

# Health belief theories and their influence on adherence behaviours in individuals with diabetic foot ulceration: A literature review

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## ABSTRACT

### Background

Existing evidence suggests that adherence to treatment plans and long-term lifestyle modifications could reduce costly complications associated with diabetes, such as diabetic foot ulcers (DFU). Applying biopsychosocial models and theories to practice can help clinicians understand why individuals adopt or reject certain health behaviours.

### Aims

This review explores the dynamic between patients' psychosocial behaviours and their levels of commitment to treatment plans, discusses approaches for improving the therapeutic relationship between health care professionals (HCPs) and patients through collaborative healthcare planning and raises awareness of the importance of identifying the psychological barriers to managing outcomes of chronic illnesses.

### Methods

This is a narrative exploration of health belief theories applied to managing diabetes and DFU, including a discussion of 'compliance', 'adherence' and 'concordance'; health psychology theories on adherence behaviours; and the role of emotional responses in influencing the acceptance of long-term treatments.

### Findings

Evidence highlighted the role of psychosocial factors in influencing a person's decision-making process and noted individual differences in the willingness to conform to certain health and treatment recommendations, based on prior assumptions and knowledge extending beyond a longer-term conception of the benefits and risks of behaviours or disease progression.

### Conclusions

Healthcare planning should shift from labelling patients as 'non-compliant' toward promoting collaborative conversations that inform choices and actions. HCPs should acknowledge the importance of patients' knowledge and views about their health and create treatment plans that best suit these individual needs. Future research should develop health belief models to incorporate patients' emotional responses to chronic illness.

### Key messages

Compliance and adherence, when used to describe patients' health behaviours, allude to both the expectations and judgments of expert medical professionals, but differ in terms of the perceived level of input from patients.

Adequate knowledge and understanding of a disease is widely assumed to help maintain an acceptable level of adherence to a treatment plan or an overall healthy lifestyle; however, the field of behavioural research has conceded that 'knowing' does not necessarily transform into 'doing'.

To foster a successful healthcare provider–patient relationship, patients' own knowledge and health beliefs must be acknowledged and included in discussions related to treatment plans, so as to improve adherence to treatment.

Gaining concordance with the patient is the most important tool in a health care professional's arsenal; this refers to working in collaboration with patients to agree to their own health care plan.

## INTRODUCTION

Discordance between prescribed treatment plans and a patient's behaviour can be commonly observed in chronic illnesses such as diabetes.<sup>1</sup> The risks of developing diabetic complications are reduced by good adherence to treatment plans and long-term lifestyle modifications<sup>2</sup>; however, estimates indicate that fewer than 1 in 5 adults achieve the recommended targets for good diabetic control.<sup>3</sup> Diabetic foot ulcers (DFUs) are a common complication of diabetes, with a lifetime risk of developing a foot ulcer as high as 25%.<sup>4</sup> Non-adherence to medical regimes can stem from the negative impact that chronic diseases can have on an individual's psychological state<sup>5</sup> and negatively impact their disease outcomes<sup>6</sup> and health-related quality of life.<sup>7</sup>

Diabetes mellitus is a disease that exerts a substantial burden on healthcare systems worldwide,<sup>8</sup> and researchers at Kings College London have estimated that the global cost of diabetes could rise to \$2.5 trillion by 2030.<sup>9</sup> In 2019, the International Diabetes Federation<sup>10</sup> suggested that the prevalence of diabetes is high, with an estimate that 1 in 11 of the world's adults aged 20 to 79 years had diabetes, which amounts to 463 million people. This prevalence is expected to rise to 642 million by 2040.<sup>11</sup>

This narrative review explores the psychological aspects involved in influencing adherence to medical regimes for chronic illnesses such as diabetes, where the risks of potential complications, such as DFU, can be improved by adopting long-term positive health behaviours.<sup>2</sup> The discussion includes an appraisal of

the terms compliance, adherence and concordance; consideration of the therapeutic relationship; health belief theories and their influence on adherence behaviours in individuals with diabetes; and the prevention of DFU.

