

Pain management in hospitalised patients with chronic kidney disease and comorbidities

Williams, A., & Manias, E. (2007) Pain management in hospitalised patients with chronic kidney disease and comorbidities *Ren Soc Aust J* 3(3) 76–83

Submitted August 2007 Accepted September 2007

Abstract

Background: Patients with chronic kidney disease and associated comorbid conditions often experience pain. Analgesic medications must be used carefully in kidney disease because of their potential to accumulate in the body and nephrotoxic risk.

Aims: This study aimed to describe the severity of pain in patients with chronic kidney disease who were admitted to hospital for an acute event and to examine their patterns of pain management.

Methods: A non-comparative cohort design incorporating a prospective clinical audit was used to examine pain severity and management in patients with the primary diagnosis of chronic kidney disease. The study was conducted in Victoria, Australia. Data were analysed using descriptive statistics and correlation analysis.

Results: Data analysis of 53 patients revealed that pain is a common problem and pain management is complex in chronic kidney disease. Many patients experienced more than one type of pain. All patients had some level of pain during the previous 24 hours and at the time of observation. All patients were prescribed some form of analgesic, predominantly non-opioids on an 'as required' basis. The Pain Management Index, which determines effectiveness of pain management, was negative in 45% of patients.

Conclusions: Pain had many diverse causes in patients with chronic kidney disease. Pain control needs to be proactively incorporated into treatment plans that consider the patients' individual needs, age and dependency status during their hospital stays. Patients with chronic kidney disease need to be actively informed and supported in effective pain control options. Guidelines for patients with chronic kidney disease and health professionals are critical to overcome barriers to effective pain management.

Key Words

pain assessment, pain management, analgesia, chronic kidney disease

sensory and emotional experience associated with actual or potential tissue damage (International Association for the Study of Pain, 1994).

Pain can arise in chronic kidney disease from multiple causes, including surgery, and comorbidities such as osteoarthritis, ischaemic limb disease and peripheral neuropathy (Mercadante et al., 2005). There are also painful conditions specifically unique to chronic kidney disease, including renal osteodystrophy and calciphylaxis. Central access devices can lead to osteomyelitis, and arteriovenous fistulae can produce painful ischaemic neuropathies (Daugirdas et al., 2006, Davison, 2003, Shayamsunder et al., 2005, Terrill, 2002).

Pharmacological pain management in chronic kidney disease is complex because of the small margin between pain relief and toxicity, and the patient's concomitant health problems that influence the type of analgesia given (Elseviers & De Broe, 1998). Pain control in older people with chronic kidney disease is complicated by the physical limitations that accompany ageing, and concerns related to inadequate excretion of drugs may compel health professionals not to prescribe medications to treat particular conditions, or to prescribe drug doses in a sub-therapeutic range (Manley et al., 2003).

Background

Chronic kidney disease is a worldwide public health concern with increasing incidence and prevalence, poor patient outcomes and high cost (Davison, 2003). For the purpose of this study, chronic kidney disease is defined as a gradual and progressive loss of the kidney's ability to excrete wastes, concentrate urine, and conserve electrolytes, with a glomerular filtration rate of less than 60 millilitres per minute. Life-sustaining therapies through

dialysis and kidney transplantation have improved survival rates for individuals with chronic kidney disease. As people with chronic kidney disease age and develop multiple comorbidities, they are also likely to experience pain (Davison, 2007, Parrino & Casuccio, 2005). In this study, comorbidity is defined as the presence of co-existing, multiple or concurrent chronic disease in addition to chronic kidney disease (de Groot et al., 2003). Pain is defined as an unpleasant

Author Details

Allison Williams, PhD, RN, GradCertNurs, GradDipNurs, MNursStud, is an Australian Research Council Postdoctoral Fellow at the School of Nursing, The University of Melbourne, Carlton, Australia. Elizabeth Manias, PhD, RN, BPharm, MPharm, GradCertCritCare, MNursStud, is an Associate Professor at the School of Nursing, The University of Melbourne, Carlton, Australia.

