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This is the second in a series of articles addressing chronic disease state management (CDSM). The first article (January 2007) addressed the concept and rationale for chronic disease self-management, this article addresses diabetes, and the next will address asthma. In addition, there is a clinical update on type 1 diabetes in February 2007 to support your professional development relevant to CDSM. Diabetes is a chronic condition for which self-management has been established to play an essential role [1] There is a growing body of research which has demonstrated that patients living with chronic diseases who are active participants in their disease management have better health outcomes[2], showing greater condition-related self-efficacy and confidence, better functioning and reduced acute care and hospitalization [2].

Although many, if not all, pharmacists are aware of the need for chronic disease state management, some find it difficult to identify a role suiting pharmacist involvement. Recently, the World Health Organisation published a handbook addressing the role of the pharmacist entitled “Developing pharmacy practice: A focus on patient care”. It is available for download as a pdf from www.who.int/medicines/publications/WHO_PSM_PAR_2006.5.pdf. This document clearly articulates a vision of the expected role of the pharmacist that is consistent with both pharmaceutical care and chronic disease state management. Of particular interest is the expectation of the “seven star pharmacist”, who should be: caregiver; decision-maker; communicator; manager; life-long learner; teacher; leader and researcher (in the sense of accessing and increasing the accessibility of evidence-based information) [3].

Effective diabetes management strategies include: effective screening for early detection; patient education and support for disease self-management; effective pharmacotherapy to maintain normal blood glucose levels, blood pressure and lipid profile; effective monitoring by the patient care multidisciplinary team [4].

A diagnosis of diabetes brings with it the necessity to make numerous changes in everyday life, and change is something that many individuals find threatening. However, changes need to become accepted as living with diabetes requires active participation on the part of the affected individual with the necessity of developing a knowledge base and number of disease-specific skills or “competencies” [4]. Individuals need to acquire nutrition and exercise-related knowledge, medication-related knowledge (Table 1 provides a quick pharmacotherapeutic review), blood glucose monitoring knowledge and device-related knowledge, as a minimum (Table 2 outlines the sorts of knowledge and skills that can be required).

Diabetes management requires the successful integration of two management teams: the personal team -the individual with diabetes; and the external support team – family, friends, other individuals with diabetes, members of the multidisciplinary healthcare team. It has been established that individuals with diabetes who receive care from a multidisciplinary team of healthcare professionals demonstrate better health outcomes [2] – perceptions of wellbeing; effective self-care and better blood glucose control [5]. These individual health outcomes are of interest as they are

strongly associated with longer term disease state outcomes such as complications, mortality and quality of life [5] .

Blood glucose monitoring – BGLs and HbA1C

One aspect of diabetes self-management that is often viewed with concern is blood glucose monitoring, and so it is important for us to consider this aspect of care in more detail before proceeding. Many of the other changes required by a diagnosis of diabetes, such as diet and exercise, merely adjust something that is already being done by “everyone”. It is important that patients become proficient as, with regular self-monitoring of BGLs, it is feasible and possible to tailor medication, diet, and exercise so as to maintain normal levels [7], and it is crucial that patients understand what the levels mean because many patients report issues such as : inconvenience; pain; cost; stress or even inability to use the devices.

The stages in blood glucose self-monitoring are outlined in Table 3., with a recent study [7] identifying that up to 83% of individuals with Type 2 diabetes make at least one error in the process. Errors may be critical i.e. affect the accuracy of the result or they may be a procedural error that influences patient adherence to the recommended schedule of testing. It is crucial therefore that patients seeking to purchase a glucometer are shown the features, size and method of operation before making a selection. Additional information about glucometers is usually readily available on the web (See Table 4 . which lists as an example the site for Accu-Chek™ glucometers). In addition, Diabetes Australia provides a downloadable chart comparing the features of common glucometers (http://www.diabetesnsw.com.au/PDFs/About_Diabetes_PDFs/Blood%20glucose%20meters%20chart%20with%20pics.pdf).

Although glucometers are supplied with a lancet device and a starter supply of lancets, not all patients will find the supplied device suits their needs. Websites and manufacturer product information is available to support these devices, and realitycheck.org.au offers “road test” reports.