## Search strategy

The articles for inclusion in this study were identified from searches of the Medline and Google Scholar databases conducted in December 2020. The search related to three main concepts: Concept 1 included compliance, adherence and concordance; Concept 2 focused on the 'health belief model', 'health locus of control' and 'lay health beliefs'; and Concept 3 related to specifically diabetes and examined the 'adherence level in diabetes', 'improving adherence chronic disease' and 'improving adherence in diabetes'. These concepts were combined to narrow the search to the most pertinent articles for discussion.

## Compliance, adherence and concordance

The commonly used terms compliance, adherence and concordance have different uses in medicine.<sup>12</sup> It is important to understand the relationships and the distinctions among these terms, in order to consider the impact on the healthcare provider (HCP)–patient relationship and the outcomes of their interactions.

The terms compliance and adherence have both been used to describe patients' health behaviours in relation to HCPs' expectations. Both terms allude to the expectations and judgments of the expert medical professional, but they differ concerning the perceived level of input from patients in their health care planning.<sup>13</sup>

With regard to compliance, the HCP–patient relationship, in this context, is one of the compliant patient following 'doctor's orders', with the doctor being the expert on the management of the chronic condition. The term non-compliance, popularised in the 1970s, was the traditional label used to describe deviations from management plans.<sup>14</sup> The term denotes a level of subservience to the medical professional and their recommendations<sup>15</sup> and generates assumptions about a patient's passivity in their care and a level of obedience that is unlikely.<sup>16</sup> The concept of compliance brings to mind an authoritarian or paternalistic relationship wherein a failure to comply could generate a perception of 'difficulty' in management or incompetence in an individual's

health-related decision-making abilities.<sup>16</sup> Hobden argued that the notion of compliance reduces the legitimacy of a patient's experiences, beliefs and circumstances related to their healthcare plan.<sup>17</sup>

In contrast, it has been argued that using the term adherence is more neutral and acknowledges a patient's autonomy in defining their own personal goals in treatment, and it encourages HCPs to consider the patient's own decision-making process in the managing their chronic illness (e.g., diabetes).<sup>14</sup> For example, 'medication adherence' refers to the extent to which a patient meets the expectations set in their prescribed medicine regime. In the management of chronic diseases, such as diabetes, there is much more to the notion of condition management than medication adherence, and management plans can be much longer term. De las Cuevas argued that adherence refers to the extent to which patients follow through with their own decisions.<sup>12</sup> By contrast, Bissonnette argued that adherence is closely linked to health behaviours that match the expectations of the HCP, and non-adherence refers to breaches of the HCP's expectations.<sup>18</sup> The term adherence assumes a level of judgment, from the HCP's point of view, concerning individuals' health-related decision-making (i.e., non-adherence to treatment can often be categorised as intentional or unintentional, but this intentionality is dependent on the patient's awareness of the extent to which they have strayed from their HCP's expectations).<sup>19</sup>

While the terms compliance and adherence are both used to describe patients' behaviours and their commitment to health-related advice or interventions, concordance is a concept that explores the consultation process and the experiences that influence these behaviours.<sup>17</sup> A concordant HCP–patient relationship takes into account the patient's beliefs, circumstances and personal characteristics in the recommended management plan.<sup>20</sup> Concordance requires a therapeutic relationship and a level of knowledge of the patient by the HCP that takes into account the individual's specific difficulties and limitations with a view to helping them make the most appropriate decisions about their treatment, which—importantly—is agreeable to both parties.<sup>14</sup> Excellent communication skills are needed to facilitate good HCP–patient rapport, and this appears to be a good predictor of medication adherence.<sup>21</sup>