Correspondence to:

Allison Williams, School of Nursing, Faculty of Medicine, Dentistry and Health Sciences, The University of Melbourne Level 1, 723 Swanston Street Carlton Victoria 3053 Australia Ph: +61 3 8344 9353 Fax: +61 3 9347 4172 afw@unimelb.edu.au

Pain management in hospitalised patients with chronic kidney disease and comorbidities

Research about pain in chronic kidney disease has largely been pharmacokinetic in nature or confined to studies on health-related quality-of-life rather than on pain (Diaz-Buxo et al., 2000, Kimmel et al., 2003, Williams & Manias, 2007). Less commonly, investigators have attempted to address the specific problem of pain by examining patients attending outpatient dialysis settings (Bailie et al., 2004, Davison, 2003, Mercadante et al., 2005, Shayamsunder et al., 2005). Using data from the Dialysis Outcomes and Practice Patterns Study (DOPPS), Bailie et al. (2004) investigated analgesic prescription patterns of 3749 patients in 142 United States (US) outpatient facilities from May 1996 to September 2001. The proportion of patients prescribed analgesics was more common in women, and varied between facilities with a mean of 27.9% (SD 18.9%). Furthermore, three-quarters of patients reporting moderate to severe pain were not prescribed analgesics which interfered with their work. The authors concluded that analgesics may be under-prescribed in the haemodialysis population.

In a prospective cohort study, Davison (2003) evaluated the prevalence, cause, severity, and management of pain in 205 patients receiving haemodialysis in Canadian dialysis centres and satellite units. Fifty percent of patients reported pain as a problem. Of those with pain, 18% had more than one cause of pain. More than 60% of those with pain had musculoskeletal pain, including osteoarthritis, renal osteodystrophy and osteoporosis. Other causes of pain identified related to the dialysis procedure, peripheral neuropathy, and peripheral vascular disease. Most significantly, 55% of patients described their pain as moderate or severe. For 74.8% of patients reporting pain, analgesic management was inadequate.

A more recent cross-sectional study of 95 patients with end-stage kidney disease

who were receiving dialysis revealed 48% had chronic pain (Mercadante et al., 2005). The mean pain intensity on a numerical scale of 0–10 was 5.59, and in 25% of patients, dialysis induced breakthrough pain. Only 15 patients were taking anti-inflammatory drugs and two patients were receiving tramadol. These agents were used very irregularly and at very low doses. Another prospective survey of 162 patients from three US dialysis units found more than 50% of participants reported bone pain, and more than a third experienced seven additional symptoms (Weisbord et al. 2005). Presence of symptoms was correlated with poor quality of life and depression. Shayamsunder et al. (2005) examined pain symptoms in 156 patients with end-stage kidney disease receiving haemodialysis in the US. Thirty percent of patients complained about pain during dialysis and 40% of patients complained of chronic pain off dialysis that was associated with decrements in quality of life. Depressive affect and poor sleep patterns were also closely linked to patients' perceptions of pain.

In summary, past pain research in chronic kidney disease has tended to focus on the nephrotoxic effects of analgesic medications, analgesic-induced morbidity and to a lesser extent, quality of life issues. Of the studies conducted specifically on pain, investigators have largely accessed patients from outpatient dialysis facilities. There has also been predominant attention given to patients with end-stage kidney disease rather than on patients at different stages of chronic kidney disease. No identified research has examined pain patterns in patients with chronic kidney disease admitted for an acute condition in hospital.

Study Aims

The aims of this study were two-fold: to describe the severity of pain in patients with chronic kidney disease and associated comorbid conditions who

were admitted to hospital for an acute event and to examine their patterns of pain management.

Methods

Settings and sample

A non-comparative cohort design incorporating a prospective clinical audit was used to examine pain severity and management in patients with a diagnosis of chronic kidney disease. The study was conducted in five adult renal units in Victoria, Australia. All five renal units were located in public metropolitan teaching hospitals. A renal unit was defined as an environment that offers specialised renal-related treatment such as renal transplantation, creation of dialysis access and dialysis.

Patients were eligible to participate if they were aged 18 years or over, had a diagnosis of chronic kidney disease, were English-speaking or had access to an interpreter at the time of data collection, and were competent to consent or had access to a next-of-kin who could provide consent. Ethics approval was obtained from the university and the five participating hospitals. Informed consent was obtained from all participants in the study.

Procedure

The prospective clinical audit involved the collection of patient demographic and clinical information, including causes of pain, comorbidities, age, and pharmacological and non-pharmacological pain management over the past 24-hour period. Numeric Pain Scale results incorporated into patients' observation charts and progress notes for the preceding 24 hours were examined to obtain worst and least levels of pain over that period. In the few cases where this information was insufficiently documented, patients were asked about their pain severity. The investigators used the World Health Organisation (WHO) analgesic ladder for pain management to

Pain management in hospitalised patients with chronic kidney disease and comorbidities

estimate pain severity on a 0 to 10-point Numerical Pain Scale with the following descriptors: 0 is associated with no pain, 1 to 4 involves mild pain (Step 1), 5 to 6 is associated with moderate pain (Step 2) and 7 to 10 involves severe pain (Step 3) (Jacox et al., 1994).

