Original Article

**Correlates of psychological care strategies for people with diabetes in the second Diabetes Attitudes, Wishes and Needs (DAWN2™) study**

**Running head:** DAWN2: correlates of psychological care strategies in people with diabetes

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**Bulleted novelty statement**

* This study examined barriers and facilitators among healthcare professionals in the provision of person-centred psychological care and self-management support for people with diabetes.
* Psychological care was positively associated with beliefs that patients need help with emotional issues and that clinical success depends on doing so.
* There were differences in psychological care between disciplines and countries.
* The provision of psychological care improved with training received and desired, multidisciplinary team membership, and resources for psychological care.

**Abstract
Aims** The second Diabetes Attitudes, Wishes and Needs (DAWN2™) study assessed the ways healthcare professionals address psychological problems of adults with diabetes.

**Methods** Approximately 120 primary care physicians, 80 diabetes specialists and 80 nurses and dietitians providing diabetes care participated in each of 17 countries (N=4785). Multiple regression analyses evaluated independent statistically significant associations of respondent attributes concerning psychological care strategies, including assessment of diabetes impact on the patient’s life, assessment of depression, provision of psychological assessment and support, and coordination with mental health professionals.

**Results** Psychological care strategies were positively associated with each other but differed by healthcare practice site and discipline; nurses and dietitians were less likely to assess depression than other healthcare professionals, while primary care physicians were less likely to coordinate with mental health specialists or ask patients how diabetes affects their lives. Psychological care was positively associated with healthcare professionals’ beliefs that patients need help dealing with emotional issues and that clinical success depends on doing so, level of psychological care training, multidisciplinary team membership and availability of resources for psychological care. There were significant between-country variations in psychological care strategies, before and after adjustment for individual-level factors, and significant country-by-covariate interactions for almost all individual-level factors investigated.

**Conclusions** Improvements in training and resources, recognition and assessment of psychological problems, and increased belief in the efficacy of psychological support may enhance healthcare professionals’ efforts to address psychological problems in adults with diabetes.

# Introduction

Diabetes poses a significant self-management challenge for people with diabetes, particularly in the absence of a well-planned approach to care and education, which is coordinated and communicated by a knowledgeable diabetes healthcare team [1,2]. It is also demanding for healthcare professionals to address the ongoing needs of people with diabetes, while providing follow-up and communication about treatment plans and self-management [1-4]. Diabetes care requires a balance between supporting optimal glycaemic control and quality of life in the short term and reducing the risk of long-term complications.

Healthcare professionals providing team-based, person-centred care and a responsive healthcare and support system play crucial roles in diabetes care, self-management and health outcomes [5-8]. When people with diabetes feel they have a close relationship with their healthcare professional or team, they are more likely to follow their diabetes care plan [9]. Studies also suggest that demographic, psychological, social dynamics and other factors such as communication, diabetes education and family support impact diabetes self-management and adherence [1,2,6,9–13]. Even with these findings and recommendations, the psychological needs of people with diabetes have found little consideration, particularly because people with diabetes often have different perceptions than healthcare professionals regarding diabetes, its impact on their lives and its management [6]. For example, people with diabetes report receiving a lower level of attention to their psychosocial needs than healthcare professionals report they provide [14,15].

In 2001, the Diabetes, Attitudes, Wishes and Needs (DAWN™) study reported that insufficient care and support was available to meet the psychosocial and educational needs of people with diabetes and that improved collaboration within a multidisciplinary healthcare-professional team was an important factor in improving outcomes for people with diabetes [16–18]. Following the publication of the DAWN study, a ‘Call to Action’ programme advocated the development of evidence-based strategies to improve psychosocial management and self-management education for people with diabetes, with support from healthcare professionals.

The second DAWN (DAWN2™) study was initiated as a global partnership among established national and international organizations including the International Diabetes Federation, the International Alliance of Patient Organizations, the Steno Diabetes Center and Novo Nordisk, with the aim of improving our understanding of the unmet needs of people with diabetes and of the family members who care for them. The findings from DAWN2 are intended to facilitate dialogue and collaboration among all key stakeholders to strengthen the active involvement and self-management of people with diabetes, while establishing a cross-culturally validated multinational survey system for assessing and benchmarking psychosocial and educational aspects of diabetes care delivery [19].

The initial global results of DAWN2 highlighted the ongoing burden of diabetes on people with diabetes and their families [14,20]. Gaps in psychosocial assessment and corresponding support for psychosocial needs and self-management remain prominent, with marked differences in perceptions between people with diabetes and healthcare professionals [15]. The availability of education and psychosocial support remains inconsistent, with many healthcare professionals eager to provide psychological care but lacking pertinent training.

The aim of this analysis was to explore the barriers and facilitators among healthcare professionals for the provision of person-centred psychological care and self-management support and, more specifically, to examine the strategies undertaken by healthcare professionals to ensure the psychological well-being of their patients.

# Participants and methods

## Study design and participants

The full methods of the DAWN2 study (UTN No: U1111-1123-7509; NCT01507116) have been published previously [19]. In brief, the study was conducted in 17 countries: Algeria, Canada, the People’s Republic of China, Denmark, France, Germany, India, Italy, Japan, Mexico, The Netherlands, Poland, the Russian Federation, Spain, Turkey, the United Kingdom and the United States of America. A minimum of 280 healthcare professionals was recruited from each country, with quotas allocated for primary care physicians (N=120), specialist endocrinologists and diabetologists (N=80) and diabetes nurses and dietitians (N=80). In total, 4786 healthcare professionals completed the survey. All participants had been in practice for at least 1 year and were treating ≥5 adults (aged ≥18 years) with diabetes per month or, for diabetes specialists, ≥50 adults per month.

## Recruitment methodology

Healthcare professionals were identified from online panels and databases, telephone lists and physician directories in each country and invited to participate in the study by email or telephone. Participants received emails with a web link to a secure server, where they completed an online survey. Unlike the people with diabetes’ and family members’ surveys, no telephone or face-to-face interviews took place.

