANNA 2016.

Improving oral hygiene for stroke patients

Caroline Woon

Abstract:

In stroke nursing, oral hygiene is fundamental and should be a priority. Patients are more dependent on the nursing staff due to problems with cognition, arm weakness, a reduced conscious level, dysphagia or aphasia. Patients rely on nurses for oral care and are at a higher risk of xerostomia (dry mouth). Effective oral care removes plaque and prevents complications such as pneumonia which would increase patient length of stay. A lack of knowledge exists amongst nursing staff in the area of oral conditions and evidence based oral hygiene. Different practices exist based on traditions or experience and education is limited. A standardised assessment tool and oral hygiene guideline should be developed to support and ensure that effective oral hygiene occurs.

Key Words: *Oral hygiene, stroke nursing, education, assessment tool, oral hygiene guideline*.

Introduction:

Oral hygiene is an important aspect of nursing care amongst stroke patients. The benefits of effective oral hygiene include improving cleanliness, removing debris and plaque, preventing complications which would result in increased hospital length of stay (Özden et al, 2013). Patients are able to eat and chew comfortably ensuring adequate nutritional intake with adequate oral hygiene (Chan & Hui-Ling, 2012). However, oral health is poor in this setting due to reduced cognition, lack of awareness of their own deteriorating oral health, reduced motor function and inability to communicate effectively (Brady et al, 2011; Cohn & Fulton, 2006). Zhu, Mcgrath and McMillan, 2008 (cited in Kwok et al, 2015) found that 83.9% of stroke patients had difficulty brushing their own teeth and are therefore dependent on nurses to maintain their oral health. Dysphagia is common in stroke patients increasing the risk of xerostomia. Certain medications also contribute to xerostomia, such as syrups and anti-hypertensives, as well as the use of oxygen and suction (Brady et al, 2011; Cohn & Fulton, 2006; Kwok et al, 2014). Sugar intake can also increase the risk of plaque formation and therefore oral health education should be provided during their hospital stay (Moynihan & Kelly, 2014).

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Dental plaque, xerostomia and bacteria formation should be identified and addressed (Prendergast, Jakobsson, Renvert, Hallberg 2012; Prendergast, Kleiman, and King, 2013).

Methods

A literature review was conducted to identify best practice of oral hygiene for stroke patients. Cochrane, Cinahl plus, Medline and Pubmed databases were searched using the search terms stroke nursing in oral hygiene, oral care, oral hygiene, stroke, acute care, hospital, mouth care, dysphagia, nursing intervention, education and the truncation nurse. Combinations of these using and/or were also searched. All articles between 2000 - 2016 were explored and articles in languages other than English were excluded.

Barriers to Effective Oral Hygiene

Oral hygiene is considered a low priority, due to other priorities, pressures and time (Brady et al, 2011; Chan & Hui-Ling, 2012; Cohn & Fulton, 2006; Kwok, et al, 2015; Lam, et al 2013). Furthermore, it is often delegated to junior nurses, students or health care assistants with different levels of experience (Brady, et al, 2006; Chan & Hui-Ling, 2012; Cohn & Fulton, 2006; Kwok, et al, 2015). Increased attention needs to be devoted to oral hygiene as poor practice causes harm (Cohn & Fulton, 2006; Prendergast et al, 2013).

Cohn and Fulton (2006) report the build up of plaque from poor oral hygiene leads to a reduction in saliva flow, resulting in a reduced clearance of debris. This causes inflammation and a weakening of the mucosal lining. As a result, bacteria can pass into the tissues and increase the risk of local, systemic infection or pneumonia (Cohn & Fulton, 2006; Chan & Hui-Ling, 2012; Kwok et al, 2015). If these complications exist, patients experience an increased length of hospital stay delaying their recovery (Gosney, et al, 2006).

Education, Oral Hygiene Assessments And Guidelines

Oral Hygiene Guidelines

Within the literature, there is a lack of protocols and evidence for best practice although standardised protocols are recommended to improve oral hygiene (Brady et al, 2006; Chan et al, 2012; Cohn et al, 2006; Kwok et al, 2014; Özden et al, 2013; Prendergast et al, 2012). According to Cohn & Fulton (2006), traditions and different regimes exist in oral hygiene amongst nursing staff. Within the author's area of practice, no guidelines, protocols or evidence-based practice exists and nurses practices vary according to their experience and education which may not have been updated since their nursing training. For some nurses this can mean twenty years of oral hygiene practice based on tradition.

