Self-Management Interventions for Type II Diabetes

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Self-management interventions (SMIs) may be promising in the treatment of Diabetes Mellitus Type 2 (T2DM). However, accurate comparisons of their relative effectiveness are challenging, partly due to a lack of clarity and detail regarding the intervention content being evaluated.

diabetes type 2 self-management interventions evidence mapping

1. Introduction

With the aging of populations worldwide, chronic conditions are a major concern, given their significant impact on individual patients, health care and society as a whole. The World Health Organization (WHO) estimates that by 2025, chronic diseases will account for 73% of all deaths and 60% of the global disease burden ^[1].

One chronic disease that has rapidly evolved during the last decades as a major public health problem is Type 2 Diabetes Mellitus (T2DM). The global prevalence of T2DM in adults was about 536.6 million people in 2021, and this number is expected to increase further to 783.2 million people by 2045 ^[2]. Diabetes is a chronic metabolic disease characterized by dysregulation of carbohydrate, lipid and protein metabolism, and results from impaired insulin secretion, insulin resistance or a combination of both. The management of T2DM often involves a combination of medical treatments and lifestyle changes geared to normalize blood sugar levels and decrease cardiovascular risk. These may include medication, diet, exercise, and regular self-monitoring activities, of which the success ultimately relies on patients' abilities to accept and take responsibility for their disease ^[3]. For most patients, this self-management is a difficult task that challenges them on a daily basis and often has a considerable impact on work, family and social life ^{[4][5]}.

Self-management interventions (SMIs) are developed to support people in their daily self-management tasks. Although different definitions of SMIs exist ^[6], in general, SMIs can be characterized as supportive interventions that healthcare staff, peers, or laypersons provide to increase patients' skills and confidence in managing their long-term condition. Interventions to support self-management of T2DM may include, among others, education, support for self-monitoring, lifestyle advice, goal setting for behavioral change and coaching ^[Z].

Evidence has shown that SMIs for type 2 diabetes can be effective, for example, by reducing glycated hemoglobin (HbA1c) and by losing weight ^{[8][9]}. However, it remains unclear which components or approaches to selfmanagement support contribute most to this effectiveness ^{[6][8]}. This is mainly due to the heterogeneity in study design and reporting ^[10]. Heterogeneity also hinders the knowledge translation from scientific evidence into clinical practice and the replication of successful SMIs by other researchers.

2. Key Characteristics of Included RCTs

The 665 studies, composing 164,437 T2DM adults with a median number of 123 adults per RCT (range 10–14,559) and a median age of 58 years old, were conducted in 64 different countries; 141 were conducted in Europe (21%), 79% outside Europe and only five studies were conducted in more than one country. Most of the studies came from the United States (35%), followed at a distance by Iraq (7%), the United Kingdom (6%), China (6%) and Korea (5%). Almost all studies were implemented on an individual patient level (92%) as compared to the population level. Almost without exceptions, studies were developed for patients (99%), with only one study for caregivers and eight targeting both patients and caregivers.

The number of intervention arms (n = 879 in total) in these 665 studies varied between two and five, but the majority of the studies (90%) included two arms. Most studies compared an SMI to usual care (n = 530, 80%), whereas 135 studies compared one or more intervention arms (head-to-head interventions). Usual care was defined as such by the authors and included regular visits and a form of education in most cases. In some studies, usual care (as indicated by the authors) consisted of something more than just information or education, for example, skills training or coaching. In this case, researchers called it 'usual care plus'. In 20% of all intervention arms (n = 879), the intervention content or delivery methods were tailored to the characteristics of the study population (e.g., educational material of an existing intervention that was simplified because of respondents with low health literacy, translated because of Spanish speaking people, or adapted because of known gender differences between men and women).

3. Characteristics of the Participants

Across all studies, participants were more often female (mean 57%, SD 49–67%); the mean age was 58 years old, and the mean time since diagnosis was 8.6 years across studies. Although most studies used general samples of T2DM, others used more specific inclusion criteria: 72 studies (11%) focused specifically on populations with a low socio-economic status. In most of these studies, education or income was used as a proxy for inclusion; 13% of the studies targeted specific minority groups. These were mostly studies from the United States and concerned immigrants in general or more specific groups such as African Americans, Mexican Americans, Latinos or veterans. Information on health literacy levels was only provided in 29 studies (4%); 13% (n = 88) of the studies focused on

diabetes patients with comorbidity; among them, 22% did not specify the type of comorbidity. In studies that did, obesity, hypertension and depression were the most common comorbidities.