## Questionnaires

The study comprised three separate questionnaires: one for people with diabetes, one for family members of adults with diabetes, and one for healthcare professionals. Questionnaires included standardized questions adapted from the original DAWN study and modified versions of validated measures that assessed health-related quality of life, self-management, attitudes and beliefs, social support, and priorities for improving diabetes care. Here we report the findings from the healthcare professional survey, which was described previously [15]. Measures used in this paper are described in Table 1. Two companion papers provide the results for family members [21] and people with diabetes [22].

Based on the healthcare-professional survey, we examined the correlates of several psychological care strategies – in particular, which respondent attributes were associated with two indicators of psychological assessment (‘assesses depression’ and ‘assesses how diabetes affects life’) and two aspects of treatment (‘provides psychological assessment and support’ and ‘coordinates with mental health professionals’).

## Ethical considerations

Surveys were conducted in accordance with all relevant ethical requirements and followed local, national and international guidelines concerning the conduct of non-interventional studies.

## Statistical analysis

### Descriptive data are presented as median values for continuous variables and as percentages for categorical variables, with country ranges (minimum–maximum) provided for both types of variable.

### Analysis of psychological care strategies used multilevel regression models with an unstructured correlation-type matrix [23] to account for the hierarchical nature of the data (healthcare professionals clustered within countries). The intraclass correlation coefficient (ICC) was calculated to assess the variation in the use of psychological care strategies among countries (as opposed to within-country variation); a greater impact of the country is shown by higher ICC values. Estimated proportions (%) of healthcare professional use of the four psychological care strategies by country are reported based on three regression models: the first (Model 0) adjusted country scores for clustering only; the second and third estimate marginal country means adjusted for practice factors (Model 1) and all factors (Model 2).

### For multilevel logistic analyses, potential correlates were entered into the regression models in four categories (practice factors, discipline, clinical practice site characteristics, and attitudes and practices relative to psychological care). Within each category, potential correlates were entered according to their hypothesized causal order – variables before mediators. In addition to being outcome measures, the assessments of depression and how diabetes affects people’s life served as covariates in some regression models. Results are reported as beta coefficients with P-values (P<0.05 was considered statistically significant); R-squared was estimated for a two-level hierarchical linear model. The level 1 R-squared value shows the between-subject variance which is explained by the set of covariates in each of the regression models.

### Supplementary analyses (1) tested for the strength of association of each factor with each outcome in different countries and (2) estimated the association of each psychological care strategy with each of the healthcare provider disciplines.

### All analyses reported in this paper were performed with the SAS version 9.4 (SAS Institute, Inc., Cary, NC, USA).

# Results

In 2012, 4785 healthcare professionals (2066 primary care physicians, 1350 diabetes specialists, 827 nurses and 542 dietitians) were surveyed. Table 2 shows the distribution of study variables. Overall, healthcare professionals had been in practice for a median of 16.8 years and more than three-quarters worked in a team. The vast majority of the people with diabetes they saw presented with Type 2 diabetes, approximately one-third had private insurance and one-fifth reported reading difficulties. Respondents estimated that approximately 17% of the people with diabetes in their care had clinical depression, but only half of healthcare professionals in our study reported assessing depression in most or all of the people with diabetes they see.

## Differences in psychological care strategies by country

Before controlling for potential mediators, there were significant between-country disparities for each of the psychological care strategies considered; the largest differences among countries were seen for ‘assesses depression’ and ‘coordinates with mental health professionals’ (ICC=0.13 for both, Supplemental Table 1). Controlling for potential mediators did not substantially modify the between-country variation for any of the care strategies except ‘assesses depression’, for which an increase in ICC from 0.13 to 0.19 was observed. Thus, the disparities in psychological care strategiesamong countries are only partially attributable to individual-level factors. Adjusted means for the each of the psychological care strategies by country are shown in Fig. 1.

## Correlates of psychological care strategies

Table 3 presents the associations of healthcare professional attributes with psychological care strategies, based on the three regression models. The ‘beta at entry’ represents the total relationship with the care strategy after all confounders have been controlled; the ‘final beta’ coefficient expresses the direct component (independent association) of the total relationship, unmediated by other variables in the analysis. Our findings demonstrate a significant correlation between most healthcare-professional variables examined and one or more of the four psychological care strategies. Controlling for mediators generally decreased the beta coefficients (reduced the correlations), suggesting that other variables mediated the associations.

A significant country-by-variable interaction in at least one psychological care strategy was found for almost all covariates investigated. Furthermore, psychological care strategies were positively associated with each other.

The utilization of psychological care strategies, particularly the assessment of depression (final beta, 0.35; *P*<0.001) and coordination with mental health professionals (final beta, 0.54; *P*<0.001), was more pronounced in healthcare professionals working in a team. It also differed by medical discipline: dietitians and nurses were less likely to assess depression (final beta, –0.41; *P*<0.01 and final beta, –0.22; *P*<0.05, respectively) than other healthcare professionals. The final beta for diabetes specialists was –0.05 and was not significantly different from primary care physicians who were the reference group. Primary care physicians were less likely to coordinate with mental health specialists than dietitians (final beta, 0.80; *P*<0.001), diabetes specialists (final beta, 0.38; *P*<0.001) and nurses (final beta, 0.36; *P*<0.01). Healthcare professionals at hospitals and community health centres were less likely to assess depression than their colleagues in private practice but more likely to coordinate with a mental health professional. Notably, the application of psychological care strategies was correlated with the amount of psychological care training received by the healthcare professional, the desire to receive further training and the beliefs of healthcare professionals that patients need help in dealing with emotional issues and that clinical success depends on doing so. The strength of association for these factors differed by discipline (Supplemental Tables 2A–2D).