Need For Oral Assessments

Early oral assessment to identify oral health problems and effective oral hygiene practices have been recommended to reduce the incidence of pneumonia; although there is a lack of oral hygiene assessments available (Azodo et al, 2013; Cohn & Fulton, 2006; Kwok et al, 2015; Prendergast et al, 2013; Sorensen et al, 2013). Standardised protocols and daily oral assessments are recommended to improve oral health (Brady et al, 2011; Chan & Hui-Ling, 2012; Cohn & Fulton, 2006; Kwok et al, 2015; Özden et al, 2013; Prendergast et al, 2012). Furthermore, compliance with assessments and protocols are essential and these should be easy and quick to use (Berry, et al, 2007; Prendergast et al, 2013). A patient's oral health should be established on admission through the use of an oral assessment tool, which would also ensure dentures are acknowledged and managed appropriately. If problems are identified early, appropriate care can be provided preventing complications.

Staff Training

The British Society of Gerodontology (2010) reflects on oral hygiene and suggests that there is a lack of staff training in oral assessments and oral hygiene techniques. Without effective education of nursing staff and health care assistants, oral hygiene may remain a lower or delegated priority of care. Time should be given to this task as the implications of ineffective oral health care could be costly and cause unnecessary complications. Brady et al, (2007) recommend training should be provided by qualified professionals such as dentists. There remains a lack of knowledge amongst nurses about oral hygiene and this includes a poor knowledge of oral conditions (Azodo et al, 2013; Chan & Hui-Ling, 2012; Cohn & Fulton, 2006; Kwok et al, 2015). Therefore, education is needed to improve this lack of knowledge amongst nurses and nursing students. Locally an education package was provided which was designed by a nurse educator and dentist. A video was created of effective tooth brushing by the dentist and a PowerPoint presentation was delivered to identify oral conditions, when to refer to the dentist and how to provide effective oral hygiene. As a result practice was standardised. This also allowed for time to reflect on current practice and understand the complications that occur as a result of poor oral hygiene.

Product Choice

Product choice in oral hygiene is not evidence based and there are variations in frequency and type of care provided (Cohn & Fulton, 2006). Some studies report toothbrush and toothpaste are the most commonly used products but others report foam swabs (Cohn & Fulton 2006; Prendergast et al, 2013). Toothbrushes prevent tooth decay, periodontitis and gingivitis and therefore their use is recommended but foam swabs do not prevent these conditions (Chan & Hui-Ling, 2012; New Zealand Dental Association, 2010; Prendergast et al, 2012; Prendergast et al, 2013). Electric toothbrush are more effective at removing plaque and could be considered as standard practice although they are not often provided within the hospital setting (Lam et al, 2013; Yoneyama, et al, 2002). Effective oral hygiene is limited by the products provided by the hospital.

Dry mouth can be a common problem in stroke patients. The New Zealand Dental Association (2010) report that sodium bicarbonate is effective for dissolving mucus,

loosening debris and treating xerostomia. A glass of water should be mixed with half a teaspoon of salt and half a teaspoon of sodium bicarbonate creating an effective xerostomia mouth rinse. However this would not be suitable for patients with dysphagia or facial weakness. Oral hygiene should be carried out twice daily as a minimum, but there is no consensus on the most effective frequency of oral care (Cohn & Fulton, 2006; The New Zealand Dental Association, 2010; Prendergast et al, 2013).

Dentures require specific management as poor denture hygiene causes infection. They should be removed and rinsed after each meal. Dentures should not be cleaned using regular toothpaste as this degrades their condition. If denture toothpaste is not available, regular soap can be used with a toothbrush and should be performed at least twice a day. They should be removed and soaked in water with a denture cleaner overnight allowing the oral cavity important time to rest (New Zealand Dental Association, 2010).

Conclusion: *Putting Evidence Into Practice*

Effective oral hygiene reduces the risk of complications such as pneumonia and is therefore fundamental. It is apparent that stroke patients require tooth brushing with toothpaste or dentures should be cleaned with soap or denture paste twice daily. For xerostomia, sodium bicarbonate and salt rinses could be used. However for those patients who have dysphagia or facial weakness, this could be problematic and further research is needed to address this problem.

Education should be provided to nursing staff and health care assistants in the latest evidence based practice to ensure practice is standardised and guidelines provided to assist with this. Health promotion should be given to avoid sugar as these patients are already at risk of decay for a number of reasons. This could be provided in a leaflet form so that patients and their family understand the importance of effective oral hygiene. Further research is required for patients who experience xerostomia and have dysphagia or facial weakness, as bicarbonate and salt mouth rinses would not be suitable.