Arguments against the model of concordance include

that it over-generalises patients to be fully accepting of healthcare recommendations, and that HCPs have a tendency to be dogmatic about the advice they provide.<sup>20</sup> One review argued that HCPs should adopt a more egalitarian attitude towards patients, in order to nurture more positive responses and attitudes.<sup>22</sup> A relationship of two equals in the discussion concerning the best care plan is ideal. De las Cuevas<sup>12</sup> described a similar view where concordance refers to how well the patients are supported in a partnership related to decision-making and medicine-taking. Therefore, it has been suggested by De las Cuevas that HCPs should be mindful of the correct use of terms, to assist with changing expectations on both sides of the HCP–patient relationship and to consider a more collaborative approach to healthcare planning with patients with chronic diseases, to improve their long-term outcomes.

#### Using health belief theories to predict patients' adherence behaviours

It is widely assumed that adequate knowledge and understanding of a disease helps to maintain an acceptable level of adherence to a treatment plan, or an overall healthy lifestyle; however, the field of behavioural research has conceded that 'knowing' does not necessarily transform into 'doing'.<sup>23</sup> The majority finding from evidence-based literature in a systematic review suggested that patients' levels of knowledge of their own illnesses do not necessarily have a statistically significant effect on their level of adherence to treatments aimed at preventing DFUs.<sup>24</sup> It has been argued that adherence is influenced by a number of internal and external factors,<sup>25,26</sup> and not just the level of understanding that patients exhibit. Existing biopsychosocial models and theories can assist our understanding of the reasons behind an individual adopting certain health behaviour. These models include the Health Belief Model (HBM), the Health Locus of Control (HLOC)<sup>27</sup> and lay health beliefs,<sup>28,29</sup> as discussed below.

#### The Health Belief Model (HBM)

The HBM has been developed gradually over decades in an attempt to understand and predict health behaviours. Janz and Becker developed a conceptual framework, based on the HBM, to help facilitate an understanding of an individual's motivation and behaviour with regards to health-related actions.<sup>30</sup> The five dimensions of this theory relate health behaviours to the patient's

1. perceived vulnerability to a condition,
2. perceived severity of an illness,
3. perceived benefits of a health behaviour,
4. barriers (i.e., costs) related to carrying out the behaviour and
5. circumstances that prompted the action.<sup>27</sup>

An early meta-analysis examined the influences of these five dimensions on health behaviours in individuals with diabetes and found that different dimensions have a variable influence on different age groups (i.e., adolescents vs. adults).<sup>31</sup> Adolescents, for example, are more influenced by the barrier dimension that are attributed to being driven more by peer interactions rather than barriers that come from their own beliefs, meaning they may feel pressure to conform to their peers' views in interactions.<sup>32</sup> An example is adherence to orthotic footwear, where their friends' opinion about the aesthetic of these devices may be more important to them than their own beliefs of the effectiveness of using this intervention. In adults, adherence relates to the perceived benefits of changes to health behaviours, and their perceived vulnerability to the negative outcomes of the condition.<sup>33,34</sup> This difference may be explained by a distinction in emotional responses between the different age groups (i.e., adults tend to have higher levels of emotional intelligence (EI) compared to adolescents),<sup>34,35</sup> and their higher EI is related to more problem-focused coping mechanisms associated with heightened rational decision-making capabilities.<sup>36</sup> Conversely, adolescents tend to adopt avoidance-related coping strategies when dealing with stressful situations, such as a chronic illness, which leads to higher-risk behaviours<sup>37</sup>, such as non-adherence to medication regimes. This evidence highlights the potential influence of individuals' emotional responses and EI on adherence, yet this aspect is not currently reflected within the dimensions of HBM. This is a gap in the existing model that should be addressed in subsequent studies examining adherence behaviours.