# Discussion

This paper examined the factors that facilitated or hindered the provision of psychological care for people with diabetes. With the impact of psychological factors on diabetes outcomes and on self-management behaviours in diabetes well established [14,16], the need to provide effective and timely psychological support to people with diabetes is reflected in most national and international guidelines for diabetes care [24–27]. Our analysis of 4785 healthcare professionals from 17 countries indicates that there are still significant deficiencies in the provision of psychological support and identifies factors that may contribute to this shortfall.

The study included primary care physicians, diabetes specialists, nurses and dietitians working in a variety of healthcare settings. Participants reported that an estimated 17% of the people with diabetes in their care had clinical depression, while almost one-third needed help in dealing with emotional issues – a degree of psychological burden consistent with other studies of self-reported depression and emotional distress [28]. Despite this significant perceived burden, only half of people with diabetes were assessed for depression. Only half of healthcare professionals routinely asked people with diabetes how the condition is affecting their lives or discussed psychological and emotional issues with them. Only 15% of healthcare professionals regularly coordinated with mental health specialists on behalf of people with diabetes requiring psychological treatment.

Our study allowed for examining differences among countries and among professional disciplines. There was substantial variation among countries in the levels of psychological assessment and support, and these differences remained even after adjusting for a variety of provider, practice and patient characteristics. Interestingly, there was no consistent trend identifying countries that performed well or low on all psychological strategies. This suggests that the significant differences in psychological care among countries may be the result of systemic differences in healthcare models and reflect local resources and developmental capacity. For example, until 2013, primary care physicians in the UK were financially rewarded for screening people with chronic illness for depression; this may have altered best practices in the context of diabetes [29]. Furthermore, within the diverse countries of DAWN2, the results may also reflect differences in culture. For example, societies may perceive psychological issues, such as depression, in different ways. These societal differences may underlie some of the variation in stigma between countries [14,15,19,20] but may also influence healthcare systems and training of those who work in those systems. As healthcare professionals are drawn from the society in which they work, their own biases may affect their provision of psychological care and their perception of the need for training in this area.

There were also substantial differences in the psychological care strategies utilized among professional disciplines. These disparities may highlight the distinct role and orientation of each medical discipline. Conversely, they may not simply reflect professional situation but individual consulting styles, the duration of consultations, the willingness to make referrals and the perception of roles within healthcare teams. Thus, we could not resolve why primary care physicians were less likely to ask routinely how diabetes affects the lives of people with diabetes than other healthcare professionals, particularly given the growing emphasis on communication and person-centred care in their clinical training. The wide range of concerns addressed in primary care practices may impede the focus on diabetes. Primary care physicians were also less likely to coordinate with mental health professionals, possibly due to poor access to such services, or lack of awareness and availability of mental health resources.

Results suggest that clinical practice site impacts the use of psychological care strategies. There were differences in the provision of psychological assessment between in-patient and out-patient settings, and between public and private practices. While these differences may reflect the ease of referral to mental health professionals and psychological services, they emphasize that psychological support is an inter-professional issue. If people with diabetes are to experience better psychological support, a service re-design should be considered to improve team working among pertinent medical specialties.

For example, our findings emphasize the need for inter-professional training and integrated care pathways to enhance the provision of psychological support and consistency of care for people with diabetes. Clarification of roles and responsibilities of the healthcare team members in relation to patient counselling and self-management support is key. Of particular importance is the need to harness the roles of nurses, educators and community health workers, with those of physicians. However, strengthening the pathways for appropriate psychological support within diabetes professional communities is insufficient; it must be accompanied by a corresponding increase in mental health resources.

Other factors associated with more optimal delivery of psychological care include its perceived need and value for achieving clinical success, which may have their root in the value and priority placed on psychological care within healthcare professional education. Indeed, study participants who had received psychological training and felt the need for more training reported providing more psychological care. While only 18% of respondents had received training concerning psychological support, more than half desired such training. If the level of psychological support provided to people with diabetes is to be improved, robust training programmes that meet international standards must be put in place. Training in the provision of psychological support may initiate a beneficial cycle of frequent psychological assessment, identification of those with clinical depression or requiring help in dealing with emotional issues, and more healthcare professionals seeking training and developing more skills for providing psychological support. This possibility is consistent with our finding that both psychological training and assessment were associated with increases in psychological support and care strategies. Given that the analysis controlled for perceived importance of providing psychological support, this suggests that the results of assessing need drives the provision of support.

Implementing training in provision of psychological care for people with diabetes has been a focus point for many DAWN2 countries recently. The German model for training and certifying diabetes care providers in psychosocial diabetes management is one example of how this can be executed [30]. We have identified common themes that need to be included in such training but it is important to consider what each country has or needs, including the specific training needs for each care provider group and the healthcare system or service in which they work. In line with the recommendations from the 5th DAWN Summit Proceedings and other guidelines, training should focus on managing the psychosocial aspects of diabetes as well as ensuring a team-based and whole-person centred approach to care. Effective communication is essential as well as a collaborative and participatory approach that ensures the values, preferences and priorities of the person with diabetes.

Most of our results were as expected. For example, longer professional experience and, more so, working in a team were associated with better psychological care. Similarly, the availability of more resources for providing psychological support was associated with more frequent psychological assessment and support. Some results were more intriguing. For example, healthcare professionals caring for a higher proportion of people with Type 1 diabetes were more likely to ask routinely how diabetes affects their lives, suggesting the perception that living with Type 1 diabetes and the associated life-long insulin therapy poses an increased burden and has a greater impact on peoples’ lives. Another surprising result was that the level of psychological assessment and support provided was inversely related to the proportion of patients reported with clinical depression; the reverse would have been expected.