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Drain tube removal in the presence of anticoagulation in Spinal Surgery

Christine Holland, Sarah Smith

Abstract:
Venous thromboembolism (VTE), the collective term for Deep Vein Thrombosis (DVT) and Pulmonary Embolism (PE), remains a major cause of morbidity and a significant cause of mortality in hospitalised patients across Australia and internationally. It is important that adequate prophylaxis is provided for patients at risk. Measures including; anti-clotting medication, graduated compression stockings, adequate hydration and early mobilisation are known to be effective in reducing the incidence of VTE.

The prevention of VTE in acute care hospitals has been recognised worldwide as a priority patient safety issue because of the strong evidence base for preventive measures and high potential for improvements in patient outcomes.

With the introduction of risk assessment tools identifying patients of increased risk of VTE, more neurosurgical patients are now receiving VTE prophylaxis during their postoperative clinical course. This raises the question of the role and the impact of VTE anticoagulation when it comes to surgical drain tube removal and the risk of bleeding after spinal surgery. With multiple neurosurgeons and a variety of opinions, the clinical nursing team decided to review the role of anticoagulation and drain tube removal through evidence based research.

Key words: *venous thromboembolism, VTE prophylaxis, spinal surgery, haematoma, neurosurgery, surgical drain tube, low molecular weight heparin (LMWH).*

Case Review:

A 53 year old male presented to St. Vincent's Private Neuroscience Unit for an elective C3-C7 decompressive cervical laminectomy for chronic cervical radiculopathy of the left arm. At the time of admission he weighed 77kgs (BMI 25.5). His relevant past history included Type 2 Diabetes and osteoarthritis. His perioperative pathology was all within normal limits.

Postoperatively, his recovery was unremarkable. He returned to the ward with a closed suction sub-fascial drain tube in situ. His vital signs were all within normal limits and he had full strength and sensation in both his arms and legs.

He was commenced on Clexane 20mg BD with his first dose at 20:00hrs Day 1 post operatively. At this stage the drain output was approximately 200mls.

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He received a second dose of Clexane 20mg the following morning and reviewed by the surgical team where the decision was made to remove the drain, as was standard practice. The drain tube now had an output of 220mls. The drain was removed with no difficulty or resistance by an experienced registered nurse.

Immediately after removal, the drain tube site bled and the patient rapidly developed symptoms of weakness and altered sensation in the right arm. An escalation call was initiated and the patient was immediately returned to theatre for urgent evacuation of a haematoma.

Due to the unplanned return to theatre, the case was critically reviewed by the surgical team and the conclusion was made that the patient had a large posterior extradural haematoma as a result of acute bleeding following the removal of the posterior cervical drain.

The incident raised concerns for the nurses within the neuroscience unit. One hypothesis was that venous thromboembolism (VTE) prophylaxis with low molecular weight heparin (LMWH) may be a contributor to post

-operative hematoma formation. As a result, nursing staff began questioning the medical staff about anticoagulation therapy. In particular, the nursing staff queried whether the LMWH should be withheld until after the drains had been removed, or to administer the LMWH and remove the drain several hours later.

A review of clinical polices on surgical drain tube removal was undertaken, utilizing the hospital's policies database and the intranet; however, neither gave the staff direction on best clinical practice. Medical records and medication charts were then reviewed. The review suggested that there was no standard practice guideline on the administration of LMWH and the removal of surgical drains. This confusion regarding drain tube removal and anticoagulation therapy was the catalyst to investigate further as to what is the best practice surrounding drain tube removal following spinal surgery in the presence of VTE prophylaxis.

In understanding the significance of VTE prophylaxis and drain tube removal, it is important to recognize that there is strong evidence that preventative measures and risk reduction strategies such as early mobilization, the use of graduated compressive stockings, sequential compressive sleeves and the use of LMWH (standard recommendation of 40mg subcutaneously daily) all assist in the prevention of deep venous thrombosis (DVT) and pulmonary embolism (PE), the collective term being VTE (Joanna Briggs, 2016). These complications remain a major cause of morbidity and a significant cause of mortality in hospitalized patients across Australia and internationally (The Australian & New Zealand Working Party on the Management and Prevention of Venous Thromboembolism, 4th Edition)

Risk screening tools are within the neurosurgical unit, with many patients undergoing spinal surgery falling within the high risk category - Major surgery & Age >40 years

(Major surgery refers to operations >45 minutes duration) (The Australian & New Zealand Working Party on the Management and Prevention of Venous Thromboembolism, 4th Edition).

As a result, more patients are screened and identified to be at risk and implementation of risk mitigation strategies are now common practice (Joanna Briggs Institute, 2016). A Cochrane review showed that combing compression and anticoagulation was more effective that a single preventative measure for preventing DVT in surgical patients (Joanna Briggs, 2016).

