Medicines adherence in people with diabetes and disability, and the role of insulin delivery devices

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Article points

1. Poor medication adherence in diabetes has been shown to be associated with disease progression, avoidable hospitalisations, disability and death.
2. The complications associated with diabetes can affect an individual's ability to self-manage the condition.
3. Insulin devices have improved the acceptability of injections in diabetes and adherence. However, many of the research studies that have examined the use of these devices do not include people with disabilities. Diabetes technology research should include individuals with a full range of impairments if benefit is to be claimed for these groups. This information is required by healthcare professionals so that they know whether benefits of technology apply to people with disabilities

Key words

- Disability
- Insulin
- Medicines adherence

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Studies show that approximately 20–30% of diabetes medication is not taken as recommended and this is associated with higher healthcare costs. The rate of disability due to diabetes complications is also increasing as many people with diabetes are living longer. These disabilities, which include cognitive decline, vision loss and impaired dexterity, can impact on a person's ability to self-manage their diabetes. This article outlines some of these disabilities and discusses the role of insulin delivery devices on adherence, and the need for research involving these devices to include people with disabilities.

Despite the efforts of healthcare professionals to improve the quality of diabetes care, studies that have examined rates of non-adherence report that between 20–30% of medicines for diabetes are not taken as recommended (Lau and Nau, 2004; Karter et al, 2005; Ho et al, 2006). Poor medication adherence in diabetes has been shown to be associated with disease progression, avoidable hospitalisations, disability and death (Sokol et al, 2005; Currie et al, 2012). Multiple studies have evaluated the relationship of costs to diabetes and generally support a correlation of increased adherence and reduced cost (Luga and McGuire, 2014). For example, Egede et al (2012) demonstrated that medicine non-adherence was associated with 41% higher inpatient cost. In the US, Sokol et al (2005) estimated that an increase in medication adherence of only 20% could reduce total healthcare spending by $1074 for every person with diabetes and another US study (Ashish et al, 2012) projected that improved adherence to diabetes medication could avert 699 000 emergency department visits and 341 000 hospitalisations annually, for a saving of $4.7 billion. Although it has been suggested that improving medicines adherence may have a far greater impact on clinical outcomes than any treatment itself (NICE, 2009), no single or combined strategy has resulted in more than small-to-modest benefits in rigorous trials (Vermeire et al, 2005, Franklin et al, 2006, Misono et al, 2010; Heisler et al, 2012).

Mortality due to diabetes has now been postponed to older age in most cases; however disability and health loss due to diabetes is increasing, particularly in the older population (Darbà et al, 2015). The complications associated with diabetes can affect the ability of an individual to carry out daily self-management activities, which include managing the relationship between food, activity and medication, and self-monitoring of blood glucose. Disabilities, including cognitive decline, vision loss, and impaired dexterity, can affect all self-management activities. The complexity of self-care often increases at the same time as the person is growing older and eyesight, hearing, fine motor skills and memory processes are changing, all of which impact on the individual's ability to comply with self-care practices, such as blood glucose monitoring and medication management. This includes the administration of insulin, resulting in more insulin dose errors (Dunning and Manias, 2004).

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1. Dementia makes the management of people with diabetes extremely difficult, and caregivers of people with diabetes and dementia report memory loss to be the first identified cause of self-care neglect.
2. Studies have shown that people with diabetic retinopathy are twice as likely to need help in managing medication.
3. A loss of manual dexterity has an effect on the ability of people to undertake self-care tasks, such as injecting insulin and measuring blood glucose.

Diabetes and dementia

It is estimated that approximately 850 000 people in the UK have dementia (Alzheimer's Society, 2015). The number of people diagnosed with diabetes is 2.6 million and by 2025 this figure is expected to rise to 4 million (Diabetes UK, 2010). Most of these cases will be type 2 diabetes, type 1 accounting for approximately 10% of all cases (Diabetes UK, 2010). Both dementia and diabetes affect older people, and people with diabetes have twice the risk of developing dementia than those without diabetes (Ott et al, 1999; Peila et al, 2002). Early symptoms of dementia include forgetfulness and short-term memory loss. As the condition worsens, the person becomes disorientated and can get lost. They also have difficulties managing social situations and using their daily living skills. In the later stages of the disease, people with dementia become completely dependent upon others (TREND-UK and The Institute of Diabetes for Older People [IDOP], 2013). Dementia makes the management of people with diabetes extremely difficult, and caregivers of people with diabetes and dementia report memory loss to be the first identified cause of self-care neglect leading to caregiver intervention (Feil et al, 2011). People who have diabetes and are then diagnosed with dementia have difficulties self-managing their medicines. Problems include forgetting to take their medication regularly, double dosing and forgetting how to inject (TREND-UK and IDOP, 2013).