These findings highlight the importance of standards of psychological-care delivery across healthcare sectors and the need to ensure that all healthcare professionals caring for people with diabetes have an appropriate level of skill to assess and attend to psychological factors. While there is no proof that improved psychological care leads to better biomedical diabetes outcomes, there is robust evidence of its impact on the quality of life of people with diabetes and their engagement with self-management behaviours [31]. Enhancing the psychological dimension of care may not only enhance psychological outcomes but, through optimizing self-management, have a beneficial effect on biomedical diabetes outcomes. Adequate training for healthcare professionals may act as a catalyst for timely psychological assessment and intervention with the aim of promoting effective self-management, while reducing the adverse psychological consequences of diabetes including comorbid depression. To reduce the discrepancies among healthcare professionals, training should be conducted inter-professionally and based on a clear and well-resourced clinical pathway supplying available psychological support resources and indicating how they can be accessed.

The strengths of this study include the large sample, representing multiple diabetes care disciplines from many countries with different cultures and healthcare systems, and the comprehensive assessment and rigorous analysis of psychological care strategies and their potential correlates. Study limitations include that all data was self-reported and that measures were not previously validated. The DAWN2 questionnaire did not ask how the participants screened or diagnosed depression in their clinical practice. It is well recognised that screening tools for depression vary widely in their clinical effectiveness in people with diabetes. Furthermore, recent research emphasizes the importance of distinguishing depression from diabetes distress. Previous studies may have overestimated the prevalence of depression in people with diabetes because of poor depression screening tools and failure to recognise diabetes distress. The diagnosis of depression is further complicated by its presentation which can be with cognitive, physical, affective or attitudinal symptoms, some of which overlap with poorly controlled diabetes. This complexity further highlights the need for appropriate training to diagnose and treat psychological issues effectively. Although the recruitment methods were designed to ensure the representativeness of the participating health professionals, there is still a potential for bias in the sample as a result of the data collection method. This and other limitations of the DAWN2 study have been discussed elsewhere [19].

In conclusion, this study has identified a number of factors associated with the provision of psychological care for people with diabetes including country, case-load characteristics, healthcare discipline, clinical practice site, and provider attitudes and available resources. The disparities in psychological care strategies among providers are likely to affect the quality of life of people with diabetes and their engagement with self-management behaviours. These disparities need to be addressed by closer integration of services and more psychological care training for healthcare providers.

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**Table 1** Description of healthcare professional psychological measures and outcomes assessed in the DAWN2 study

| **Measure** | **Description** |
| --- | --- |
| Proportion of people with diabetes with clinical depression | Approximately what percent of the people with diabetes you see currently have clinical depression? |
| Proportion of patients who need improvement in dealing with emotional issues | What proportion of the people with diabetes you see need significant improvement in dealing with emotions associated with having diabetes? (About three-quarter or more vs. About half or less) |
| Received psychological management training | Have you ever attended post-graduate training in the management of psychological aspects of diabetes? (Yes vs. No) |
| Reported need for training in psychological support | Would you like to receive more training or support on an ongoing basis in order to provide better care for people with diabetes - management of psychological aspects of diabetes? (Yes vs. No) |
| Number of resources to provide psychological care | Which of the following resources are available as support for you in providing adequate psychological care for people with diabetes who are emotionally distressed?Practical clinical guidelines for management of psychological issues related to diabetes; Opportunities for skills training in dealing with psychological and emotional aspects of diabetes; Reimbursement for the time I spend to evaluate and counsel regarding psychological issues; Self-help patient materials for coping with emotional issues which I can give to people with diabetes; Psychological support programmes or groups specifically addressing emotional aspects of diabetes; Community-based diabetes counselling or peer support programmes that I can refer to; Mental health professionals with experience in diabetes that I can refer to; Mental health professionals that I get regular supervision from in my care for people with diabetes; Clinical guidelines and medications for the pharmacological treatment of depression or anxiety |
| Believe clinical success depends on dealing with emotional problems | My success in caring for people with diabetes depends largely on my ability to understand and manage the emotional issues people with diabetes face (Range from 1 [Fully Disagree] to 6 [Fully Agree]) |
| **OUTCOMES** |  |
| Assesses how diabetes affects life | How often do you ask the people with diabetes you see how diabetes affects their lives? (HCP-PACIC-DSF) (Most of the time or more vs. Some of the time or less) [1] |
| Assesses for depression | During the past 12 months, (for) how many people with diabetes you see (did you have/had their) depression assessed?(About half or more vs. About one-quarter or less) |
| Provides psychological assessment and support | I discuss emotional/psychological issues with most or all people with diabetes I see who have emotional distress or are at risk of depression (Yes vs. No) |
| Coordinates with mental health professional | Do you work with mental health professionals on a regular basis and/or discuss people with diabetes you see with mental health professionals on a regular basis and/or regularly refer people with diabetes to mental health professionals (e.g., psychologists/ psychiatrists/counsellors)?(Yes vs. No) |

1. Holt RIG, Nicolucci A, Kovacs Burns K, Escalante M, Forbes A, Hermanns N *et al.* Diabetes Attitudes, Wishes and Needs second study (DAWN2): cross-national comparisons on barriers and resources for optimal care health professional perspective. *Diabetic Med* 2013; **30:** 789–798.