#### Health Locus of Control (HLOC)

The Health Locus of Control (HLOC) theory considers how a person perceives the control of their health in terms of three dimensions: whether they have control (internality), whether external pressures influence their control (externality) or whether someone else has agency over their health (powerful others).<sup>38,39</sup> O'Hea et al.<sup>40</sup> found that HLOC is meaningfully related to medical outcomes and proposed that indi-

viduals possess all three HLOC dimensions, so that adherence is driven by the complex interactions of varying degrees of internal, external and powerful other components. They suggested that many studies on adherence to diabetic regimes focus only on the effects of the internal HLOC on adherence behaviours, whilst neglecting the effects of the external HLOC. A systematic review<sup>39</sup> of 154 articles supported this theory and found that high levels of internal HLOC and self-efficacy (a person's belief in their own abilities) consistently promoted adherence behaviours, whereas external or powerful other control dimensions had a negative impact on adherence. However, if patients felt that a doctor (powerful other) had control over their health, this was associated with high levels of adherence. The authors concluded that a 'joint empowerment' approach to the HCP-patient relationship could help improve adherence. This supports the view that individuals have multifaceted and dynamic views, especially in social interaction,<sup>41</sup> which includes medical consultations.

#### Lay health beliefs

Lay health beliefs refers to general society's prevalent ideas about health and illness.<sup>29</sup> HCPs may operate under the assumption that patients possess the professional medical knowledge that they have, while patients may have actually lay health views that reflect oversimplified versions of expert knowledge intermingled with information from multiple, sometimes questionable, sources.<sup>42</sup> These beliefs influence individuals' interpretations of physical health and disease and individuals' responses to recommendations and the advice they give to one another.<sup>43</sup> For example, a person newly diagnosed with diabetes may be informed of all the facts regarding the disease, but these may be in opposition to prior, deeply ingrained notions of health regarding the appropriate treatments for diabetes.<sup>44</sup> For a successful HCP-patient relationship, patients' self-knowledge and beliefs should be acknowledged and woven into the discussion. This ensures that both parties have a compatible understanding of the treatment plan and promotes adherence.<sup>43</sup>

#### The role of adherence in the prevention of DFU

With the prevalence diabetes predicted to increase over time,<sup>10</sup> cases of DFU will also rise, leading to an increased burden on healthcare systems.<sup>5,45</sup> In fact, a previous estimate of the treatment cost for one DFU in a European study was €10K.<sup>46</sup> Therefore,

there is a need for transition from ulcer management to prevention, to curb the ever-increasing financial strain and to reduce patients' incidences of morbidity and mortality.<sup>45</sup> The recommended interventions proposed by the International Working Group on the Diabetic Foot include patient risk stratification, regular foot screening, self-monitoring of the feet, sufficient education for patients and relatives, adequate footwear and early pre-ulcerative management,<sup>10</sup> all of which help to prevent first-time occurrence and recurrence. Recurrence has a reported rate of 30–40% within the first year of an ulcer healing.<sup>45,47</sup>

Studies have found that patient education on its own is inadequate for improving adherence behaviours in both chronic illnesses and ulcer treatment and prevention.<sup>23,34,45,48</sup> In a narrative review of research that applied health belief models to self-care behaviours in diabetes, Harvey and Lawson<sup>34</sup> argued that education alone does not motivate some patients with diabetes enough to implement lifestyle changes, as they could be asymptomatic or fail to grasp the concept of the management plan being life-long. Therefore, it is important to inform patients of the consequences of non-adherence while also educating those with high-risk feet about preventative treatment interventions. Doing so guides them to make the best decisions regarding treatment modalities.<sup>9</sup> In a systematic review of the literature on the prevention and treatment of DFU,<sup>45</sup> Bus and van Netten investigated the link between adherence and ulcer prevention. They found a positive correlation between adherence and good ulcer outcomes (with effect sizes ranging from 58 to 98%), while the effectiveness of patient education alone without adherence was equivocal.