Given the information already obtained and lack of best practice information available within the policy database and hospital intranet, a medical record audit was conducted on patients having spinal surgery who met the following criteria: Over 40 years in age who had "Major Surgery" of greater than 40 minutes

Of the sixty medical records reviewed, 55% received LMWH in addition to compression stockings. 66% had a suction drain in situ.
For those having LMWH, there were a variety of doses and times used by the treating neurosurgeons:

Time Administered	Dosage (Variance)	Percentage
Mane	40mg (1x60mg)	20%
Nocte	40mg (1x30mg)	50%
BD	20mg (2x40mg)	30%

This highlights that there was no general consensus on the dosage or administration time for LMWH within the neurosurgical unit.

Although haematoma formation following spinal surgery is a rare complication, its consequences can be severe. (Yi, Yoon, Kim, Kim and Shin, 2006). The surgical drain tube is often used in spinal surgery to remove fluid and blood away from the surgical site to reduce haematoma formation (Joanna Briggs, 2015). The clinical presentation of haematoma formation can include, pain, swelling/ooze at the suture line, nerve damage, weakness and/or numbness, saddle paresthesia and urinary and bowel dysfunction – all depending on the level of the collection (Hickey, 2014). Competent and efficient nursing assessment is paramount for the early detect of hematoma formation. This will prompt immediate return to the operating theatre to evacuate the collection before irreversible nerve damage occurs.

Review by the neurosurgeon is usually performed Day 1 post operatively. At this

point discussion is around improvement from pre-operative symptoms, plan for the remainder of the admission and the removal of the surgical drain tube. Nursing staff within the neurosurgical unit are highly proficient and competent in the removal of surgical drain tubes in spinal surgery. Upon removal, the tip of the drain is examined by two experienced registered nurses to ensure complete removal. Regular monitoring of the insertion site is performed to ensure there is no leakage and no signs of post-operative infection. Any concerns regarding the patient's condition is fed back to the treating neurosurgeon.

Due to a lack of adequate information and resources surrounding best practice guideline, a systematic literature review was undertaken. A data base search was completed using Joanna Briggs, EbscoHost, Medline, Pub Med and ACU Library. Key words used included drain tube removal, spinal surgery, haematoma/haemorrhage, anticoagulation and LMWH.

These key search terms were used alone or in combination. The search results demonstrated a deficiency in available and well-designed research or literature reviews on the use of anticoagulation therapy and drain tube removal in spinal surgery.

VTE prophylaxis	**Drain Tube**
OR Heparin	OR Bellovac
OR Low molecular weight heparin	OR Surgical Drain tube
OR Unfractionated heparin	OR Redivac
OR Clexane	
Spinal Surgery	**Haematoma**
OR Lumbar laminectomy	OR Bleeding
OR Neurosurgery	OR Haemorrhage
OR Lumbar fusion	
OR Cervical/Thoracic	

Literature Review:

When reviewing the literature, it was evident that there was no consistent best practice guideline for the use of LMWH in the background of spinal surgery.

Awad, Kebsish, Donigan, Cohan and Kostuik, (2005), performed the largest study looking at the risk factors associated for the development of postoperative spinal epidural haematoma. Over a period of 2 years and 14935 patients, the authors looked at the incidence of patients returning to theatre with the complication of postoperative hematoma. Of the 14935 patients only 32 (0.21%) returned to theatre within one week due to heamatoma formation. Awad et al (2005) concluded that the use of well controlled anticoagulation therapy for DVT prophylaxis and the lack of surgical drains were not associated with the development of spinal epidural haematoma. The authors stated that although drains are commonly used as prophylaxis against haematoma formation, there is no evidence in the literature to support that hypothesis. The authors went on further to say that anticoagulation therapy in the postoperative phase is safe as long as it is monitored carefully. If anticoagulation is well controlled, it is not associated with increased incidence of haematoma. However, individual assessment is paramount. Kanayama, Togawa and Hashimoto, (2010) suggest that although well controlled anticoagulation was not associated with epidural haematoma formation, patients who were coagulopathic from their procedure or from overmedicated with anticoagulants had a higher risk of epidural haematoma formation.

However, in caring for patients undergoing spinal surgery, not all neurosurgeons explore the benefits of DVT prophylaxis and the use of drain tubes. Chementi and Molinari, (2013), looked at 1750 patients over an 8 year period, who had undergone spinal surgery to determine the incidence of epidural heamatoma. Out of the 1750 patients, 4 (0.23%) had sub-fascial wound suction drains in place. Three of those patients developed neurological deficits with the drains in situ, whilst one patient had the drain removed 24 hours post op. The authors suggested that there appeared to be no increased risk with the use of spinal suction drains and the incidence of epidural haematoma. Of interest, however, none of the patients in this study received chemoprophylaxis for DVT prevention postoperatively. Intermittent pneumatic compression stocking were used instead.