**Table 2** Barriers and facilitators of the provision of psychological diabetes care assessed in the DAWN2 study

| **Barriers and facilitators** | **Country median****(min–max)\*** | **ICC** |
| --- | --- | --- |
| **Practice** |
| Years in practice | 16.8 (9.4–22.5) | 0.15 |
| Work in team (%) | 78.6 (54.8–95.0) | 0.14 |
| % People seen with Type 1 diabetes | 14.7 (6.0–20.7) | 0.05 |
| % People seen with Type 2 diabetes | 82.6 (77.1–92.0) | 0.05 |
| % People with diabetes seen with private health insurance | 32.0 (6.8–78.6) | 0.36 |
| % People with diabetes seen with reading difficulties | 20.4 (13.1–44.1) | 0.13 |
| **Medical discipline** |
| Primary care physicians (%) | 42.9 (41.7–49.8) | 0.04 |
| Diabetes specialists (%) | 28.6 (24.0–29.0) | 0.00 |
| Nurses (%) | 15.2 (14.2–23.2) | 0.01 |
| Dietitians (%) | 14.1 (5.4–14.5) | 0.00 |
| **Clinical practice site** |
| Private practice/office-based (%) | 39.3 (0.0–68.2) | 0.46 |
| Hospital – out-patient (%) | 24.3 (6.8–58.6) | 0.17 |
| Hospital – in-patient (%) | 19.4 (3.6–47.1) | 0.17 |
| Community health centre/clinic (%) | 11.7 (0.0–53.9) | 0.37 |
| Other (%) | 1.4 (0.0–3.5) | 0.11 |
| **Psychological factors** |  |  |
| % People with diabetes and clinical depression | 17.2 (6.3–32.7) | 0.18 |
| % People with diabetes who need improvement in dealing with emotional issues | 31.3 (14.5–58.2) | 0.09 |
| Received psychological management training (%) | 17.9 (9.4–41.1) | 0.09 |
| Reported need for more training in providing psychological care (%) | 55.9 (43.5–77.5) | 0.05 |
| Number of resources to provide psychological support | 2.2 (1.4–3.7) | 0.13 |
| Believes clinical success depends on dealing with emotional issues (1 [Fully Disagree] to 6 [Fully Agree]) | 4.3 (3.7–4.8) | 0.05 |
| Assesses how diabetes affects peoples’ lives (%) | 50.7 (34.0–74.6) | 0.07 |
| Assesses people with diabetes for depression (%) | 52.7 (23.5–82.6) | 0.13 |
| Provides psychological assessment and support (%) | 54.2 (30.7–75.7) | 0.05 |
| Coordinates with mental health professionals (%) | 14.9 (5.3–50.7) | 0.13 |

\*Crude value by countries.

ICC: intraclass correlation coefficient; min: minimum value; max: maximum value.

**Table 3** Effects of various risk and protective factors on the healthcare professional use of four psychological care strategies

| **Barriers and facilitators** | **Assesses how diabetes affects life** | **Assesses depression** | **Provides psychological assessment and support** | **Coordinates with mental health professional** |
| --- | --- | --- | --- | --- |
|  | Beta at entry | Final beta | Beta at entry | Final beta | Beta at entry | Final beta | Beta at entry | Final beta |
| **Practice** |  |  |  |  |  |  |  |  |
| Years in practice a,b,c,d | 0.01\*\* | 0.01\* | 0.02\*\*\* | 0.01 | 0.02\*\*\* | 0.01 | 0.00 | 0.00 |
| Work in team a,b,d | 0.46\*\*\* | 0.26\*\* | 0.46\*\*\* | 0.35\*\*\* | 0.17\* | -0.03 | 0.90\*\*\* | 0.54\*\*\* |
| % People seen with Type 1 diabetes a,c,d | 0.15\*\*\* | 0.12\*\* | 0.04 | 0.01 | 0.02 | -0.01 | 0.10\* | 0.01 |
| % People seen with Type 2 diabetes b,c,d | 0.02 | 0.03 | -0.03 | -0.04 | -0.01 | -0.01 | -0.02 | -0.03 |
| % People with diabetes seen with private health insurance a,d | 0.00 | -0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 |
| % People with diabetes seen with reading difficulties a,b,d | 0.03\* | 0.03\* | 0.02 | 0.01 | 0.00 | -1.01 | -0.01 | -0.40\* |
| *R-squared level 1* | 0.06 |  | 0.01 |  | 0.00 |  | 0.00 |  |
| **Medical discipline** (Reference discipline: primary care physicians)a,b,c,d |  |  |  |  |  |  |  |  |
| Dietitians | 0.53\*\*\* | 0.65\*\*\* | -0.38\*\* | -0.41\*\* | -0.10 | 0.20 | 0.66\*\*\* | 0.80\*\*\* |
| Diabetes specialists | 0.43\*\*\* | 0.28\*\* | 0.05 | -0.05 | 0.22\*\* | 0.10 | 0.69\*\*\* | 0.38\*\*\* |
| Nurses  | 0.33\*\*\* | 0.31\*\* | -0.20\* | -0.22\* | -0.15 | -0.09 | 0.56\*\*\* | 0.36\*\* |
| *R-squared level 1* | 0.03 |  | 0.00 |  | 0.00 |  | 0.00 |  |
| **Clinical practice site** (Reference site: private practice/office-based )a,c,d |  |  |  |  |  |  |  |  |
| Hospital – out-patient  | -0.17 | -0.15 | 0.09 | 0.05 | -0.12 | -0.19 | 0.19 | 0.13 |
| Hospital – in-patient | -0.44\*\*\* | -0.36\*\* | -0.27\* | -0.19 | -0.58\*\*\* | -0.48\*\*\* | 0.27\* | 0.45\* |
| Community health centre/clinic | -0.19\* | -0.21\* | -0.47\*\*\* | -0.43\*\*\* | -0.50\*\*\* | -0.38\*\*\* | 0.53\*\*\* | 0.70\*\*\* |
| Other | -0.64\* | -0.54\* | -0.02 | 0.28 | -0.36 | -0.46 | -0.13 | -0.01 |
| *R-squared level 1* | 0.03 |  | 0.04 |  | 0.00 |  | 0.00 |  |
| **Psychological factors§** |  |  |  |  |  |  |  |  |
| % People with diabetes and clinical depression a,c |  | -0.03\*\*\* |  | -0.06\*\*\* |  | -0.05\*\*\* |  | -0.02\* |
| % People with diabetes who need improvement in dealing with emotional issues |  | 0.11 |  | 0.34\*\*\* |  | 0.04 |  | -0.03 |
| Received psychological management training c,d |  | 0.46\*\*\* |  | 0.27\*\* |  | 0.60\*\*\* |  | 0.45\*\*\* |
| Reported need for training in psychological support c |  | 0.28\*\*\* |  | -0.01 |  | 0.27\*\*\* |  | 0.50\*\*\* |
| Number of resources to provide psychological care b,c,d |  | 0.13\*\*\* |  | 0.16\*\*\* |  | 0.09\*\*\* |  | 0.17\*\*\* |
| Believes clinical success depends on dealing with emotional problems a,b,c,d |  | 0.25\*\*\* |  | 0.11\*\*\* |  | 0.13\*\*\* |  | 0.10\*\* |
| Assesses how diabetes affects peoples’ lives a |  |  NA |  | 0.59\*\*\* |  | 0.44\*\*\* |  | 0.51\*\*\* |
| Assesses people with diabetes for depression a,b |  |  NA |  |  NA |  | 0.82\*\*\* |  | 0.38\*\*\* |
| *R-squared level 1* | 0.03 |  | 0.00 |  | 0.00 |  | 0.00 |  |