Whilst knowledge of current blood glucose levels is critical, of equal or arguably greater importance to health outcomes is longer term blood glucose control. Glycosylated haemoglobin (HbA1c) levels provide an indication of blood glucose levels over the past 3 months, with levels < 7 seen to be desirable, and more recent recommendations arguing for lower limits around 6.5. HbA1c serves as a marker of disease management and increasingly patients are encouraged to have regular blood tests to identify its level and to be aware of the result, tailoring their management, if required [2] .

What do we need to be able to assist patients with diabetes?

Our patients live with diabetes every day and so we need to be able to assist them in their self-management, so we need interest, motivation and a commitment to patient disease self-management. Naturally, we then need a sound knowledge of diabetes pharmacotherapy, common adverse effects and strategies to minimise them if possible, or discussion with the prescriber if the adverse effect is serious and/or clinically relevant. We also need a good understanding of the disease state which we update regularly. Then we need a good “portfolio” of resources be they other

healthcare practitioners such as podiatrists, dietitians, or diabetes educators,); disease state organisations such as Diabetes Australia; patient support groups, books, videos, DVDs or web-site URLs (See Table 4).

Then as chronic disease states are amenable to lifestyle changes and self-management, we need to know what changes are considered beneficial to individuals with diabetes so that we can consider which ones to discuss with the patient with whom we are conversing. Since change is usually neither fun nor easy, we also need to be aware of, and communicate to patients, the benefits of the activity we suggest. There are a number of issues commonly of interest to individuals with diabetes [8] : lifestyle changes, blood glucose monitoring, foot care, illness and glucose control; management of hypoglycaemia; oral care ; travelling.

The lifestyle changes that are most often required are restriction of energy intake, increased activity and, weight loss. The benefits to patients of weight loss in particular include: lower plasma glucose and lipid levels; improved blood pressure measurements; improved insulin resistance. When suggesting changes in physical activity, we need to be discussing with patients how they can include exercise for at least 30 minutes each day – this is optimum though 3-4 times a week is generally considered acceptable. Patients are often concerned about “hypos” should they choose to exercise, the chance of these occurring can be reduced by consumption of a modest amount of carbohydrate before exercise, or a decrease insulin if part of therapy; carrying jelly beans or glucose; checking BGL following exercise and refraining from exercise when unwell.

Healthy eating is a critical component for successful management of all types of diabetes, and a balanced, healthy diet (such as we should all be eating) is usually recommended. In addition, many patients may be advised to increase monounsaturated or polyunsaturated fats and decrease saturated fats; increase dietary fibre, spread the intake of carbohydrates throughout the day, and choose low-moderate glycaemic index carbohydrates. Consideration of the glycaemic index and glycaemic load has been established to offer additional benefits in promoting normoglycaemia than merely accounting for the total amount of carbohydrate in the diet [6] . The glycaemic index ranks carbohydrates based on their impact on blood glucose, with high GI carbohydrates producing a rapid rise in blood glucose. GI values of a large number of foods can be found at <http://www.glycemicindex.com/>.

Because smoking can increase the risk of complications of diabetes such as heart attacks, strokes, serious circulation problems in feet and legs and even contribute to oral infections, giving up or even reducing the number of cigarettes smoked can be particularly beneficial. Self-care fact cards, “quit kits”, nicotine replacement therapy and regular meetings with you may assist your patients who smoke to quit and remain healthier longer.

In the overall management of diabetes, foot care can seem to be one of the least important not only to patients but also to healthcare professionals, yet during their lifetime, about 20% of patients with diabetes will experience foot/leg ulceration, which may result in a serious infection, gangrene and even amputation. So when talking to patients, we need to inquire about visits to a podiatrist and suggest daily

foot care which includes washing, drying and a careful inspection (with a long-handled mirror if necessary) for injuries or calluses. In addition, as most patients will be participating in some exercise, it's wise to suggest ideally shoes should be fitted by a trained fitter, and will be comfortable (no "breaking them in"), supportive shoes with low heels and plenty of wiggle room for the toes; worn with seamless socks with no mended areas. Patients should also check the inside of their shoes before slipping them on to ensure that no foreign objects are inside (particularly if there are young children, or pets, in the house). Going barefoot is also not recommended because of the potential for injuries such as cuts, scratches and abrasions

Oral hygiene and regular visits to the dentist are also recommended with professional cleaning every six months, twice daily brushing and once daily flossing usually recommended. This is particularly an issue if blood glucose control is not as tight as desired as diabetes increases the risk of infection and the poorer circulation slows healing.