There is also a need to tailor treatment plans to fit patients who are either already non-adherent or who are anticipated to be, as understanding the reasons behind and finding ways to counteract non-adherence can help with the provision of the best evidence-based foot care, thus directly improving DFU outcomes.<sup>49</sup> This view is supported by the HLOC theory, which proposes that patients with a high internal HLOC demonstrate better adherence to treatments, compared to those with high external HLOC.<sup>40</sup> From the perspective of the HBM, perceptions of disease-related threats (severity and susceptibility) are associated with non-adherent behaviours, while perception of benefits (treatment efficacy) increase adherence.<sup>34</sup>

A counselling technique called motivational inter-

viewing (MI) can ameliorate patients' doubts and perceived barriers to carrying out the treatment plan to achieve the desired behaviour and outcome.<sup>50</sup> The technique can also be implemented to improve HCP–patient concordance and improve the therapeutic relationship.<sup>51</sup> It has been contended that MI can be used in a nurturing manner, as it facilitates the ability to cater to the specific needs of individual patients and boosts an individual's confidence in executing the steps to prevent a DFU.<sup>26</sup>

In practice, using MI has demonstrated positive outcomes<sup>50,52,53,54</sup>; for example, MI has been demonstrated effective in primary care settings for improving medication adherence in patients over the age of 65 with a chronic illness.<sup>52</sup> The combination of skills involved in MI appear complex, but several authors agree that the way a person behaves with someone is more important than what they say, and the evidence supports this.<sup>51,53,54</sup> A systematic review of MI and health behaviours (excluding addiction) examined what aspects of MI were the most effective mechanisms for change and found these to be the MI spirit (the three dimensions of collaboration, evoking the clients' ideas about change and autonomy) and the clients' motivation to change.<sup>54</sup>

An often-overlooked facet of adherence is professional adherence (i.e., the extent to which HCPs follow recommendations or clinical guidelines in terms of treating patients with chronic conditions).<sup>55</sup> This is cause for concern, as patients with DFU have an increased risk of amputation,<sup>56</sup> and specialised diabetic foot programmes can reduce amputation rates by 50%.<sup>57</sup> It has been proposed that there is a continuing need for integrated and accessible diabetic foot programmes and a coordinated multidisciplinary team approach to care, particularly in community settings.<sup>58,59</sup>

#### Limitations of the review

It is acknowledged that one limitations of the review is that only a limited number of databases were used to undertake the search. If the review were to be repeated, it would be advisable to use at least one more, for example CINAHL, to provide a more comprehensive and systematic account of the evidence. This needs to be recognised with regard to the implications of the findings.

#### CONCLUSION

Poor adherence to treatment interventions is a long-

standing and complex issue in health care, particularly in relation to individuals with chronic illnesses such as diabetes.<sup>1</sup> An individual's willingness to adhere to certain health and treatment recommendations goes beyond their understanding of the benefits and risks of a behaviour or disease, as psychosocial factors also influence decision-making processes.<sup>34</sup> HCPs must acknowledge the importance of patients' pre-existing knowledge and views about their health condition, so they may create treatment plans that best suit their patients' needs.<sup>15</sup> Ultimately, a reconceptualisation of a person's actions is needed to shift the paradigm from simply labelling someone as non-adherent to adopting a person-centred model in which better communication and understanding of the individual's circumstances are achieved to help inform their health choices.

#### **IMPLICATIONS FOR CLINICAL PRACTICE**

Taking a nurturing approach to developing health-care plans with individuals in a collaborative way is an effective way of motivating changes and increasing adherence to healthcare behaviours to prevent and treat diabetic complications. HCPs should establish

patients' pre-existing knowledge and views about their health condition with a view to addressing these via an appropriate treatment plan that best suits the individual's needs. HCPs should also consider and discuss emotional responses to treatment plans that can result in psychological barriers, as such barriers that can cause patients to find it difficult to engage with the required treatment. Ultimately, shared decision-making should guide the choices made in a concordant care plan.