‘Beta at entry’ columns report regression coefficients for all variables in the model at the end of each block, controlling all variables in the same or previous blocks (i.e. the total unconfounded association, combining both the mediated and unmediated components).

‘Final beta’ columns report regression coefficients for all variables in the model, with all variables entered into the model (i.e. the unconfounded unmediated association).

§For the psychological factors, ‘beta at entry’ and ‘final beta’ are identical; therefore, only ‘final beta’ coefficients are reported.

*R*-squared is the proportion of between-subject variance explained by the set of covariates in the regression model.

Countries by covariate interaction (*P*<0.05); apsychological assessment and support; bcoordination with mental health professional; cdepression; dhow diabetes affects life.

\**P*<0.05; \*\**P*<0.01; \*\*\**P*<0.001.

NA: not applicable.

**Supplemental Table 1** Adjusted percentages of healthcare professional use of psychological care strategies by country

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Psychological care strategies** | **Assesses how diabetes affects life** | **Assesses depression** | **Provides psychological assessment and support** | **Coordinates with mental health professional** |
|  | Model 0 (*ICC=0.07*) | Model 1 (*ICC=0.07*) | Model 2 (*ICC=0.07*) | Model 0 (*ICC=0.13*) | Model 1(*ICC=0.13*) | Model 2(*ICC=0.18*) | Model 0 (*ICC=0.05*) | Model 1(*ICC=0.04*) | Model 2 (*ICC=0.06*) | Model 0 (*ICC=0.13*) | Model 1 (*ICC=0.12*) | Model 2 (*ICC=0.13*) |
|  |
| **Overall** | 52.0 | 52.0 | 52.3 | 50.5 | 50.4 | 49.6 | 55.0 | 55.0 | 56.3 | 15.9 | 15.1 | 12.9 |
| **Mexico** | 63.0 | 63.9 | 59.9 | 68.6 | 70.3 | 68.6 | 57.0 | 59.2 | 52.6 | 34.3 | 31.9 | 23.9 |
| **USA** | 48.8 | 49.0 | 50.5 | 73.5 | 72.9 | 78.8 | 64.6 | 62.7 | 66.8 | 13.4 | 13.0 | 10.3 |
| **Canada** | 38.5 | 38.7 | 40.1 | 57.9 | 57.2 | 61.8 | 59.4 | 58.4 | 64.3 | 11.9 | 12.0 | 10.3 |
| **France** | 47.5 | 47.5 | 49.8 | 56.2 | 55.5 | 56.5 | 73.9 | 72.7 | 76.3 | 25.0 | 23.5 | 23.5 |
| **Germany** | 49.8 | 50.5 | 47.5 | 54.0 | 55.0 | 52.3 | 64.1 | 65.0 | 63.4 | 16.1 | 16.1 | 11.9 |
| **Netherlands** | 56.2 | 54.5 | 60.8 | 44.3 | 41.6 | 42.8 | 54.0 | 52.5 | 56.7 | 21.3 | 18.0 | 18.5 |
| **Denmark** | 36.6 | 34.8 | 33.9 | 37.1 | 34.8 | 35.7 | 61.3 | 59.2 | 64.1 | 8.6 | 8.0 | 7.2 |
| **UK** | 45.5 | 43.8 | 48.8 | 81.5 | 80.9 | 84.9 | 61.8 | 61.3 | 64.6 | 14.9 | 12.9 | 12.2 |
| **Italy** | 53.3 | 53.0 | 54.0 | 49.8 | 49.8 | 50.5 | 54.2 | 53.5 | 54.7 | 7.4 | 7.6 | 6.7 |
| **Spain** | 50.8 | 49.0 | 53.0 | 52.8 | 51.5 | 52.8 | 54.2 | 53.7 | 58.2 | 9.5 | 8.4 | 7.8 |
| **Poland** | 35.0 | 35.2 | 32.1 | 37.3 | 37.8 | 33.2 | 53.7 | 54.2 | 59.2 | 12.2 | 12.9 | 10.2 |
| **Russia** | 63.7 | 65.0 | 64.8 | 37.8 | 38.9 | 33.9 | 49.0 | 50.5 | 52.0 | 19.9 | 18.1 | 14.9 |
| **Algeria** | 63.2 | 59.6 | 61.8 | 28.1 | 25.9 | 19.5 | 47.8 | 47.8 | 48.5 | 49.5 | 45.5 | 49.3 |
| **Turkey** | 66.8 | 68.6 | 73.5 | 57.7 | 60.8 | 68.1 | 45.0 | 48.5 | 51.0 | 17.8 | 17.1 | 13.4 |
| **India** | 73.3 | 73.9 | 67.9 | 56.0 | 56.2 | 46.3 | 52.8 | 53.5 | 42.1 | 11.3 | 10.6 | 6.0 |
| **China** | 52.5 | 54.2 | 45.5 | 38.5 | 39.7 | 28.1 | 46.8 | 48.0 | 40.4 | 23.9 | 22.4 | 15.1 |
| **Japan** | 37.3 | 40.4 | 44.0 | 24.4 | 25.5 | 26.1 | 32.7 | 33.2 | 37.8 | 6.1 | 7.4 | 8.6 |

Model 0: multilevel model controlling country.