The clinical audit provided data to enable the Pain Management Index (PMI) to be calculated for each patient. The PMI is a validated tool that assesses the adequacy of analgesics administered based on the WHO guidelines for managing pain (Ward et al., 2000). The index regards pain management is appropriate when congruence exists between patients' reported level of worst pain and suitability of the prescribed analgesic regimen. To calculate the index in the study, the level of analgesic therapy was identified: 0 indicates no analgesic is ordered; 1 indicates a non-opioid analgesic is ordered, 2, a weak opioid is ordered (e.g. tramadol); and 3, a strong opioid is ordered (e.g. morphine). Pain levels were categorised numerically according to the WHO analgesic ladder for pain management. The PMI was then analysed by subtracting the pain level from the analgesic level, and possible values vary from -3 to +3. Negative PMI scores are regarded as indicators of inadequate analgesic treatment, and scores of 0 or greater are considered as a rough indicator of appropriate treatment. While the PMI has been mainly used in the cancer pain setting (Cleeland et al., 1994, de Wit et al., 2001, Ward et al., 2000), it has also been employed in renal dialysis (Davison, 2003) and surgical settings (Sherwood et al., 2003).

The Rush-Medicus Patient Classification Workload Measurement Tool (R-M Tool) was used to calculate patient dependency of each patient at the time of data collection. The R-M Tool measured the influence of 10 dependency factors that may pertain to pain (Halloran, 1985). These factors included: severity of illness, complications associated with illness,

comorbidities, assistance with activities of daily living (for example, hygiene and eating), assistance with mobility, physiological status, communicative limitations, emotional needs, complexity of clinical judgement, and proportion of time spent between a particular patient and the allocated nurse during a randomly selected 2-hour observation period in the renal unit.

Observations were randomly conducted at different times of the day and evening when pain activities were likely to be common, such as medication rounds, doctors' ward rounds, hygiene activities with patients, wound dressing procedures, and settling patients for sleep.

Statistical analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 12.0 (SPSS Inc., Chicago IL). Descriptive statistics were carried out for demographic variables and for analgesic and adjuvant therapies used to treat pain, including means, standard deviations and frequencies. Inferential statistics involved the calculation of correlations between age, worst pain experienced over 24 hours, patient dependency, and the number of comorbidities present. P values less than .05 were considered statistically significant.

Characteristic	n	%
Renal	24	45.3
Vascular	8	15.1
Haematological	6	11.3
Cardiac	4	7.5
Respiratory	4	7.5
Gastrointestinal	3	5.7
Musculoskeletal	2	3.8
Central Nervous System	2	3.8
Surgery or other invasive procedure occurring during observation		
Yes	32	60.7
Language spoken at home		
English	38	71.7
Greek	4	7.5
Cantonese	4	7.5
Vietnamese	3	5.7
Maltese	2	3.8
Arabic	1	1.9
Italian	1	1.9

Communication barriers		
Difficulties in understanding English	15	28.3
Drowsiness	7	13.2
Aphasia or dysphasia	2	3.8
Visual problems	2	1.9
Hearing problems	1	1.9
Comorbidities		
Coronary artery disease	21	39.6
Hypertension	21	39.6
Peripheral vascular disease	17	32.1
Diabetes	16	30.2
Depression	7	13.2
Lung disease	6	11.3
Osteoarthritis	5	9.4
Inflammatory arthritis	5	9.4
Cancer	5	9.4
Glaucoma	4	7.5
Gout	3	5.7
Cerebrovascular disease	3	5.7
Osteoporosis	1	1.9
Epilepsy	1	1.9

Table 1. Patient characteristics (n=53) Nature of diagnosis at time of admission

Pain management in hospitalised patients with chronic kidney disease and comorbidities

Results

Patient demographics

In total, 125 patients were present in the five renal units at the time of data collection. Of this number, 38 did not have a diagnosis of chronic kidney disease and were therefore not eligible to participate. Of the 87 patients who were eligible to participate, 10 were not located in the unit at the time of data collection. Twelve patients were unable to participate because of lack of competence to consent due to a cognition problem. Next-of-kin were not available to provide consent for these patients. A further 12 patients were unable to consent because of significant English language difficulties and an interpreter was unavailable to assist with their consent at the time of data collection.