When looking at best practice guidelines for DVT prophylaxis, it is suggested that the use of combined modalities of compression and anticoagulation and careful individual evaluation of risk will produce the best outcome for patients, (Joanna Briggs Institute, 2016; Morse, Weight and Molinari, 2007). Al-Dujaili, Majer, Madoun, Kassis and Saleh,

(2012) explored this further by looking at the use of multimodality DVT prophylaxis and the incidence of epidural heamatoma in spinal surgery. The authors looked at 158 patients. One patient developed a DVT, whilst three patients (1.8%) developed an epidural haematoma. Similarly to the Joanna Briggs Institute (2016), Al-Dujaili et al (2012) suggest that early mobilsation, mechanical and chemical prophylaxis is effective in decreasing the risk of postoperative DVT formation without significantly increasing the risk of haematoma formation.

The authors go on further to say that neurosurgeons must look at the risk vs benefit ratio of DVT prophylaxis and the potential for bleeding complications. Preoperative assessment and evaluation of risk (comorbidities) is vital to determine the most appropriate course of action for each individual patient (Yi et al 2006). Both Awad et al (2005) and Chementi et al (2013) suggest that one risk factor for epidural formation could be patients of an age greater than 60-years.

Al-Dujail et al (2012) and Browd, Ragel, Davis, Scott, Skalabrin and Couldwell, (2004) state that there is unfortunately no consensus regarding DVT prophylaxis regime amongst neurosurgeons. Browd et al (2004) goes on further to state that based on the current literature, the use of LMWH appears safe when given at least 24hours after the conclusion of the surgery. However, Choo (2009) suggests that the administration of LMWH should be delivered 6 hours postoperatively as this does not significantly increase the risk of bleeding; however it does retain the efficiency for VTE prophylaxis. This differs from Morse et al (2007) who states that full anticoagulation should be used carefully in the early postoperative period. Although, in this clinical case review, the patient (who was admitted for multi-level lumbar decompression) required full anticoagulation due to cardiac ischemia which occurred 13 hours postoperatively. The author's state that thoughtful evaluation of risk and potential benefits need to be assessed (Morse et al, 2007).

Although it has been suggested in the literature that there is no apparent link between chemical prophylaxis and epidural haematoma formation post drain tube removal, a retrospective study by Aono et al (2011) suggest that there appeared to be a link between spinal epidural haematoma and suction drain tube removal. The study suggests that there was no standard protocol for the removal of the drain, stating that some surgeons may remove the drain if the output is <50ml per 12 hours, whilst other surgeons may tolerate larger volumes. Limiting the results of this study, the authors do state that they have a small cohort (26 patient). Nine out of those 26 had associated illness involving haemorrhage. However, the authors state that half of the patients in the study developed an epidural haematoma post suction drain tube removal.

Conclusion:

Spinal epidural haematoma can have devastating consequences and its assessment and treatment should be carefully considered. Within the literature, it has been highlighted that although epidural haematoma is a rare complication, the prophylactic treatment of haematoma formation is vague and non-consistent. The literature has been unable to definitively state that there is a link between anticoagulation therapy for VTE prophylaxis and the potential for hematoma post removal of the surgical drain tube. There is a lack of consensus and guidance from neurosurgeons as to the time of anticoagulation administration and removal of drain tubes. This makes the management of these patients all the more difficult. As demonstrated, there is no clear evidence or guideline as to what is the best clinical practice for the administration of anticoagulation therapy for VTE prophylaxis and removal of drain tubes. Further evidence and research is required. Given that LMWH peaks at two hours and has a half-life of 12 hours, it could be suggested that it be administered as a nocte dose. What is the gold standard of the administration of anticoagulation therapy and the removal of drain tubes for patients having spinal surgery? The suggestion could be made to err on the side of caution and take direction from the neurosurgeon involved.

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Caring and Collaborating
A case study on a complex patient under multiple teams

Larissa J. Engel, Mandy J. Ryan

Abstract

This case study introduces Mr X, who was diagnosed with Tuberculosis (TB) in early 2016. Although the TB originated in his lungs it spread causing Miliary TB in his brain. The case study focuses on the nursing issues identified during the collaboration of different specialities and disciplines, while ensuring the patient's and family's needs are met.