Travelling, especially overseas, can also be a concern for patients but can be reduced to a minimum with forward planning. Patients are advised to consult their GP or specialist, to discuss their travel plans, especially the countries they intend to visit. Whilst disease state management does aim to "normalise" living with a chronic condition, it may not be possible to consider climbing Mount Everest or trekking in Nepal. In addition, it's advisable to carry a letter from the medical practitioner outlining medications, syringes, sharps kits and devices that the patient needs to manage their diabetes. It can be helpful to carry an NDSS card and photo ID, to have every pack of medication fully labelled, spare batteries for the glucometer, and a source of glucose such as jelly beans. A medical alert bracelet or neck chain are also suggested in case of hospitalisation by accident or illness. Wherever possible, itineraries should be arranged to allow rest days, and leisure times on days activities are planned.

Take a moment now to look at Mr JW (Table 5) and see what assistance in disease self-management you can offer, based on the section above and your professional experience.

Putting it into practice

As highly accessible healthcare settings [9], pharmacies can be ideal for the delivery of diabetes self-management information and strategies [9]. Successful pharmacy-based diabetes self-management programs in community pharmacy usually start with an initial interview and discussion, at which diabetes history and medications are elicited, diabetes-related goals discussed and risk factors identified [9]. A self-care strategy is developed and discussed at approximately monthly intervals, with referrals addressing specific areas of concern. Table 2. outlines common topics for discussion in a self management framework and possible referral solutions to address patients needs, along with a rationale for that discussion or strategy. It is critical to develop and/or maintain effective professional communication with every healthcare provider providing care for your patient to optimise patient self-management.

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Table 3. Stages of blood glucose self monitoring using a glucometer

Individual processes and potential sources of error in blood glucose measurement
Washing and drying hands (or alternate site if alternate site testing is used)
Disinfection e.g. alcohol wipe if recommended by specialist or GP
Stimulating circulation (if required)
Inserting or changing the lancet
Verifying or adjusting the lancet striking depth
Verify use of correct test “strips”, appropriate storage and expiry date
Glucometer turned on and ready to measure
Test strip extracted and inserted into glucometer, test strip container closed or secured
Sideways pricking of finger pad (if finger tip is used)
Sufficient size of blood drop “extracted”
Applying blood sample to active site on the test strip / device
Reading, recording or storing the test results

