Foot screening in a dialysis unit – a pilot educational project

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Abstract

Background
Patients with chronic kidney disease (CKD) appear to be more prone to foot ulceration, with risk increasing as the kidney disease progresses. Patients on dialysis, even without diabetes mellitus (DM), are at high risk, but awareness of this risk for non-diabetic patients is low.

Aims and objectives
A pilot foot screening program was established within one metropolitan Australian satellite dialysis unit. The key aims of the pilot were: 1) to identify factors necessary to sustain the program; 2) to determine the prevalence of risk factors for foot ulceration in patients on haemodialysis with and without DM; and 3) to provide real-life, individual professional education to podiatry students.

Design and methods
A pilot screening program was initiated, utilising a customised screening and assessment tool. Patient consent to participate was obtained. Podiatry students undertook screening and assessment and the data obtained was analysed to inform the planning of an appropriate post-assessment clinical pathway.

Results
A total of 25 patients (17 male, 8 female), mean age 69 ± 14.94 (SD) completed screening. Of the 15 non-diabetic patients screened, 14 (93%) of patients had one or more risk factors for ulceration, but only 5 were seeing or had seen a podiatrist.

Conclusion
A high proportion of patients on haemodialysis without DM had risk factors for ulceration. Foot screening and assessment within dialysis clinics has the potential to increase staff and patient awareness of risk factors associated with foot ulceration. Involving podiatry students in screening and assessment offers a broad professional and educational experience.

Keywords
Chronic kidney disease, foot screening, renal, podiatry education, prevention.

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Introduction

Chronic kidney disease (CKD) is a worldwide epidemic and significant public health problem (Radhakrishnan, et al., 2014). It is estimated that CKD affects over 10% of the world’s population, a similar burden to diabetes mellitus (DM) (Couser, et al., 2011). The management of CKD places significant financial burden on communities and health care systems (The Lancet, 2013). Incident rates will continue to escalate in response to our ageing population and the increased prevalence of DM (Freeman, et al., 2008).

On diagnosis of CKD5 and commencement of renal replacement therapy, the survival rate of patients on haemodialysis is significantly reduced in comparison to the general population. Jones, et al. (2013) detailed that a key contributing factor to increased mortality rates in patients with CKD is foot ulceration and associated risk of lower limb amputation. In 2007, a UK Renal Registry report was released suggesting that the occurrence of foot ulceration within the first 90 days of dialysis initiation was the most important predictor of death (Jones, et al., 2012). It is acknowledged that data released from the ANZ Data Registry within the same year did not identify foot ulceration as the most important predictor of death following dialysis initiation (ANZData, 2007).

DM is a cause of both foot ulceration and kidney disease (Lewis, et al., 2012). There is extensive evidence indicating the pathological relationship between DM and the development of foot ulcers. Risk factors for foot ulceration in this population include peripheral neuropathy and vascular insufficiency (Bowling, et al., 2015). CKD is three times more prevalent in those with DM compared to the general population, with risk factors for ulceration increasing with progression to end-stage renal failure (Freeman, et al., 2008).

Less is known about the risk factors for ulceration in individuals with a diagnosis of CKD who do not have DM, but the influence of vasculopathy is clear. Freeman, et al. (2008) investigated the pathological pathway involved in the association between CKD and foot ulceration. The randomised controlled trial of 100 patients showed that those with CKD alone had an identical rate of foot ulcers to those with DM alone. Patients with CKD alone had a greater prevalence of vascular insufficiency, a risk factor in development of foot complications. There was no statistically significant difference in risk factor presentation between CKD patients without DM and those with DM alone.

Kaminski, et al. (2011) expanded on these findings by investigating the prevalence of risk factors for foot ulceration in the end-stage renal disease (CKD5) population on haemodialysis compared to individuals with DM. Findings indicated a high prevalence of risk factors for foot ulceration in patients with ESRD either with or without the coexistence of DM (Kaminski, et al., 2011). By identifying differences in the type of risk factors for foot ulceration between the two populations, the primary outcome was development of appropriate foot screening practices, education and treatment.

Jones, et al. (2012) investigated the prevalence of risk factors for foot ulceration to determine if the prevalence of risk factors for lower limb amputation in a stable haemodialysis population was greater in a diabetic as opposed to non-diabetic cohort. The high prevalence of risk factors was not confined to the diabetic population, findings consistent with previous studies that detailed the non-diabetic population on haemodialysis were also at risk of developing foot ulceration.

Although the evidence indicates that risk factors for foot complications are similar in the DM and dialysis populations, there is less emphasis placed on foot screening and preventive measures in the non-diabetic dialysis group. Historically, the target population for foot screening and assessment has been those with DM. Patients on dialysis, even without DM, are at high risk but awareness in non-diabetic patients is low. The conclusive findings of these studies provide justification for strategies to monitor and prevent foot pathology in the CKD population, to minimise morbidity and mortality associated with foot ulceration.