This particular case was especially challenging for the authors due to cultural differences, difficulties with communication with both family, specialties and multidisciplinary team (MDT), and the challenges of each team involved to work together and giving differing information to all involved. Due to the rare diagnosis for this patient, this was not something we had come across before.
This case study was developed through information gained from nursing the patient directly, discussions with the surgical and medical teams involved, research articles, personal reflections, and viewing the patient's clinical notes and scans.

Nursing considerations will be discussed throughout the case study including the obstacles in nursing a patient who required complex care with several different MDT.

Keywords: *Miliary tuberculosis, tuberculosis meningitis, cultural challenges, multiple teams, nursing care*

The Patient/Background

Mr X was a male in his mid-twenties, of Asian descent. He moved to New Zealand with his new wife in mid-2015, and returned to his home country for a short holiday in late 2015. Mr X was admitted to Christchurch Hospital on January 16th, 2016. He had no documented medical history, and the only known family history was from his mother – an insulin-dependent diabetic – which became another issue we had to address for this family throughout the course of the patient's care.

On January 18th, Mr X was given a potential diagnosis of Tuberculosis (TB), with confirmation of this diagnosis on January 19th. Mr X was also confirmed to have a miliary strain of TB, starting in his lungs, only to spread and cause TB Meningitis.

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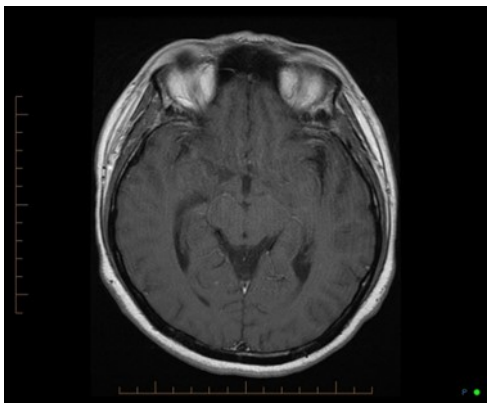
Throughout the course of his admission, Mr X was transferred between various wards, including an Intensive Care Unit admission, before eventually transferring to our neurosciences ward for neurological observation postoperatively following a ventriculoperitoneal (VP) shunt insertion.



Pictured above is the patient's admission MRI, which also showed subtle changes indicative of TB Meningitis.

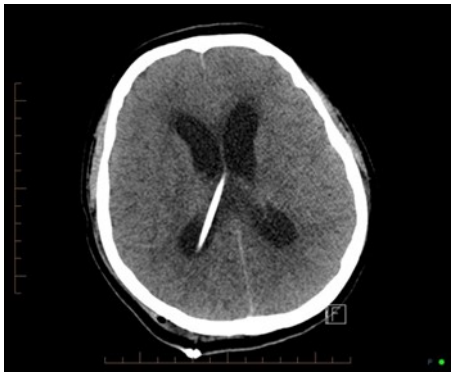
Whilst on our ward, Mr X remained under the care of the General Medical team, as well as neurosurgery, while also receiving regular consults from neurology, infectious

diseases, and standard multidisciplinary teams such as physiotherapy, speech and language therapy, and dieticians.

Miliary Tuberculous and Tuberculous Meningitis

Milary TB is a form TB where bacteria first enters the host by droplet inhalation (Ramachandran, 2014). This, at first a localised infection, usually starts within the lungs causing tiny tubercles that appear like "millet seeds" in size and appearance, hence the name "miliary" (Sharma, Mohan & Sharma, 2012). These seed-like infective sites can spread to other regions through the bloodstream that eventually reach the brain causing small abscesses that burst in the subarachnoid space resulting in TB Meningitis (TBM) (Ramachandran, 2014). The abscesses appear on MRI's as small lesions (Cherian & Thomas, 2011), such as in the scan on the previous slide.

Patients with Miliary TB usually present with fever, anorexia, weightless, weakness and a cough (Man et al., 2010; Sharma, Mohan & Sharma, 2012). Often small skin lesions exist and can help with the diagnosis. Suspected TBM patients can present with headaches, seizures and signs of intracranial pressure (Cherian & Thomas, 2011). Hyponatraemia may indicate the presence of TBM and can also be a predictor of mortality (Sharma, Mohan & Sharma, 2012).



Pictured above is one of the scans the patient had during February showing enlarged ventricles indicative of hydrocephalus from the blocked shunt.