Fifty-three patients participated in the study, comprising 34 men and 19 women. Patient characteristics are shown in Table 1 according to the patients' medical history. Twenty-three patients were admitted for surgical procedures related to their chronic kidney disease, and 14 had end-stage kidney disease. Their ages varied from 19 to 79 (mean = 50.8, SD = 15.6 years). Thirty percent of patients had communication problems such as dysphasia, hearing and visual difficulties, and some difficulties understanding English. Next-of-kin assisted in data collection wherever possible. Causes of pain were diverse as shown in Table 2. Surgical trauma involving a limb amputation or renal transplantation accounted for 43.3% of all causes. Fifty-three percent of patients had more than one cause of pain. Seventy percent of patients had three or more medical conditions such as diabetes, hypertension, and peripheral vascular disease.

Severity of pain experienced in patients with chronic kidney disease

The data showed that 38 patients (71.7%) experienced moderate or severe pain in

the past 24 hours and that 31 patients (58.5%) experienced moderate or severe pain at the time of data collection (Table 3). Significant correlations were found between worst pain in the past 24 hours and age ($r=.285, P<.05$): as age increased, the pain intensity increased towards a more severe level.

For example, 16 patients with a pain score of 7 out of 10 were over the age of 50 years, whereas 5 patients with pain scores of 7 out of 10 were under the age of 50 years. Significant correlations were found between patient dependency and worst pain in the past 24 hours ($r=.349, P<.05$), and between age and the number of comorbidities ($r=.577, P<.01$). No significant correlation was found between the number of comorbidities and the worst pain experienced ($r=.122, P>.05$).

Pain management in patients with chronic kidney disease

Prescribed and administered analgesics are detailed in Table 4. All 53 patients were ordered various types of analgesics. Only 12 patients were prescribed strong opioids, such as morphine or fentanyl. In total, 30 patients received adjuvants for pain control, which included calcitriol and doxepin.

The most common pro re nata (as required or PRN) analgesic given was oral or rectal paracetamol (acetaminophen). Of the 47 patients prescribed paracetamol, 6 patients were ordered a paracetamol-codeine

combination as an alternative PRN agent to paracetamol if they required it.

Medical records contained no documented information about non-pharmacological strategies used to manage pain. During observations, however, nurses were observed to apply non-pharmacological strategies including turning, massage and limb elevation to five patients. Adjuvants, including phenytoin, carbamazepine, amitriptyline, ketamine and gabapentin, were administered in accordance with

Cause of pain	n ^a	%
Surgical trauma	23	43.3
Peripheral vascular disease	17	32.1
Osteoarthritis	5	9.4
Inflammatory arthritis	5	9.4
Renal osteodystrophy	4	7.5
Osteomyelitis	1	1.9
Osteoporosis	1	1.9
Pain related to dialysis procedure	14	26.4
Peripheral neuropathy	10	18.9
Malignancy	5	9.4
Gout	3	5.7
Calciophylaxis	2	3.8
Polycystic kidney disease	1	1.9

Table 2. Causes of pain in patients (n=53)

^a Numbers add up to more than 53 (100%) because 28 patients (53%) had more than 1 cause of pain.

Pain	No pain (0/10) n (%)	Mild pain (1-4/10) n (%)	Moderate pain (5-6/10) n (%)	Severe pain (7-10/10) n (%)
Worst pain over 24 hours	0 (0)	15 (28.3)	15 (28.3)	23 (43.4)
Least pain over 24 hours	6 (11.3)	34 (64.2)	7 (13.2)	6 (11.3)
Current average pain	0 (0)	22 (41.5)	21 (39.6)	10 (18.9)

Table 3. Severity of pain: worst and least pain over 24 hours and current average pain (n=53)

Pain management in hospitalised patients with chronic kidney disease and comorbidities

Management of pain	Prescribed n	Proportion of prescribed dose PRN (%)	Mean dose in mg administered over 24 hours (SD)
<i>Non-opioids</i>			
Oral and rectal paracetamol	41	38 (92.7)	2521 (1193)
Oral ibuprofen	1	1 (100)	200 (NA ^b)
<i>Adjuvants</i>			
IV calcitriol ^a	17	0 (0)	0.0005 (0.0003) 3 times/week
Oral doxepin	2	0 (0)	10.00 (NA ^b)
Oral phenytoin	1	0 (0)	330 (NA ^b)
Oral carbamazepine	2	0 (0)	250 (70.71)
Oral amitriptyline	2	0 (0)	125 (35.36)
Oral clonidine	2	0 (0)	0.075 (NA ^b)
IV ketamine	2	0 (0)	116.00 (107.48)
Oral gabapentin	4	0 (0)	1200.00 (734.85)
Oral prednisolone	12	0 (0)	11.52 (8.57)
<i>Weak opioids</i>			
Oral tramadol	7	7 (100)	108.33 (58.45)
Oral oxycodone	11	8 (72.7)	24.54 (33.12)
Oral paracetamol (500mg) and codeine (8mg or 30 mg) combination	6	6 (100)	2.50 (1.36) paracetamol 15.3 (11.4) codeine
<i>Strong opioids</i>			
IV morphine	10	7 (70.0)	6.20 (7.35)
IV fentanyl	2	1 (50.0)	0.045 (0.007)

Table 4. Analgesics prescribed and administered (n=53)

^a IV dose of calcitriol was administered three times each week.