Diabetes retinopathy

Diabetes retinopathy is caused when diabetes affects the small blood vessels of the retina of the eye. This condition progresses with time; however, it may go undetected until it begins to affect a person's vision. All people with diabetes are at risk of retinopathy and the longer an individual has diabetes, the greater the risk of retinopathy (International Diabetes Federation [IDF], 2015). It is estimated that 74% of people who have had diabetes for 10 years or more will develop some form of retinopathy, and the risk of retinopathy is increased in those who have poorly controlled diabetes and in those who have a high blood pressure (IDF, 2015). Over 1200 cases of blindness caused by diabetic retinopathy are reported each year in England and it is estimated that a further 4200 people each year are at risk of blindness (Public Health England, 2015). People with visual impairment have been reported to be twice as likely to need help in managing medication (McCann et al, 2012). Devenney and O'Neill (2011) emphasise the importance of support from healthcare professionals and social networks for people with diabetic retinopathy, as visual loss is often accompanied by a sense of dependence, social isolation, and loss of social and occupational roles, which can limit the person's ability to maintain good blood glucose control.

Manual dexterity

Polyneuropathy affects approximately 40% of people with diabetes (Vinik, 2003; Miralles-García et al, 2010). A deterioration in manual skills and dexterity has been reported in people with diabetes, and this deterioration has been found to increase with age (Pfützner et al, 2011). People with diabetes are often required to measure their blood glucose and inject themselves with insulin several times a day. A loss of manual dexterity has an effect on the ability of people to undertake these tasks.

Other factors

Other factors that can affect medicines adherence in diabetes include regimen complexity (Paes et al, 1997), more frequent insulin injections and injection-related pain or embarrassment (Peyrot et al, 2010). In turn, these factors can worsen each of the disabilities described above.

Insulin delivery devices

Up until the early 1980s, insulin delivery was a lengthy and time-consuming process using glass syringes and needles. However, over the last 3 decades a number of different types of insulin delivery devices have been developed, including insulin pens, pumps and jet injectors, along with devices that help with diabetes management and make the process of injecting insulin easier.

The introduction of the insulin pen in 1985 had a big impact on the acceptability of injections in diabetes and adherence. Pen devices have been developed that incorporate numerous design elements that make them easier to handle, preferable to use, more discreet and more accurate than a syringe and vial (Asakura et al, 2009). Insulin pens have become the main device of use in Europe for insulin delivery (Hansen et al, 2011). They are associated with higher quality-of-life scores (Rubin and Peyrot, 2004) and

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1. The introduction of the insulin pen in 1985 had a big impact on the acceptability of injections in diabetes and adherence. They are associated with higher quality of life scores and are preferred by people with diabetes.
2. A number of research studies that have examined the use of insulin delivery devices do not include people with diabetes and even fewer involve people with disabilities.
3. If insulin pens and other devices used in the administration of insulin are to be improved, in order to optimise outcomes, people with these disabilities need to be included in this research.

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are preferred by people with diabetes (Jefferson et al, 1985; Korytkowski et al, 2003) and providers (Asamoah, 2008; Davis et al, 2009). Furthermore, researchers in the US investigating claims data report that people with diabetes who switch from syringes and needles to pre-filled insulin analogue pen devices exhibit significantly better medication adherence, have fewer claims for hypoglycaemic events, fewer hypoglycaemic-related emergency department and physician visits, and lower overall treatment costs (Lee et al, 2006; Baser et al, 2010). The same benefits have been reported more recently by Asche et al (2012) in a review of the research evidence.

Although the research studies that have examined the use of insulin delivery devices do have some significant methodological strengths, a number of these studies do not include people with diabetes. For example, research by Asakura et al (2009) involved the injection of insulin vial by syringe and a pen into a sponge and pad by healthcare professionals. Similarly, work by Friedrichs et al (2011) exploring injection force of reusable insulin pens, was undertaken in the laboratory setting and human subjects were excluded. Therefore, the conclusions that can be drawn from these studies for practice, and the significance for pen users, are unclear. In those studies that do include people with diabetes (Korytkowski et al, 2003; Rubin and Peyrot 2004), with the exception of only a few (such as work by Hansen et al, 2011) people with disabilities are not included. Given that by the time of diagnosis, 50% of people with diabetes show signs of disability or complications and these disabilities may begin 5–6 years before diagnosis (UKPDS [UK Prospective Diabetes Study] Group, 1991), it is extremely important that these individuals (often with multiple disabilities) are included in research studies. Without the inclusion of these groups, it is impossible to generalise findings to the impaired population and claim that an insulin delivery device makes insulin injection easier for people with disabilities. The need to recruit people with disabilities in diabetes technology research has been reported previously (Williams, 2011). Work by Courtenay and colleagues at Cardiff University underway at the time of writing this article, has been designed to explore the early experiences of adopters of an Insulin Medication System (n=350) on medicines adherence, medicines self-management and injection practices. This study has specifically included people with disabilities (Courtenay et al, 2015).

Conclusion

Between 20–30% of people with diabetes do not take medicines as expected. Poor medication adherence in diabetes is associated with substantial healthcare costs. Disabilities associated with diabetes affect medicines adherence and high numbers of people with diabetes, at the time of diagnosis, have experienced disabilities. Although modern insulin delivery devices have had a big impact on adherence, many of the research studies that have examined the use of these devices, do not include people with disabilities. If insulin pens and other devices used in the administration of insulin are to be improved, in order to optimise outcomes, people with these disabilities need to be included in this research. ■

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