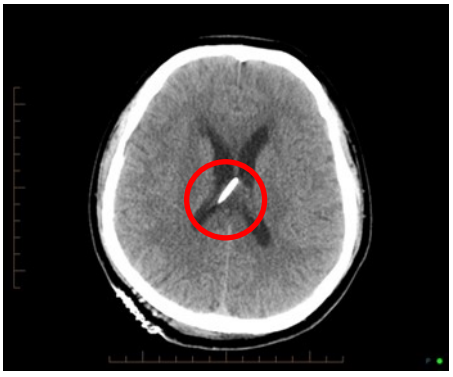
Complications of TBM include obstructive hydrocephalus, caused by the release of a thick exudate from the bacteria which causes blockages in cerebrospinal fluid (CSF) flow (Rock, Olin, Baker, Molitor & Peterson, 2008) leading to neurological deterioration. The fluid from the burst abscesses commonly cause vasculitis which also can lead to cerebral infarction or stroke (Rock, Olin, Baker, Molitor & Peterson, 2008; Man et al., 2010; Sheu et al., 2010; Radwan & Sawaya, 2011.). Vasculitis is inflammation of the blood vessels. This causes them to narrow, leading to loss of perfusion to the brain (NHLBI- NIH, 2014).

Treatments and Explanations

The treatments for Mr X included the TB specific medications Rifampacin, Isonazid, Pyrazinamide and Ethambutol, which are the four main anti-TB drugs, and are generally used for a duration of 12 months (Man et al., 2010; Horsburgh, Clifton & Lange, 2015; Heemskerk et al., 2016.). Dexamethasone was also used as steroid therapy to reduce cerebral oedema and inflammation, and attempt to prevent CSF blockage (Sheu et al., 2010; Horsburgh, Clifton & Lange, 2015; Heemskerk et al., 2016).

Unfortunately, despite the use of dexamethasone, Mr X did develop hydrocephalus, and a VP shunt was inserted. Due to excess protein in the CSF, the shunt continued to block and it was replaced with a short term external ventricular drain (EVD) with the hope that the protein would reduce or a bigger shunt could be found from India, where TB prevalence is higher.

In addition, Mr X also had persistent hyponatraemia, and due to this he was put on constant fluid restrictions of 600-800ml per day. Towards the end of his stay, Mr X's sodium normalised and further hydration was able to be given.



Pictured above is a scan of the patient's brain. The white area circled in red shows the placement of the shunt following the first surgery.

Furthermore, throughout Mr X's time on our ward, he suffered small strokes, leading to decreased GCS and swallow ability, resulting in the insertion of a nasogastric tube for both nutrition and medications.

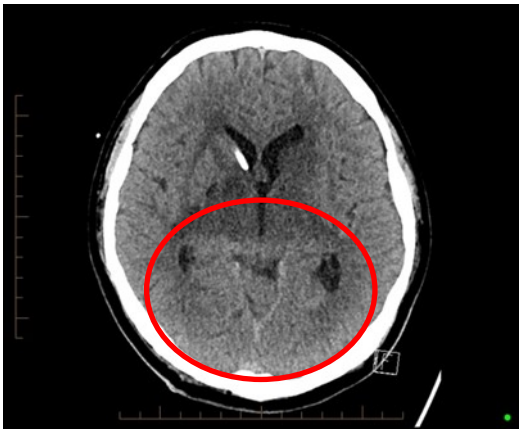
Final day

The final day commenced on the night shift of 1st-2nd March. It began with the previous shift handing over that Mr X's current GCS was 10 (E4 V1 M5), with a high respiratory and heart rate. During the night shift, Mr X's GCS dropped further, eventually reaching a GCS of 6, with sluggish pupils and vitals increasing significantly. At this point, another medical review was called. Throughout this period, the patient's EVD remained patent, ruling out further hydrocephalus as the cause. Despite reluctance from teams, an intensive care team was eventually called, and an urgent CT head was arranged. To note, at this point, the patient was still for full resuscitation despite the potential poor outcomes. The patient's wife was then contacted, she was informed of her husband's status, and she arrived at the hospital to join his parents at his bedside. By 0645hrs, the patient's GCS remained at 6, however he had become vitally more unstable, with a notable temperature of 39.5°C and heart rate of 189 beats per minute, with a non-responsive right pupil. Shortly after, he was accompanied to his CT scan.

On arrival back to the ward the neurosurgery team had arrived and we requested a review but were told his status was 'not an acute concern'. We then rang his general medical team who were unaware of his deterioration. They quickly arrived at the ward and the results of the CT were discussed between teams. The CT showed a large brain stem stroke. The decision was made to have an urgent family meeting and a Chinese doctor was asked to translate for Mr X's parents. The extremely unwell status of the patient was explained to the family and they were told "given his current clinical condition and context we do not believe he will recover". The family were told that there was a high chance he would pass away today, and that no intervention would be beneficial. At this point Mr X's wife became distraught and fainted. Resuscitation status was finally discussed with the family soon after and despite his parents wish for him to be resuscitated no matter the outcome; the final decision was made by his wife, as his next of kin, for him to be not for resus (NFR). The NFR status form was then filled out and Mr X confirmed officially as NFR. Throughout the day treatment was continued, the EVD was still patent, intravenous antibiotics and medications were still given with patients vitals decreasing throughout the day. At 1230 vitals were unable to be obtained, the patient was noted to be posturing, and at 1258 Mr X took a last breath and passed away surrounded by his family.