^b Standard deviation is not applicable as the same dose was administered in the small number of patients who were prescribed the medication.

the daily recommended doses (Rossi, 2005), and as routine medications for all patients who were prescribed these medications. Calcitriol, which was used to control the symptoms of bone pain through regulation of calcium levels, was also given according to recommended practice (n=17).

Administered doses of non-opioid and opioid analgesics were towards the lower end of recommended daily doses. In contrast to adjuvant medications, non-opioid and opioid agents were administered on a PRN rather than on a routine basis. There were 20 patients

for whom routine doses of analgesics were prescribed to be given within one hour of dialysis treatment. In all these situations, nurses withheld the analgesic dose as it would be dialysed off.

Effectiveness of analgesic use is shown in Table 5. Only 5 patients had positive PMI scores, indicating adequate pain management, and 24 patients had negative PMI scores, indicating insufficient pain management. For eight patients who were administered strong opioids, their PMI was neutral because they continued to experience severe pain.

Discussion

This study is the first identified research examining pain severity and management in patients with chronic kidney disease admitted to hospital for an acute condition. The findings demonstrate that pain is a common problem for this patient population. Perceptions of pain vary greatly in gender, and the predominantly male sample may have influenced the study findings (Vallerand, 1995, Bailie et al. 2004). Age and comorbidity increased the severity of pain experienced. All patients experienced pain, with the most common cause being surgical pain associated with

Pain management in hospitalised patients with chronic kidney disease and comorbidities

Pain Management Index (PMI)	Total (n=53)	None-mild pain (n= 15)	Moderate pain (n= 15)	Moderate-severe pain (n= 23)
Positive (+1 to +3)	5 (9.4)	2 (13.3)	(20.0)	0 (0)
Neutral (0)	24 (45.3)	13 (86.7)	3 (20.0)	8 (34.8)
Negative (-3 to -1)	24 (45.3)	0 (0)	9 (60.0)	15 (65.2)

Table 5. Pain Management Index (PMI) scores (n=53)

Note: Values expressed as number (percent)

renal transplantation, limb amputation and the creation of fistulas. Pain associated with dialysis procedures was also commonly experienced.

All patients had some level of pain during the previous 24 hours and at the time of observation. Twenty-three patients rated their pain as severe. Most importantly, since almost half of the patients had negative PMI scores, the study shows that pain management was probably inadequate for these patients. Experiences of the worst pain in the past 24 hours correlated significantly with age and patient dependency, but not with the number of comorbidities. A lack of strong correlation between worst pain and number of comorbidities could have related to insufficient discrimination between pain and the increased incidence of comorbidities. Findings of this study demonstrate the importance of examining patients' age and calculating patient dependency on admission (for example, through use of the R-M tool), and of pre-empting any changes in pain severity over a patient's hospital stay.

Previous studies have examined patient dependency in terms of predicting nursing staffing numbers and the type of health professional expertise required for patient care (Gotherstrom et al., 1995, Halloran, 1985, O'Brien-Pallas et al., 1992). This study shows patient dependency data could also be used in conjunction with specific renal pain management guidelines to plan patients' pain management needs for analgesics

and non-pharmacological measures. In addition, many patients experienced more than one type of pain, which is not an unexpected finding in view of their comorbid conditions and correlation data for patient dependency and age.

The PMI results were negative for 45.3% of patients with pain, indicating that pain was under-treated in this group. This result is lower than in Davison's (2003) study, who found the PMI was negative in 74.8% of patients on haemodialysis experiencing chronic pain. The difference in results could have related to the sources of pain. In this study, a large number of patients were admitted for surgical procedures that cause acute pain, and analgesics were specifically prescribed to relieve the anticipated pain. Nevertheless, despite being prescribed analgesics, nearly half of patients did not have their pain managed well.