Source: Adapted from Muller et al 2006

Table 2. Topics addressed in a diabetes self-management program

Intervention	Rationale
Introduction to diabetes – discussion of what diabetes is; likely personal experiences; goals for management	A newly diagnosed individual may respond with denial or overwhelming anxiety; an individual with a longer time from diagnosis may have formed incorrect perceptions or assumptions
Discussion of modifiable factors such as exercise, relaxation and better sleep programs – Referral if required to exercise physiologist or a psychologist or other appropriate practitioner	Individuals become familiar with the differences between acute illnesses and ‘cures’ compared to management of chronic diseases and lifestyle changes to facilitate that management
Discussion of appropriate nutrition – referral advisable to a dietitian with experience in diabetes and patient age/life stage e.g. you may wish to refer differently for a patient who is a 16 year old living at home and a 65 year old pensioner living alone	Appropriate nutrition is a key cornerstone of diabetes management, and usually modifiable as individuals have significant control over what they consume. In addition newer concepts such glycaemic index and glycaemic load may be unfamiliar to a long-established diabetic.
Further explanation about feeling of living with diabetes – identifying strategies to manage – Referral if required	Self- management paradigm asserts that individuals with a chronic condition not only have information and skills but also feels free to question and evaluate strategies and has the resources to do so
Discussion and identification for strategies for change that are appropriate for that patient – referral if required to psychologist or diabetes educator	Change is often difficult to cope with and manage, and understanding the process and likely timeframe can assist diabetics to form realistic and achievable goals
Discussion and a ‘show & tell’ about glucometers and blood glucose testing; also addressing disease state organisations – Referral to local support group, if required	Introduces a new patient to testing and develops self-efficacy (perception of the ability to do that task), and checks the technique of a patient who has been diagnosed longer, as some studies have identified that technique is poor is > 80% of individuals with diabetes
Discussion of role, function and specific requirements (e.g. relationship to food) of any medications if prescribed, and identifying appropriate ways to schedule adherence into the lifestyle and daily activities	Identifies specific area of expertise as a member of the healthcare team; assists in the reduction of adverse events
Identification of any adherence issues and referral to GP (e.g. for adverse effects) or other member of the patient care team as relevant	There are many causes of non-adherence and simple strategies can often assist patients e.g. if possible, once daily dosing achieves greater adherence than four times daily dosing
Confirmation that individual has a diabetes action plan to cope with sick days, travel and other issues – referral to GP, local support group or diabetes educator as appropriate in your community with available resources	Philosophy is one of developing “expert patients” and empowering the individual with the chronic condition so that they feel more able to take personal responsibility for the management of their condition
Verify self-management outcomes, using qualitative (how individual feels and is coping) and quantitative measures (e.g. HbA1c). Support and reinforce, or refer as required if targets are not being achieved	Continuity of care concept guides this stage with key factors: ready access; interactions with other healthcare providers; communication and personal responsibility

Source: Adapted from Cooper et al 2003 and Harris et al 2000

Table 4. Useful web-sites to assist individuals with diabetes

URL (web address)	Organisation	Resources available
www.diabetescounselling.com.au	Diabetes Counselling	Site for people with diabetes; private and group counselling, forum and chat room
www.diabetes.org.au	Diabetes Centre, Queen Elizabeth Hospital	Information on diabetes; dictionary of terms; and patient care leaflets
www.diabetesaustralia.com.au	Diabetes Australia	Self-management products and services
www.dipex.org	Dipex.org	Provides personal experiences of living with a chronic illness, one of which is diabetes
care.diabetesjournals.org	Diabetes Care journal	Tables of contents, some full text and abstracts
www.taichifordiabetes.com	Tai Chi for Diabetes	Information about tai chi by Dr Paul Lam for individuals with diabetes, supported by Diabetes Australia
http://www.daq.org.au/content/index.cfm?action=getfile&id=452	Resource on the Diabetes Australia – Queensland web site	Good source of basic facts, definitions and identification of risk factors
www.diabeteshealth.com/index.html	Diabetes Health magazine – US based site, so not all products are available in Australia, but an excellent way to see new products which may become available	Lots of resources; recipes; types of diabetes; glucometers and pumps; celebrities with diabetes
www.accu-chek.com.au/index.asp NB Most manufacturers have a site for their diabetes products, just search for the meter or the company	A site dedicated to Roche’s Accu-Chek range of glucometers	Information for individuals with diabetes and health professionals
Realitycheck.org.au/glucometers_test.htm	Site for young adults with diabetes – this page rates common glucometers	Gives description, likely cost, size and advantages of each model evaluated. Other areas on this site road test lancet devices.

Table 1. Brief overview of diabetes pharmacotherapy

Medication group	Simplified mode of action	Adverse reactions	Strategies to minimise adverse reactions
Insulin secretagogues –sulfonylureas e.g. Glibenclamide, glimepiride, glipizide, gliclazide	Increases release of insulin from pancreas	Weight gain Hypoglycaemia	With food + Blood glucose monitoring and maintenance of a regular lifestyle
Insulin secretagogues –nonsulfonylureas e.g. Repaglinide	Stimulates rapid insulin release Faster onset, shorter duration	Gastrointestinal, hypoglycaemia	Usually best NOT taken if missing a meal
Biguanides e.g. metformin	Decreases excess hepatic glucose output, increases insulin sensitivity in skeletal muscle, Lowers LDL-C	Gastric upset Lactic acidosis (can be serious) Weight reduction is a common and often welcome feature	Take with meals
Alpha-glucosidase inhibitors e.g. acarbose	Reduces postprandial glucose Not as effective as other agents at reducing Hb A1c levels	Gastrointestinal adverse effects fairly common	Careful titration of dose, may benefit from increase in complex carbohydrates; limited intake of simple sugars, legumes
Thiazolidinediones ‘glitazones’ e.g. Rosiglitazone	Enhance insulin sensitivity in muscle, liver, and adipose tissue	weight gain, fluid retention,	Attention to diet; exercise Patients can sometimes take 8-10 weeks to “see” onset of action
Insulin - many different forms available with different onset, peak effect and duration	Same as naturally produced	Weight gain can occur	Attention to diet; exercise