Challenges

During Mr X's treatment, one of our major challenges as nurses was the issue of attempting to communicate information and concerns to all the appropriate medical teams.



Pictured above is the result of the patient's urgent CT head taken the morning that the patient passed away. It shows a large bilateral basal ganglia and thalamic infarct.

Within our hospital there is a clear-cut difference between teams such as medical and surgical, especially out of normal hours, so making the right people aware was difficult. There was a lack of clear guidelines around which issue needed to be reviewed by which team, leading to delays in decisions by the appropriate people.

Collaborating between the teams involved was also difficult, and the family was unfortunately told differing information from Mr X's health teams, as each team reiterated their own specialty. For example, the neurosurgical consultant told the family early on that the patient could die, but the family attributed this information to the upcoming surgery, not the illness as a whole. Also on the day before his death, Mr X was told that his TB was well controlled and improving, however this was in reference to the pulmonary TB and not the TBM occurring in his brain which was still a serious concern.

Language barriers were also an issue due to the family not speaking much English. Mr X's wife, however, spoke English well, and as a nurse herself understood most of what was happening, but as his parents spoke little to no English, they unfortunately used his wife as a translator. This put her in a difficult situation, often translating information they did not want to hear.

The cultural differences between our health system and that of their native country meant the family did not always understand or agree with some health interventions. Unfortunately they felt the need to get the embassy of their country to be involved and come to the hospital demanding health information legally they could not be given. They also gained advice from an expert on TB in their country and asked the surgeons to change treatments accordingly, despite the fact they were not aware of the specifics of the case. The parents requested a traditional herbal medication to be given, however on discussion with the pharmacist this was found to interact with other medications the patient was on and was toxic to the body.

The family found this difficult to understand despite the translators used. The day the patient died the family were found to be preparing this medication for the patient and despite the above interactions, due to the patient's condition, approval was given for this medication to be administered via nasogastric tube, and not orally like the family was attempting to give in desperation.

On reflection and discussion around their culture following this case we now understand that their actions were all very normal for them but were foreign to us. Nurses need to remember that different cultural beliefs can influence preferences, prioritisations of needs, communication between family and their understanding of diagnoses and outcomes and to take this into account when nursing patients of different cultures (Singleton & Krause, 2009).

Mr X's mother disclosed that she had brittle diabetes and was running low on insulin, as she did not expect to be in the country that long. The issue was raised many times from staff and her husband that she was not adequately caring for her nutrition and rest needs leading to further family stress. She also needed to be referred onto a GP for an insulin refill, incurring high costs for the family.

Mr X was nursed in an isolated environment in a side room due to his diagnosis, resulting in one-on-one care for weeks on end. Because of this we felt quite isolated in nursing this patient leading to our colleagues not fully understanding the severity of the situation and our response when he passed away.

Reflections

On reflection, this was an incredibly difficult case that we both struggled with at times, resulting in this case study. Working with this patient so intensely caused us to learn a lot about our practice as nurses. We have both learned a lot regarding cultural difficulties in supporting different cultures and their health, especially when it comes outside "the norm". It made us more aware of just how much our culture can influence our nursing care.

Advocacy was also a huge issue in this case, and helped us to learn to become stronger in making ourselves heard when we feel we need to voice what our patient cannot. Resuscitation status was a particularly big issue in this instance as we both believed we should have gone that little bit further to make sure this issue was discussed earlier and not in the unfortunate scenario of being discussed mere hours before Mr X passed away.

When we called Mr X's wife in her home country for consent prior to this case study she expressed the concerns that we had already felt around the collaboration of teams and the information being given. She felt conflicting information was quite frequently given especially in the days leading up to his death and she was questioning why the family was informed that he was stable the day before he died.

We had expressed concerns around this during a debrief for this case and there was a plan for the teams involved to have further discussion around ensuring information given was the same across teams.

Implications for Practice:

The aim of this case study was to bring awareness of how multiple teams contributing to a patient's case can bring complications, without even realising it. We wanted to promote the importance of communication between teams and to show an example of where this went wrong. We also wanted to educate about cultural differences and how important they are to consider when nursing patients.

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· Department of Neurosurgery
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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.

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