Barriers to effective pain management include patients' reluctance to report pain, communication difficulties, the lack of health professionals' knowledge about the principles of pain management, and patients' reluctance to take analgesics (Williams & Manias, 2007, Manias et al., 2006, Watt-Watson et al., 2001, Willson, 2000). In particular, a significant proportion of patients came from Non-English speaking backgrounds. Moreover, depression, which seven patients were diagnosed with, and poor sleep patterns commonly experienced in hospital settings have been reported to increase patients' perceptions of pain

(Davison, 2007, Shayamsunder et al. 2005). Pain management is a more complex problem for patients with chronic kidney disease and associated comorbidities compared to patients who do not have this condition.

The pharmacokinetics of medications is complicated in chronic kidney disease, and patients may experience problems of opioid toxicity, including confusion and sedation. The dialysis process needs to be considered since the effectiveness of analgesics can be nullified if they are largely affected by dialysis and if they are administered close to the time of dialysis (Kurella et al., 2003). For 20 patients, routine doses of analgesics were prescribed to be given within one hour of dialysis treatment. In all these situations, nurses withheld the analgesic dose as it would be dialysed off. A possible way of dealing with this situation is to organise predetermined times for pain administration around the clock, when the analgesics are appropriately coordinated with dialysis times.

In the study, all patients were prescribed some form of analgesic in reduced doses. The most common type prescribed was a non-opioid medication (90.6%) while 22.6% of patients were ordered a strong opioid analgesic. These prescription rates were higher than those in past studies (Bailie et al., 2004, Davison, 2003). Davison's (2003) chart review of 205 patients receiving haemodialysis through in-centre and satellite units found 29.1% of patients with pain were given non-opioid analgesics and 9.7% were given strong opioids. In detailing the analgesic prescription patterns of 3749 patients on haemodialysis through a self-report method over two time points (May 1997 and September 2000), Bailie et al. (2004) found the total proportion of patients prescribed any analgesic decreased from 30.2% to 24.3% and opioid analgesic prescription reduced from 18.0% to 14.9%. Differences in prescription rates may be due to the types of patients recruited or variations in doctors' prescribing practices.

Pain management in hospitalised patients with chronic kidney disease and comorbidities

Patients who were specifically admitted to hospital for an acute condition were recruited for the current study; therefore, many patients had problems with acute pain. Davison's (2003) work focused on patients who had problems with chronic pain rather than acute pain. Furthermore, data relating to analgesic prescription during periods of hospitalisation were not included in Bailie et al.'s (2004) work. Their findings may also be an underestimation of actual analgesics used because information on analgesic prescription depended upon patient recollection.

In the current study, despite the relatively high level of analgesic prescription, severe pain persisted. Non-steroidal anti-inflammatory agents and paracetamol lack potency and have a ceiling effect on analgesic relief, and are therefore not effective in controlling severe pain as the opioids (Kurella et al., 2003). Past studies have emphasised the importance of administering opioids to control severe pain (Bailie et al., 2004, Davison, 2003, Mercadante et al., 2005). In the renal units under investigation, health professionals may have been reluctant to use strong opioids due to a fear of adverse effects and inadequate knowledge of analgesic medication in kidney disease, leading to under-treatment. A further concern was that for non-opioid and opioid analgesics, between 50 and 100% were scheduled on an 'as required' or PRN basis. Routine administration of analgesics avoids 'wind-up' pain that can progress to intractable pain (Roth, 2002). However at the time of data collection, these renal units experienced staff shortages and employed nurses without renal qualifications. Inadequate nurse/patient ratios and inappropriate skill mix have been strongly linked with negative patient outcomes (Aiken et al., 2002, McGillis Hall et al. 2003).

Prescribing patterns of codeine and pethidine appeared to follow

recommended practice. In total, six patients were ordered a paracetamol-codeine combination and no patients were prescribed codeine as a sole agent. Pharmacokinetic research shows that the half-life of codeine is extended significantly in patients on dialysis (Kurella et al., 2003). Prolonged central nervous system depression has been observed in patients with chronic kidney disease who were administered usual doses of codeine (Matzke et al., 1986). Current evidence recommends therefore that conventional codeine preparations are used cautiously in patients with chronic kidney disease (Kurella et al., 2003). In the case of the synthetic opioid, pethidine, it is metabolised in the liver to the active metabolite, norpethidine. Norpethidine is half as potent as an analgesic but its pro-convulsive effect is at least twice that of pethidine (Chan & Matzke, 1987). Norpethidine is excreted in urine, and can accumulate in patients with chronic kidney disease. No patients were prescribed pethidine in this study. The pharmacokinetics of analgesic medications in chronic kidney disease highlight the need for explicit guidelines for health professionals to clarify appropriate analgesic medication regimens to improve pain management in this population (Kurella et al., 2003).