A large community-based study undertaken by Margolis, et al. (2008) demonstrated a progressive rise in risk of foot disease as renal impairment worsened. Ndip, et al. (2010) referenced the Margolis, et al. study acknowledging that the case for prevention is compelling; however, foot care and prevention programs are not yet an integral part of most dialysis units worldwide. Ahmad (2009) highlighted that without screening protocols in dialysis centres, foot problems are not identified early on and foot care often only attracts attention after a problem has arisen. Ndip, et al. (2010) proposed a minimalistic model of foot care for dialysis patients, which included a routine and systematic foot assessment. Undertaking foot screening in dialysis centres provides an opportunity to identify early problems and screen for risk factors (Ahmad, 2009).

The first point of care is often within primary care with specialist nephrology nurses in the ideal position to work in partnership with primary care clinicians in prevention and management of foot pathology (Walker, et al., 2013). Murphy, et al. (2012) developed a foot screening tool and trialled the use of the tool in two settings, including a dialysis centre. The tool demonstrated both reliability and validity in identifying those at risk of foot complications and those with actual ulcers (Murphy, et al., 2012). Egbert, et al. (2013) initiated a foot screening strategy in a satellite haemodialysis centre to identify those at risk of foot pathology. A foot screening assessment tool was developed. A clinical audit conducted following implementation
of the screening service identified that the majority of patients were unaware they were at risk of foot pathology and did not know how to care for their feet (Egbert, et al., 2013).

A foot assessment and screening service was established in a satellite dialysis clinic as part of pilot educational project to concomitantly provide learning opportunities for podiatry students on clinical placement. With the public sector under pressure to increase student clinical placement capacity, strategies to increase capacity included the utilisation of non-traditional learning environments not often utilised by allied health. Foot screening in a dialysis unit offers an educational opportunity for entry-level podiatry students who are developing competencies in the assessment and management of foot pathology. Involving podiatry students in the foot assessment process provides a multidisciplinary clinical experience within “real-life” clinical environments. Specific learning opportunities include gaining exposure to extended scope of practice, being provided with insight into multidisciplinary care and the public health service more broadly.

The key aims of this study were: to initiate a pilot foot screening program within a satellite dialysis unit; to identify factors necessary to sustain the program; to determine the prevalence of risk factors for foot ulceration in patients on haemodialysis with and without DM; and to provide real-life individual professional education to podiatry students.

**Method**

To establish the foot screening initiative, the podiatry placement coordinator engaged clinical managers of a satellite dialysis unit to determine interest in and feasibility of piloting a foot screening and assessment program. Capacity for accommodating students was also discussed. The placement coordinator reviewed the clinical space for logistical considerations for students undertaking the foot screening process. Prior to commencing the foot screening and assessment, the placement coordinator engaged dialysis patients to obtain verbal consent to be involved in the pilot. An information brochure was prepared and distributed to dialysis patients prior to commencement of the pilot. A customised assessment and screening tool was designed (Appendix A).

The foot screening and assessment was undertaken fortnightly on a Tuesday and Thursday for six weeks. Each screening and assessment session was three hours in duration involving two students and one clinical supervisor. The session would commence 30 minutes into a routine dialysis run and be completed 30 minutes prior to the end of a dialysis run. Foot assessment sessions varied in duration from 15 to 25 minutes.

While patients with DM and/or CKD were undergoing dialysis, students undertook foot assessments and screened for foot risk factors (Appendix 1). Students completed the screening tool and reviewed the patients’ feet and lower legs. At the end of the screening and assessment process the student and supervisor together determined an appropriate post-assessment clinical pathway. Each patient’s GP was notified of the findings and recommendations for follow-up actions.

**Results**

A total of 25 patients (17 male, 8 female), mean age 69 ± 14.94 (SD) completed screening. This age and gender distribution is similar to that in the dialysis unit’s complete dialysis patient cohort. Ten patients (40%) had DM; none had current foot ulceration. A total of 12 podiatry students participated in the foot screening and assessment program.

Of the 15 non-diabetic patients, 3 (20%) were current and 8 (54%) were past smokers. Of the 15 non-diabetic patients, 14 (93%) of patients had one or more risk factors, but only 5 were seeing or had seen a podiatrist. Documented risk factors included DM, smoking (past and current), peripheral neuropathy, vascular insufficiency, structural deformity and skin pathology.

The prevalence of neuropathy, vascular insufficiency, structural deformity, nail dystrophy and skin breaks was not statistically different in diabetic and non-diabetic patients (Figure 1).

Key patient outcomes following the foot assessment included recommendation for an annual foot check, ongoing podiatry review (6–8 weekly); linking patients to community health podiatry; notifying the patient’s GP of patient eligibility for the Medicare Enhanced Primary Care initiative.

**Discussion**

A foot assessment and screening service was initiated in a satellite dialysis clinic as part of a pilot educational project to provide learning opportunities for podiatry students on clinical placement. Although the evidence indicates that risk factors for foot complications are similar in the DM and dialysis patients, less emphasis has been placed on foot screening.
and preventive measures for the non-diabetic dialysis patient population specifically. Historically, the target population for foot screening and assessment has been those with DM.