Model 1: Multilevel model controlling country, years in practice, work in team, people seen with Type 1 or Type 2 diabetes, people with diabetes seen with private health insurance, people with diabetes seen with reading difficulties.

Model 2: multilevel model controlling all variables in four categories: (1) practice, (2) medical discipline, (3) clinical practice site and (4) psychological factors. A complete listing of variables within these categories is provided in Table 2.

ICC: intraclass correlation coefficient.

**Supplemental Table 2A** Effect of various barriers and facilitators on the assessment how diabetes affects life by healthcare professionals in different medical disciplines

| **Barriers and facilitators** | **Primary care physicians****(N=2066)** | **Diabetes specialists****(N=1350)** | **Nurses****(N=827)** | **Dietitians****(N=542)** |
| --- | --- | --- | --- | --- |
| **Practice** |  |  |  |  |
| Years in practice | 0.01\* | 0.01 | -0.01 | 0.02 |
| Work in team | 0.41\*\* | 0.15 | 0.08 | 0.08 |
| % People seen with Type 1 diabetes | 0.32\*\*\* | -0.21 | -0.12 | 0.19\* |
| % People seen with Type 2 diabetes | 0.12\*\* | -0.30 | -0.10 | 0.06 |
| % People with diabetes seen with private health insurance | 0.01 | -0.02 | -0.04 | 0.00 |
| % People with diabetes seen with reading difficulties | 0.05\* | 0.00 | 0.06 | -0.02 |
| **Clinical practice site****(Reference site: private practice/office-based)** |  |  |  |  |
| Hospital – out-patient | 0.06 | -0.32 | 0.52 | -0.62\* |
| Hospital – in-patient | -0.30 | 0.00 | 0.17 | -1.21\*\*\* |
| Community health centre/clinic | -0.01 | -0.17 | 0.09 | -0.64 |
| Other | -0.38 | -0.10 | -0.06 | -1.19\* |
| **Psychological factors§** |  |  |  |  |
| % People with diabetes and clinical depression | -0.03\*\*\* | -0.04\*\*\* | -0.03\* | -0.04\*\* |
| % People with diabetes who need improvement in dealing with emotional issues | 0.11 | 0.10 | -0.01 | 0.39 |
| Received psychological management training  | 0.23 | 0.54\*\*\* | 0.70\*\* | 0.06 |
| Reported need for training in psychological support  | 0.27\*\* | 0.09 | 0.38\* | 0.25 |
| Number of resources to provide psychological care  | 0.13\*\*\* | 0.16\*\*\* | 0.12\* | 0.18\*\* |
| Believes clinical success depends on dealing with emotional problems | 0.21\*\*\* | 0.33\*\*\* | 0.27\*\*\* | 0.10 |

Columns report final beta and P-value regression coefficients for all variables in the model, with all variables entered into the model (i.e. the unconfounded and unmediated association).

\*P<0.05; \*\*P<0.01; \*\*\*P<0.001.

§The psychological factors, ‘assesses how diabetes affects peoples’ lives’ and ‘assesses people with diabetes for depression’ were not tested for the outcome measure presented in this table.

**Supplemental Table 2B** Effect of various barriers and facilitators on the assessment of depression by healthcare professionals in different medical disciplines

| **Barriers and facilitators** | **Primary care physicians****(N=2066)** | **Diabetes Specialists****(N=1350)** | **Nurses****(N=827)** | **Dietitians****(N=542)** |
| --- | --- | --- | --- | --- |
| **Practice** |  |  |  |  |
| Years in practice | 0.01 | 0.00 | 0.01 | 0.01 |
| Work in team | 0.19 | 0.57\*\* | 0.34 | 0.76\* |
| % People seen with Type 1 diabetes | -0.01 | -0.02 | 0.08 | 0.03 |
| % People seen with Type 2 diabetes | -0.04 | -0.10 | 0.04 | -0.04 |
| % People with diabetes seen with private health insurance | -0.02 | 0.03 | -0.01 | -0.01 |
| % People with diabetes seen with reading difficulties | 0.01 | 0.00 | 0.00 | -0.04 |
| Clinical practice site(Reference site: private practice/office-based) |  |  |  |  |
| Hospital – out-patient | -0.35 | -0.57\*\* | -0.19 | 0.12 |
| Hospital – in-patient | -0.39 | -0.31 | 0.02 | 0.04 |
| Community health centre/clinic | -0.05 | -0.23 | 0.79\* | 0.42 |
| Other | 0.95 | 0.50 | -1.48 | 1.19 |
| **Psychological factors§** |  |  |  |  |
| % People with diabetes and clinical depression | -0.06\*\*\* | -0.07\*\*\* | -0.05\*\*\* | -0.04\*\* |
| % People with diabetes who need improvement in dealing with emotional issues | -0.42\*\*\* | 0.48\*\*\* | -0.14 | 0.09 |
| Received psychological management training  | -0.26 | 0.30 | -0.30 | 0.36 |
| Reported need for training in psychological support  | 0.09 | 0.08 | -0.33 | 0.06 |
| Number of resources to provide psychological care  | 0.13\*\*\* | 0.14\*\*\* | 0.11 | 0.31\*\* |
| Believes clinical success depends on dealing with emotional problems | 0.17\*\*\* | 0.11 | 0.03 | 0.06 |
| Assesses how diabetes affects peoples’ lives | 0.74\*\*\* | 0.70\*\*\* | 0.46\* | 0.61\* |

Columns report final beta and P-value regression coefficients for all variables in the model, with all variables entered into the model (i.e. the unconfounded and unmediated association).