#### **Further research**

Based on the literature reviewed in this paper, the most apparent gap is that the existing HBM lacks an incorporation of the impact of individuals' emotional responses. Further studies could help to understand the impact of patients' emotional responses on their views and attitudes toward adherence to healthcare plans and ultimately improve patients' positive health behaviours. In addition, channels for monitoring the effectiveness of multidisciplinary team coordination for the prevention of DFUs in community settings could be explored further. ■

## REFERENCES

- Delamater AM. Improving patient adherence. *Clin Diabetes*. 2006; 24(2):71–7.
- Kent D, Melkus GD, Stuart PW, McKay JM, Urbanski P, Boren SA, et al. Reducing the risks of diabetes complications through diabetes self-management education and support. *Popul Health Manag*. 2013; 16(2):74–81.
- Gonzalez JS, Tanenbaum ML, Commissariat PV. Psychosocial factors in medication adherence and diabetes self-management. *Am Psychol*. 2016; 51(3):162–84.
- Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J. The global burden of diabetic foot disease. *Lancet*. 2005; 366(9498):1719–24.
- de Ridder D, Geenen R, Kuijper R, van Middendorp H. Psychological adjustment to chronic disease. *Lancet*. 2008; 372(9634):246–55.
- Keles H, Ekici A, Ekici M, Bulcun E, Altinkaya V. Effect of chronic diseases and associated psychological distress on health-related quality of life. *Intern Med J*. 2007; 37(1):6–11.
- Fortin M, Bravo G, Hudon C, Lapointe L, Dubois M. Psychological distress and multimorbidity in primary care. *Ann Fam Med*. 2006; 4(5):417–22.
- Chatterjee S, Khunti K, Davies MJ. Type 2 diabetes. *Lancet*. 2017; 389(10085):2239–51. doi.org/10.1016/S0140-6736(17)30058-2.
- Bommer C, Sagalova V, Heesemann E, Manne-Goehler J, Atun R, Bärnighausen T, et al. Global economic burden of diabetes in adults: Projections from 2015 to 2030. *Diabetes Care*. 2018; 41(5):963–70. doi:10.2337/dc17-1962.
- International Diabetes Federation. *IDF Diabetes Atlas*. 9th ed. Brussels, Belgium: International Diabetes Federation; 2019.
- Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nat Rev Endocrinol*. 2018; 14(2):88–98. doi.org/10.1038/nrendo.2017.151.
- De las Cuevas C. Towards a clarification of terminology in medicine taking behavior: Compliance, adherence and concordance are related although different terms with different uses. *Curr Clin Pharmacol*. 2011; 6(2):74–7.
- Bell JS, Airaksinen MS, Lyles A, Chen TF, Aslani P. Concordance is not synonymous with compliance or adherence. *Br J Clin Pharmacol*. 2007; 64(5):710–3.
- Lutfey KE, Wishner WJ. Beyond “compliance” is “adherence.” *Diabetes Care*. 1999; 22(4):635–9.
- Donovan JL, Blake DR. Patient non-compliance: Deviance or reasoned decision-making? *Soc Sci Med*. 1992; 34(5):507–13.
- Russell S, Daly J, Hughes E, Op’T Hoog C. Nurses and “difficult” patients: Negotiating non-compliance. *J Adv Nurs*. 2003; 43(3):281–7.
- Hobden A. Concordance: A widely used term, but what does it mean? *Br J Community Nurs*. 2006; 11(6):257–60.
- Bissonnette JM. Adherence: A concept analysis. *J Adv Nurs*. 2008; 63(6):634–43.
- Bajramovic J, Emmerton L, Tett SE. Perceptions around concordance - Focus groups and semi-structured interviews conducted with consumers, pharmacists and general practitioners. *Heal Expect*. 2004; 7(3):221–34.