Table. 5 Case study for consideration, Mr J.W. – diabetes mellitus type 2.

Information that you currently have about Mr JW, and additional information at each interview or discussion	Potential issues – how many additional issues have you identified? How will you address them?
1. Male, of Caucasian background; aged 55 years; diagnosed 15 years ago, taking metformin 1G three times a day	What are his BGLs and HbA1c levels? Does he have a family history of diabetes?
2. He weighs 120kg and is in his own words “undertall” at 170cm	Is he able to exercise? Is he already exercising? What is his normal diet?
3. His latest HbA1c is 8.2, and when he measures his BGLs they can vary from 4 to 13	How often is he measuring his BGLs? Is he taking his oral hypoglycaemics? Has he been ill or particularly pressured or stressed?
4. He asks for a large tube of clotrimazole cream for a foot rash.	Is the cream for himself? Is he testing his BGLs? What readings has he been getting? Will he show you his feet so you can look at the “rash”? Has he been taking his medication?
5. He tells you he has had three teeth removed over the last week, and asks for analgesics.	How often does he visit the dentist? Does he brush morning & night? Flossing? What analgesics has he taken already?
6. He is travelling from Melbourne to Brisbane (assume he lives in Melbourne) over three weeks	How is he travelling? Is he travelling alone? Does he have sufficient medication or a repeat Rx to obtain more? Is he taking any rest days?

MCQs – provide 3 with answers only one of which is correct
Multiple choice questions – correct in bold

1. Which of the following provide the **best answer** to this question, “Why do patients need to adopt self management of their diabetes?”
 - a) **Many of the activities which contribute to better diabetes health outcomes are activities that need to be undertaken by the patient – such as blood glucose monitoring; changes to diet and activity level; appropriate foot care including regular inspections**
 - b) It is after all THEIR disease and no one else can do it for them
 - c) If they did not, the health care budget would explode
 - d) There are currently no cures for diabetes and they often need continuous medication usage which takes up their visits to the medical practitioner so the rest falls to them – they ‘fall through the cracks’ in the system

2. Which of the following **best describes** patients’ issues with blood glucose self monitoring?
 - a) Feeling faint at the sight of blood; not needed as the doctor orders blood tests anyway; eats a high protein diet which doesn’t affect blood glucose levels
 - b) Pain; cost; not needed as doctor orders blood tests
 - c) **Pain; inconvenience; inability to use the device; cost**
 - d) Pain; inability to use any of the devices; as an athlete expends enough energy through physical activity not to have to worry about BGLs

3. Which of the following **best** describes pharmacist activities which might assist self management in a patient with diabetes?
 - a) Spending time each visit talking about their risk of complications; providing a relevant self-care fact card on each visit; providing information about Diabetes Australia and checking that they have joined; making sure they have enough medications including test strips
 - b) Listening sympathetically each time they return with repeat prescriptions; asking about adverse effects and the development of any complications with kidneys, eyes or feet
 - c) Checking how their condition is progressing; suggesting additional sources of information and different devices needing smaller blood volumes and quicker processing time and memory; making certain you stay current on all the new technological developments in diabetes care
 - d) **Discuss their feeling about and experiences of diabetes; identifying modifiable behaviours; identifying their need for information and resources; providing information such as relevant Self-Care fact cards and referrals to relevant healthcare professionals; ensuring blood glucose monitoring is undertaken and strategies to address levels outside the normal range are developed**