The pilot screening and assessment process showed that of the 15 non-diabetic patients, 14 (93%) had one or more risk factors for foot ulceration. These findings are consistent with studies undertaken by Freeman, et al. and Kaminski, et al., who found a high prevalence of risk factors for foot ulceration in patients with CKD without the coexistence of DM. The types of risk factors for foot ulceration, which included peripheral neuropathy and vascular insufficiency, are also consistent with previous research (Freeman, et al., 2008; Kaminski, et al., 2011). Although no active ulcers were detected during the pilot project, compromised skin integrity was a common theme. For the 14 non-diabetic patients, less than half of the population were having podiatry interventions.

The pilot project provided real-life individual professional education to podiatry students and the students’ involvement in the nephrology satellite dialysis clinics provided specific learning opportunities. Students performed foot assessment and liaised with nursing staff in relation to the outcome of the individual foot screening. Where required, patients were linked into relevant podiatry services, increasing their awareness of foot health and the role of the podiatry profession. Focus groups undertaken as part of the evaluation of the pilot model of clinical placement revealed that all students found value from involvement in a variety of clinics. Perspectives included the broadening of learning experiences, which allowed students to understand the different professions, increased confidence in approaching clinicians and insight on how podiatrists are able to cooperate with the different professions to improve patient outcomes. Support was gained from the nephrology department to sustain a foot screening and assessment service. Broader key requirements to sustain the clinical placement program included podiatry clinical coordination and development of an appropriate post-assessment clinical pathway.

Foot screening can be undertaken by a podiatrist in liaison with a dialysis nurse. The authors recommend increased awareness in staff and patients, preferably with regular podiatric input. Specialist nephrology nurses are in the ideal position to work in multidisciplinary partnership to impart knowledge and skills, both in terms of biomedical and self-management interventions (Walker, et al., 2013).

The limitations of this pilot study include the screening population being small. Screening within a larger patient cohort is required to validate the findings of this pilot study. Although this makes it difficult to draw strong conclusions to findings, as a pilot program the findings are consistent with previous research. A customised assessment and screening tool was designed, which is consistent with the evidence base on foot screening tools; however, the assessment tool has not previously been validated.

Further research is required to determine the effectiveness of foot screening and assessment and patient education on reducing foot complications in patients with CKD5.

**Conclusion**

Renal failure, like DM, is an independent risk factor for an individual developing foot complications and similar preventive strategies should be utilised. Findings of a pilot foot screening and assessment program revealed a high proportion of patients on haemodialysis without DM had risk factors for ulceration. Factors necessary to sustain the foot screening program include podiatry clinical coordination and development of an appropriate post-assessment clinical pathway. Involving podiatry students has offered them a broad professional and educational experience.

**References**


Murphy, A. C., Laforet, K., Da Rosa, P., Tabamo, F., & Woodbury, M. G. (2012). Reliability and Predictive Validity of Inlow’s 60-Second Diabetic Foot Screen Tool. Advances in Skin & Wound Care, 25, 261–266.


Reliability and Predictive Validity of Inlow’s 60-Second Diabetic Foot Screen Tool. Advances in Skin & Wound Care, 25, 261–266.


Appendix

### Screening Tool for Foot Risk Factors

**Patients with Diabetes and/or Chronic Kidney Disease (CKD)**

<table>
<thead>
<tr>
<th>Patient Consents to Foot Assessment</th>
<th>UR Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Assessment:</td>
<td></td>
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<tr>
<td>Dialysis Start Date:</td>
<td></td>
</tr>
<tr>
<td>Dialysis Access:</td>
<td></td>
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</tbody>
</table>

| ESB (English speaking background) |          |
| NESB (Non-English speaking)      |          |

**Do you currently see a podiatrist?**
- Yes [ ]
- No [ ]

**If yes, how often?** ________

**Have you seen a podiatrist in the past?**
- Yes [ ]
- No [ ]

#### DIABETES
- Type 1 [ ]
- Type 2 [ ]
- Duration _____ yrs

#### RENAL DISEASE:
- Diabetes [ ]
- Hypertension [ ]
- Autoimmune [ ]

- Glomerulonephritis [ ]
- Polycystic Kidney Disease [ ]
- Other [ ]

#### COMORBIDITIES:
- Coronary Artery Disease/ IHD [ ]
- Diabetes Type I [ ]
- Peripheral Vascular Disease [ ]
- Hyperlipidemia [ ]
- Immunosuppressed [ ]

- Cerebrovascular Disease [ ]
- Diabetes Type II [ ]
- Hypertension [ ]
- Obesity [ ]
- Smoker current [ ]
- Smoker past [ ]

#### NEUROPATHY Semmes Weinstein 10g monofilament

**R/Foot** ____ /4 sites  **L/Foot** ____ /4 sites

**Yes [ ]**

**No [ ]**

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Diabetic foot study Screening tool draft 1.14 [pdf]
Adapted from Amy Freeman; Heather Locking-Cusolito, et al