- Segal JZ. “Compliance” to “concordance”: A critical view. *J Med Humanit*. 2007; 28(2):81–96.
- Cushing A, Metcalfe R. Optimizing medicines management: From compliance to concordance. *Ther Clin Risk Manag*. 2007; 3(6):1047–58.
- McCoy M. Autonomy, consent, and medical paternalism: Legal issues in medical intervention. *J Altern Complement Med*. 2008; 14(6):785–92.
- Binning J, Woodburn J, Bus SA, Barn R. Motivational interviewing to improve adherence behaviours for the prevention of diabetic foot ulceration. *Diabetes Metab Res Rev*. 2019; 35(2):1–11.
- van Netten JJ, Price P, Lavery LA, Monteiro-Soares M. Prevention of foot ulcers in the at-risk patients with diabetes: A systematic review. *Diabetes Metab Res Rev*. 2016; 32:84–98.
- Poulton B. Factors Which Influence Patient Compliance. *J Tissue Viability* [Internet]. 1991; 1(4):108–10.
- Russell S, Daly J, Hughes E, Op’T Hoog C. Nurses and “difficult” patients: Negotiating non-compliance. *J Adv Nurs*. 2003; 43(3):281–7.
- Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. *Heal Educ Behav*. 1988; 15(2):175–83.
- Dines A. A review of lay health beliefs research: Insights for nursing practice in health promotion. *J Clin Nurs*. 1994; 3(6):329–38.
- Leventhal H, Benyamini Y, Shafer C. Lay beliefs about health and illness. In: Ayers S, Baum A, McManus C, Newman S, Wallston K, Weinman J, et al., editors. *Cambridge handbook of psychology, health and medicine*. 2nd ed. Cambridge: Cambridge University Press; 2007. p. 124–8.
- Janz NK, Becker MH. The health belief model. A decade later. *Health Educ Q*. 1984; 11(1):1–47.
- Harrison JA, Mullen PD, Green LW. A meta-analysis of studies of the health belief model with adults. *Health Educ Res*. 1992; 7(1):107–16.
- Abraham A, Silber TJ, Lyon M. Psychosocial aspects of chronic illness in adolescence. *Indian J Pediatr*. 1999; 66(3):447–53.
- Brownlee-Duffeck M, Peterson L, Simonds JF, Goldstein D, Kilo C, Hoette S. The role of health beliefs in the regimen adherence and metabolic control of adolescents and adults with diabetes mellitus. *J Consult Clin Psychol*. 1987; 55(2):139–44.
- Harvey JN, Lawson VL. The importance of health belief models in determining self-care behaviour in diabetes. *Diabet Med*. 2009; 26(1):5–13.
- Mayer J, Salovey P, Caruso D. Emotional intelligence: Theory, findings and implications. *Psychol Inq*. 2004; 15(3):197–215.
- Umaki TM, Umaki MR, Cobb CM. The psychology of patient compliance: A focused review of the literature. *J Periodontol*. 2012; 83(4):395–400.
- Ben-Zur H, Reshef-Kfir Y. Risk taking and coping strategies among Israeli adolescents. *J Adolesc*. 2003; 26(3):255–65.
- Wallston KA, Wallston BS, Devellis R. Development of the multidimensional health locus of control (MHLC) scales. *Health Educ Monogr*. 1978; 6(2):160–70.
- Náfrádi L, Nakamoto K, Schulz PJ. Is patient empowerment the key to promote adherence? A systematic review of the relationship between self-efficacy, health locus of control and medication adherence. *PLoS One*. 2017; 17;12(10):e0186458. doi:10.1371/journal.pone.0186458. PMID: 29040335; PMCID: PMC5645121.
- O’Hea EL, Grothe KB, Bodenlos JS, Boudreaux ED, White MA, Brantley PJ. Predicting medical regimen adherence: The interactions of health locus of control beliefs. *J Health Psychol*. 2005; 10(5):705–17.