\**P*<0.05; \*\**P*<0.01; \*\*\**P*<0.001.

§The psychological factor, ‘assesses people with diabetes for depression’ was not tested for the outcome measure presented in this table.

**Supplemental Table 2C** Effect of various barriers and facilitators on the provision of psychological assessment and support by healthcare professionals in different medical disciplines

| **Barriers and facilitators** | **Primary care physicians****(N=2066)** | **Diabetes Specialists****(N=1350)** | **Nurses****(N=827)** | **Dietitians****(N=542)** |
| --- | --- | --- | --- | --- |
| **Practice** |  |  |  |  |
| Years in practice | 0.00 | 0.02\* | 0.00 | 0.02 |
| Work in team | 0.09 | -0.16 | -0.07 | -0.09 |
| % People seen with Type 1 diabetes | -0.08 | -0.34 | 0.17\* | 0.00 |
| % People seen with Type 2 diabetes | -0.03 | -0.37 | 0.08 | 0.01 |
| % People with diabetes seen with private health insurance | 0.01 | -0.03 | 0.01 | 0.02 |
| % People with diabetes seen with reading difficulties | 0.02 | -0.05 | -0.06 | 0.07 |
| **Clinical practice site**(Reference site: private practice/office-based) |  |  |  |  |
| Hospital – out-patient | -0.47\*\* | -0.32 | -0.43 | -0.46 |
| Hospital – in-patient | -0.56\*\* | -0.22 | -0.44 | -1.24\*\* |
| Community health centre/clinic | -0.08 | -0.25 | -0.40 | -0.64 |
| Other | -0.20 | -1.29 | 0.00 | -1.20\* |
| **Psychological factors** |  |  |  |  |
| % People with diabetes and clinical depression | -0.06\*\*\* | -0.06\*\*\* | -0.03\* | -0.06\*\*\* |
| % People with diabetes who need improvement in dealing with emotional issues | 0.05 | -0.21 | 0.03 | 0.44 |
| Received psychological management training  | 0.35\* | 0.84\*\*\* | 0.38 | 0.63 |
| Reported need for training in psychological support  | 0.20 | 0.28\* | 0.25 | 0.22 |
| Number of resources to provide psychological care  | 0.07\* | 0.13\*\*\* | 0.04 | 0.20\* |
| Believes clinical success depends on dealing with emotional problems | 0.15\*\* | 0.21\*\*\* | 0.11 | -0.06 |
| Assesses how diabetes affects peoples’ lives | 0.31\*\* | 0.46\*\*\* | 0.53\*\* | 0.75\*\* |
| Assesses people with diabetes for depression | 0.83\*\*\* | 1.02\*\*\* | 0.76\*\*\* | 0.51 |

Columns report final beta and *P*-value regression coefficients for all variables in the model, with all variables entered into the model (i.e. the unconfounded and unmediated association).

\**P*<0.05; \*\**P*<0.01; \*\*\**P*<0.001.

**Supplemental Table 2D** Effect of various barriers and facilitators on the coordination with mental health professionals by healthcare professionals in different medical disciplines

| **Barriers and facilitators** | **Primary care physicians****(N=2066)** | **Diabetes Specialists****(N=1350)** | **Nurses****(N=827)** | **Dietitians****(N=542)** |
| --- | --- | --- | --- | --- |
| **Practice** |  |  |  |  |
| Years in practice | 0.00 | -0.01 | -0.01 | 0.02 |
| Work in team | 0.51\* | 0.66\* | 0.74 | 0.69 |
| % People seen with Type 1 diabetes | -0.10 | 0.07 | 0.09 | -0.09 |
| % People seen with Type 2 diabetes | -0.03 | 0.00 | 0.06 | -0.09 |
| % People with diabetes seen with private health insurance | 0.02 | -0.01 | 0.01 | 0.05 |
| % People with diabetes seen with reading difficulties | -0.02 | -0.03 | -0.11\* | 0.17\*\* |
| **Clinical practice site****(Reference site: private practice/office-based)** |  |  |  |  |
| Hospital – out-patient | 0.77 | 0.54\*\* | 1.08\* | 0.31 |
| Hospital – in-patient | 0.45\*\* | 0.09 | 1.46\*\* | 0.08 |
| Community health centre/clinic | 0.34 | 0.01 | 0.57 | 0.19 |
| Other | 0.83 | 0.41 | 0.83 | -1.82 |
| **Psychological factors** |  |  |  |  |
| % People with diabetes and clinical depression | -0.03\*\* | -0.02\* | 0.01 | -0.02 |
| % People with diabetes who need improvement in dealing with emotional issues | -0.13 | 0.20 | -0.00 | -0.24 |
| Received psychological management training  | 0.55\*\* | 0.41\* | 0.56\* | 0.00 |
| Reported need for training in psychological support  | 0.60\*\*\* | 0.44\*\* | 0.46\* | 0.34 |
| Number of resources to provide psychological care  | 0.13\*\* | 0.18\*\*\* | 0.20\*\*\* | 0.36\*\*\* |
| Believes clinical success depends on dealing with emotional problems | 0.10 | 0.14\* | 0.03 | 0.18 |
| Assesses how diabetes affects peoples’ lives | 0.84\*\*\* | 0.50\*\* | 0.34 | 0.27 |
| Assesses people with diabetes for depression  | 0.44\* | 0.30 | 0.55\* | 0.02 |

Columns report final beta and *P*-value regression coefficients for all variables in the model, with all variables entered into the model (i.e. the unconfounded and unmediated association).

\**P*<0.05; \*\**P*<0.01; \*\*\**P*<0.001.

# Figure Legends

**Figure 1** Aspects of psychological care for people with diabetes by country

Percentages are adjusted for clustering and all variables in four categories: (1) practice, (2) medical discipline, (3) clinical practice site and (4) psychological factors. A complete listing of variables within these categories is provided in Table 2.