Diabetes & Metabolic Syndrome: Clinical Research & Reviews xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Original article

Adherence to blood pressure and glucose recommendations in chronic kidney disease hospital inpatients: Clinical inertia and patient adherence

Fergus William Gardiner[a,b,c,*], Ezekiel Uba Nwose[a], Phillip Taderera Bwititi[c], Judith Crockett[a], Lexin Wang[c]

[a] School of Community Health, Charles Sturt University, Australia
[b] Calvary Hospital, ACT, Australia
[c] School of Biomedical Sciences, Charles Sturt University, Australia

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Cardiovascular diseases
Diabetes mellitus
Kidney diseases
Guideline
Inpatients

ABSTRACT

Aims: To determine the extent to which targets for blood pressure (BP) (<140.90 mmHg) and random blood glucose level (BGL) (<7.7 mmol/L) control in patients with chronic kidney disease (CKD) are achieved; and the extent clinical inertia affects BP and glucose control in CKD and diabetes mellitus (DM).
Methods: Data was collected from the 1st January 2015 until 31st December 2015 on key patient pathology, admission reason, final discharge diagnosis, and information concerning clinical guideline adherence.
Results: Eighty-seven ($n = 87$) CKD patients were included. The average hospital BP for all CKD patients was 134.3/73.4 mmHg, adhering to recommendations of <140/90 mmHg. The average CKD patient pre-admission BP was 134.8/72.2 mmHg compared to the discharge BP of 129.8/72.2 mmHg. At admission, 63.3% and 93.1% of patients adhered to systolic and diastolic BP recommendations, which significantly ($p = < .05$) increased at discharge to a systolic and diastolic BP adherence of 83.9% and 98.8%, respectively. The average random hospital BGL was 7.7 mmol/L, indicating good control, whereas the pre-hospital HbA1c average was 7.58%, indicating poor control (>7.0% >53 mmol/mol). There were 21 cases of clinical inertia, affecting 18 out of 87 patients (20.7%), with significant adverse hospital discharge differences ($p = <.05$) between clinical inertia and non- clinical inertia patient systolic BP (144.2 vs. 132.8 mmHg), deranged BGL (66.7% vs. 35.3%), and reduction in kidney function (83.3% vs. 30.9%).
Conclusion: Adherence appears to be related to inpatient clinical inertia and outpatient patient health literacy and empowerment.

1. Introduction

A complication of diabetes mellitus (DM) is diabetic nephropathy but if kidney damage is identified early, it can be slowed with treatment but once albimunuria occurs, the kidney function can progressively worsen without treatment. The primary treatment strategies to slow progression of kidney damage include controlling HT and blood glucose levels by medications and lifestyle changes. CKD is a significant cause of morbidity in patients with DM, often leading to dialysis or kidney transplants [1].

The generally accepted Australian BP target for preventing major cardiovascular events, and reducing the risk of progression to CKD is <130/80 mmHg if tolerated, otherwise <140/90 mmHg [2–4]. The need for prompt follow-up and referral, combined with appropriate medications to achieve a BP control (<140/90 mmHg) is important, and emphasised in Australian guidelines [[9–13],[2–4]]. However, even with guidelines, studies [5–8] have highlighted that treatment is often inadequate, and other studies indicate that recognition and control of HT in the inpatient hospital setting are limited, especially in patients with high-risk conditions, such as DM and CKD [9–13]. The general HbA1c target is <8.0% (<53 mmol/mol), with desired target of <6.5% (<48 mmol/mol) depending on the patient's medical history [14]. These recommendations reflect the RCPA recommendations [[9–13],15] and other studies [16,17] that a HbA1c of <8.0% (64 mmol/mol) indicates good control in DM patients. Tight glycaemic control

* Corresponding author at: The Calvary Public Hospital, Bruce, Canberra, Australia.
E-mail addresses: gus_gardiner@hotmail.com, gus.gardiner@health.gov.au (F.W. Gardiner).

https://doi.org/10.1016/j.dsx.2017.12.007
1871-4021/

early in diabetes is desirable, and is seen to lead to the greatest benefit for the prevention of micro- and macrovascular complications, as well as mortality [14].

Clinical treatment barriers in patients with DM, CKD, and cardiovascular disease (CVD) have been explored, and have often been associated with clinical inertia [18–20]. Clinical inertia is when the clinician fails to escalate care in the presence of competing demands from multiple comorbidities [5,21,22] It has been reported [23]. that clinical inertia is a major factor that contributes to inadequate chronic disease care in patients with DM, HT, dyslipidemia, depression, coronary heart disease (CHD), and other conditions such as CKD.