Conclusion

Pain is common in chronic kidney disease and has many diverse causes. Pain control in chronic kidney disease is difficult because of the risk of nephrotoxicity, reduced analgesic excretion or dialysis influences. However, optimal pain management is an acceptable expectation. Despite developments in renal technology and the best intentions of health professionals, pain is commonly experienced by patients with chronic kidney disease admitted to hospital for an acute condition. Patients with chronic kidney disease should be actively informed during their hospital stay about effective

acute, chronic and recurrent pain control options and provided with appropriate support to enable their pain needs to be met. Depression needs to be actively diagnosed and treated. Pain control needs to be proactively incorporated into treatment plans and schedules that consider the patient's age and dependency status. Guidelines need to be developed for patients and health professionals to manage pain effectively in chronic kidney disease. Better pain management enhances patient outcomes such as comfort, satisfaction of care and reduced health care utilisation.

Limitations of the study

This study used a small sample size in a single Australian state where communication difficulties and organisational structures influencing healthcare delivery may have biased the results. It was difficult to interpret effectiveness of pain management where only a few patients were prescribed particular analgesic or adjuvant medications. Patients were not followed through from hospital admission to discharge to examine whether their pain control needs changed over time. The cause of pain was largely based on chart review for patients undergoing treatment for an acute event. Thus, diagnoses for various causes of pain, including kidney-related bone pain could have been missed because patients may not have had the diagnostic investigation to confirm the cause. In addition, the PMI used to analyse the adequacy of pain management was initially developed for individuals with cancer pain. As already mentioned, however, the PMI has recently been used in patients on haemodialysis experiencing chronic pain (Davison, 2003). Furthermore, the WHO guidelines upon which the PMI is based have been advocated for use in patients with non-malignant pain (Kurella et al., 2003).

Pain management in hospitalised patients with chronic kidney disease and comorbidities

Acknowledgements

The Nurses Board of Victoria, Australia, supported this research. The views expressed herein do not necessarily represent those of the Nurses Board. The researchers also acknowledge the contribution of Kate Chester in data collection and the nurses and patients who kindly gave their time to participate in the study. The authors have no potential conflict of interest in relation to this study.