- Wiese SL, Vallacher RR, Strawinska U. Dynamical social psychology: Complexity and coherence in human experience. *Soc Personal Psychol Compass*. 2010; 4(11):101.
- Hughner RS, Kleine SS. Views of health in the lay sector: A compilation and review of how individuals think about health. *Health (Irvine Calif)*. 2004; 8(4):395–422.
- Hughner RS, Kleine SS. Variations in lay health theories: Implications for consumer health care decision making. *Qual Health Res*. 2008; 18(12):1687–703.
- Moorman C, Matulich E. A model of consumers’ preventive health behaviors: The role of health motivation and health ability. *J Consum Res*. 1993; 20(2):208–28.
- Bus SA, van Netten JJ. A shift in priority in diabetic foot care and research: 75% of foot ulcers are preventable. *Diabetes Metab Res Rev*. 2016; 32:195–200.
- Prompers L, Huijberts M, Schaper N, Apelqvist J, Bakker K, Edmonds M, et al. Resource utilisation and costs associated with the treatment of diabetic foot ulcers. Prospective data from the Eurodiabetes Study. *Diabetologia*. 2008; 51(10):1826–34.
- Pound N, Chipchase S, Treece K, Game F, Jeffcoate W. Ulcer-free survival following management of foot ulcers in diabetes. *Diabet Med*. 2005; 22(10):1306–9.
- Mazzuca SA. Does patient education in chronic disease have therapeutic value? *J Chronic Dis*. 1982; 35(7):521–9.
- Armstrong DG, Boulton AJM, Bus SA. Diabetic foot ulcers and their recurrence. *N Engl J Med*. 2017; 376(24):2367–75.
- Rubak S, Sandbak A, Lauritzen T, Christensen B. Motivational interviewing: A systematic review and meta-analysis. *Br J Gen Pract*. 2005; 55(513):305–12.
- Laws MB, Rose GS, Beach MC, Lee Y, Rogers WS, Velasco AB, et al. Patient-provider concordance with behavioral change goals drives measures of motivational interviewing consistency. *Patient Ed Couns*. 2015; 98(6):728–33. doi.org/10.1016/j.pec.2015.02.014.
- Moral R, Torres L, Ortega L, Larumbe M, Villalobos A, García J, et al. Effectiveness of motivational interviewing to improve therapeutic adherence in patients over 65 years old with chronic diseases: A cluster randomized clinical trial in primary care. *Patient Ed Couns*. 2015; 98(8):977–83.
- Pollak K. Learning what is in the “secret sauce” of MI that is essential for teaching busy clinicians. *Patient Ed Couns*. 2015; 98(4):399–400.
- Copeland L, McNamara R, Kelson M, Simpson S. Mechanisms of change within motivational interviewing in relation to health behaviors outcomes: A systematic review. *Patient Ed Couns*. 2015; 98(4):401–11.
- Miller NH, Hill M, Kottke T, Ockene IS. The multilevel compliance challenge: Recommendations for a call to action: A statement for healthcare professionals. *Circulation*. 1997; 95(4):1085–90.
- Sugarman J, Reiber G, Baumgardner G, Prael C, Lowery J. Use of therapeutic footwear benefit among diabetic Medicare beneficiaries in three states, 1995. *Diabetes Care*. 1998; 21(5):777–81.
- Amin N, Doupis J. Diabetic foot disease: From the evaluation of the “foot at risk” to the novel diabetic ulcer treatment modalities. *World J Diabetes*. 2016; 7(7):153–64.
- Lavery LA, Wunderlich RP, Tredwell JL. Disease management for the diabetic foot: Effectiveness of a diabetic foot prevention program to reduce amputations and hospitalizations. *Diabetes Res Clin Pract*. 2005; 70(1):31–7.
- Lavery LA, Hunt N, LaFontaine J, Baxter C. Diabetic foot prevention: A neglected opportunity in high-risk patients. *Diabetes Care*. 2010; 33(7):1460–2.