Furthermore, lack of or inadequate patient health literacy and empowerment has been established as a barrier to patient adherence. Patient health literacy is the "degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" [24], while empowerment is "the subjective feelings of power, control and self-esteem that make the patient value autonomy—and thus interest in and desire to participate in healthcare decisions. In this vein, patient empowerment is volitional" [25,26]. Although volition is important, it may come secondary to other considerations, such as the conflict between other costs of living and purchasing medications. As such, some patients may have good health literacy and empowerment, but are financially unable to afford specific treatments. Thus, poor patient adherence in this context includes an ongoing history of poor BP and glycaemic control, poor and/or unaffordable medication and pathology request compliance and ongoing challenges with self-management of lifestyle and diet, despite ongoing education.

It is not clear how well Australian clinicians and patients control BP while in hospital, especially in those with chronic conditions, such as CKD. Furthermore, it is unknown whether how well the patients control their DM directly before hospital admission. These are major limitations in preventing renal disease progression. The aims of this study was to determine to what extent are the targets for BP and blood glucose control in patients with CKD achieved; and to what extent is clinical inertia affecting BP and glucose control in patients with CKD and DM.

It is hypothesised that:

- average hospital BP is <140/90 mmHg; and as such reflective of the Australian BP guidelines [2,3].
- average hospital random blood glucose is <7.7 mmol/L; and as such reflective the Royal College of Pathologist Australasia [1,24] guidelines.
- achieving the target BP and blood glucose levels in in/out-patients with CKD and DM are not consistently achieved due to clinical inertia and poor patient health literacy.

2. Methods

The project was approved by the Calvary Public Hospital Bruce Research Ethics Committee (reference number: 33-2016), and the Charles Sturt University (CSU) Human Research Ethics Committee (reference number: H17009). The Calvary Hospital Bruce is a 256 bed public hospital located in Canberra Australia. The hospital has many services, including an Emergency Department, an Intensive and Coronary Care Unit, Medical and Surgical Wards, a Maternity Unit, a voluntary Psychiatric Ward, and Ambulatory Care and outreach facilities and services. The hospital is a teaching hospital with associations with local universities.

2.1. Data collection and analysis

A retrospective review was performed involving access to all patients' notes who had a diagnosis of CKD upon or during admission, from the 1st January 2015 until 31st December 2015 (12 months). Estimated GFR (eGFR) was the pathology used to indicate kidney function. As per the RCPA Manual [1], eGFR is a derived value: eGFR (mL/min/1.73 m^2) is calculated by the pathology laboratory using the patient's age, sex and serum creatinine result. The result is expressed relative to a 'standard' body surface area of 1.73 m^2; and calculated using the CKD-EPI formula. Patients were diagnosed with CKD when they had a prior history of documented kidney disease, involving moderate, severe or end-stage reduction in eGFR persisting for more than 3 months, indicating CKD.

Data was collected on patients admitted to the hospital and only those with a diagnosis of CKD were included. Furthermore, only patients with at least 5 measurements of: BP, blood glucose, albumin, creatinine, urea, calcium, and CRP, while admitted to hospital were included. Information collected also included patient's stage of kidney disease, which was determined using the KDOQI Clinical Practice Guidelines for Chronic Kidney Disease. The KDOQI stages of kidney disease are detailed in Table 1. Demographic data was collected in addition to the patients' CKD stage, and their DM and HT status. Furthermore data was collected on the presenting/admission reason and the final discharge diagnosis/prognosis.

2.2. Clinical inertia definition and algorithm

Clinical inertia (CI) was established as a factor when the clinician failed to escalate care in the presence of competing demands from multiple comorbidities [5,21,22] including when the treating team did not escalate care in the presence of high BP >140/90 mmHg and/or random BGL >7.7 mmol/L. To be defined as demonstrating CI, the following must have occurred: the patient failed to achieve guideline recommended BP and BGL; and the

Table 1
Stages of Chronic Kidney Disease.

Stage	GFR[a]	Description
1	90+	Normal kidney function but urine findings or structural abnormalities or genetic trait point to kidney disease
2	60–89	Mildly reduced kidney function, and other findings (as for stage 1) point to kidney disease
3	30–59	Moderately reduced kidney function
4	15–29	Severely reduced kidney function
5	<15 or on dialysis	Very severe, or endstage kidney failure (sometimes call established renal failure)

– See more at: http://www.renal.org/information-resources/the-uk-eckd-guide/ckd-stages#sthash.igkObBzd.dpuf.
[a] All GFR values are normalized to an average surface area (size) of 1.73 m^2.Source: The Royal College of Pathologists of Australasia Manual [1,24].

Please cite this article in press as: F.W. Gardiner, et al., Adherence to blood pressure and glucose recommendations in chronic kidney disease hospital inpatients: Clinical inertia and patient adherence, Diab Met Syndr: Clin Res Rev (2017), https://doi.org/10.1016/j.dsx.2017.12.007