References

- Aiken L, Clarke S, Sloane D. (2002) Hospital staffing, organization, and quality of care: Cross-national findings. *Int J Qual Health Care*, 14: 5-13.
- Bailie G.R., Mason N.A., Bragg-Gresham J.L., Gillespie B.W. & Young E.W. (2004) Analgesic prescription patterns among hemodialysis patients in the DOPPS: potential for underprescription. *Kidney Int* 65, 2419-2425.
- Chan G.L, Matzke G.R. (1987) Effects of renal insufficiency on the pharmacokinetics and pharmacodynamics of opioid analgesics. *Drug Intell Clin Pharmac* 21, 773-783.
- Cleeland C.S., Gonin R., Hatfield A.K., Edmonson J.H., Blum R.H., Stewart J.A. & Pandya K.J. (1994) Pain and its treatment in outpatients with metastatic cancer. *New Eng J Med* 330, 592-596.
- Daugirdas J., Blake P. & Ing T. (Eds). (2006) *Handbook of Dialysis* (4th ed.). Sydney, Lippincott, Williams & Wilkins.
- Davison S.N. (2003) Pain in hemodialysis patients: Prevalence, cause, severity, and management. *Am J Kidney Dis* 42, 1239-1247.
- Davison S (2005) Chronic pain in end-stage renal disease. *Advances in Chronic Kidney Disease* 12(3), 326-334.
- Davison S.N. (2007) Chronic kidney disease: psychosocial impact on chronic pain. *Geriatrics* 62(2), 17-23.
- de Groot, V., Beckerman H., Lankhorst G.J. & Bouter L.M. (2003). How to measure comorbidity: a critical review of available methods. *J Clin Epidemiol* 56(3), 221-229.
- de Wit R., van Dam F, Loonstra S, Zandbelt L., van Buuren A., van der Heijden K., Leenhouts G. & Huijjer A-SH. (2001) The Amsterdam Pain Management Index compared to eight frequently used outcome measures to evaluate the adequacy of pain treatment in cancer patients with chronic pain. *Pain* 91, 339-349.
- Diaz-Buxo J.A., Lowrie E.G., Lew N.L., Zhang H. & Lazarus J.M. (2000) Quality-of-life evaluation using the Short-Form 36: comparison in hemodialysis and peritoneal patients. *Am J Kidney Dis* 35, 293-300.
- Elseviers M. & De Broe M. (1998) Analgesic abuse in the elderly: renal sequelae and management. *Drugs Aging* 12, 391-400.
- Gotherstrom C., Hamrin E. & Gullberg, M. (1995) Development of a tool for measuring the concept of good care among patients and staff in relation to Swedish legislation. *Intern J Nurs Stud* 32, 277-87.
- Jacox A., Carr D.B. & Payne R. (1994) New clinical-practice guidelines for the management of pain in patients with cancer. *New Eng J Med* 330, 651-655.
- Halloran E.J. (1985) Nursing workload, medical diagnosis related groups, and nursing diagnoses. *Res Nurs Health* 8, 421-433.
- International Association for the Study of Pain (1994) *Classification of chronic pain* (2nd ed.). Seattle, IASP Press.
- Kimmel P.L., Seth L.E., Newmann J.M., Danko H. & Moss A.H. (2003) ESRD patient quality of life: symptoms, spiritual beliefs, psychosocial factors, and ethnicity. *Am J Kidney Dis* 42, 713-721.
- Kurella M., Bennett W.M. & Chertow, G.M. (2003) Analgesia in patients with ESRD: a review of available evidence. *Am J Kidney Dis* 42, 217-228.
- Manley H., McClaran M., Overbay D., Wright M.A., Reid, G. M., Bender, W.L., Neufeld T.K., Hebbard S. & Muther R. (2003) Factors associated with medication-related problems in ambulatory hemodialysis patients. *Am J Kidney Dis* 41: 386- 93.
- Manias E., Botti M. & Bucknall T. (2006) Patients' decision-making strategies for managing postoperative pain. *J Pain* 7, 428-437.
- Matzke G.R., Chan G.L., & Abraham P.A. (1986) Codeine dosage in renal failure. *Clinical Pharmacology* 5, 15-16.
- Mercadante S., Ferrantelli A., Tortorici C., Lo Cascio A., Lo Cicero M., Cutaia I., Parrino I. & Casuccio A. (2005) Incidence of chronic pain in patients with end-stage renal disease on dialysis. *J Pain Symptom Manage* 30, 302-304, 2005
- McGillis Hall L., Doran D., Baker G., Pink G.H., Sidani S., O'Brien-Pallas L. & Donner G. (2003) Nurse staffing models as predictors of patient outcomes. *Med Care* 41: 1096-109.
- O'Brien-Pallas L., Cockerill R. & Leatt P. (1992) Different systems, different costs? An examination of the comparability of workload measurement systems. *J Nurs Admin* 22(12), 17-22.
- Parrino I. & Casuccio A. (2005). Incidence of chronic pain in patients with end-stage renal disease on dialysis. *J Pain Symptom Manage* 30, 302-304.
- Rossi S. (Ed) (2005) *Australian Medicines Handbook*. The Royal Australian College of General Practitioners, Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists, Pharmaceutical Society of Australia, Adelaide.
- Roth S.H. (2002) A new role for opioids in the treatment of arthritis. *Drugs* 62, 255-263.
- Shayamsunder A.K., Patel S.S., Jain V, Peterson R.A. & Kimmel P.L. (2005) Psychosocial factors in patients with chronic kidney disease. *Seminars in Dialysis* 18(2), 109-118.
- Sherwood G.D., McNeill J.A., Starck P.L. & Disnard G. (2003) Changing acute pain management outcomes in surgical patients. *Am Op Room Nurs J* 77, 374-395.
- Terrill B. (2002) *Renal Nursing – A Practical Approach*. Ausmed, Melbourne.
- Vallerand A. (1995) Gender differences in pain. *Image J Nurs Sch* 27(3), 235-237
- Ward S., Scharf H., Donovan B., Owen E. & Grosen, R. (2000) An individualized intervention to overcome patient-related barriers to pain management in women with gynecologic cancers. *Res Nurs Health* 23(5), 393-405
- Watt-Watson J.H., Stevens B., Garfinkel P., Streiner D. & Gallop R. (2001) Relationship between nurses' pain knowledge and pain management outcomes for their postoperative cardiac patients. *J Adv Nurs* 36, 535-545.
- Weisbord S., Fried L., Arnold R., Fine M., Levenson D., Peterson R. & Switzer G. (2005) Prevalence, severity, and importance of physical and emotional symptoms in chronic hemodialysis patients. *J Am Soc Nephrol* 16(8), 2487-2494.
- Williams A. & Manias E. (2007) Pain assessment and management of patients with chronic kidney disease: a structured literature review. *Journal of Clinical Nursing*. OnlineEarly, doi: 10.1111/j.1365-2702.2007.01994.x
- Willson H. (2000) Factors affecting the administration of analgesia to patients following repair of a fractured hip. *J Adv Nurs* 31, 1145-1154.