Most studies described their T2DM populations with respect to sex (96%), age (97%) and diabetes control (HbA1c; 83%). Other information on study populations, such as illness duration, comorbidities, socio-economic status characteristics and health literacy levels, were described less frequently. Age (61% of trials used an age range for patients to be included) and diabetes control (41% of the studies used a threshold value for HbA1c) were most often used as specific inclusion criteria. Other characteristics, such as time since diagnosis (17%), belonging to a cultural minority group (11%), having comorbidity (9%), sex (4%), socio-economic status (4%) and health literacy levels (1%), were less often used as explicit inclusion criteria for the SMIs in diabetes.

4. Characteristics of the SMIs Reported

Figure 1 shows a matrix with the frequency with which specific SM support techniques are combined across studies. **Figure 2** shows the number of studies in which expected behaviors go together in one study.

Support Techniques	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.Coaching	·237	• 57	• 121	• 66	•176	36	*140	33	13	•233	• 94	• 71
2. Emotional management		152	• 78	25	• 93	18	• 77	13	10	•149	• 84	· 58
3. Enhancing problem solv			•311	* 70	• 225	63	•190	• 54	23	0308	●150	• 96
4. Equipment provision				·248	• 122	- 57	•215	25	12	•241	= 120	31
5. Goal setting					6424	• 73	e279	- 60	. 39	0418	•198	* 105
6. Prompts use						•147	• 97	27	8	143	• 60	26
7. Self -monitoring							0495	• 69	26	0 488	0252	• 101
8. Services use								• 93	9	• 92	• 38	28
9. Shared decision making									- 44	- 42	- 22	5
10. Sharing information										6861	0359	•179
11. Skills training											0365	• 92
12. Social support												•181

Figure 1. Frequency in which support techniques are combined across intervention arms (n = 879). The size and color of the bubble indicates the number of studies including each combination presented, with bigger size and darker color referring to more studies included.

Expected behaviours	1.	Z.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	34.	15.	16.	17.
1.Able to work	1	1	D	0	0	- 3	1	0	0	1	1	0	0	0	1	1	1
2. Alcohol reduction		- 18	2	- 9	4	- 17	5	0	- 3		15	1	- 1	34	13	3	1
3. Communication with he			+ 49	- 26	30	- 32	34	1	- 6	- 28	- 30		13	+ 33	- 4	6	0
4. Condition specific beha				0120	•109	0296	* 65	2	+ 52	6207	0275	* 31	- 32	Q112	+ 45	15	1
5. Early recognition					0142	=109	- 33	0	- 24	• 91	= 102	9	- 10	*120	19	6	0
6. Healthy eating						0.42	=102	1.5	+ 64	0277	6164	• 35	+ 36	0185	* 61	15	1.2
7. Emotional handling							#142	4	6	• 65	• 101	12	10	• 83	14	8	1
8. Healthy sleep								. 9	0	1	6	1	0	5	0	0	0
9. Managing devices									•116	* 47	• 71	5	16	*107		4	0
10. Medication use										0157	0258	- 28	- 38	0264	- 42	13	1
11. Physical activity											0.39	+ 32	- 36	0:77	= 60	15	2
12. Physical management												+ 44		• 33	1	1	0
13 Professional help aski													• 53	+ 48	7	6	0
14. Self-monitoring														0.45	+ 48	16	1
15, Smoking reduction															= 64	3	2
16. Social roles																- 22	1.3
17. Work fit																	2

Figure 2. Frequency in which expected behaviors are combined across intervention arms (n = 879). The size and color of the bubble indicates the number of studies including each combination presented, with bigger size and darker color referring to more studies included.

4.1. Self-Management Support Techniques

Self-management techniques are techniques or methods used to provide care and encouragement to people with chronic conditions and their carers to help them understand their central role in managing their condition, make informed decisions about care and engage in appropriate behaviors. In the intervention arms, the number of self-management support techniques varied between 1 and 11 (median 4, IQR 3–6). Sharing information was used in almost all intervention arms (98%), followed by self-monitoring (56%), goal setting (48%) and skills training (42%). Other techniques, for example, learning skills to handle emotions and learning to use social support or external resources, such as specific websites, were reported in less than a fifth of the studies. Shared decision-making was least mentioned as a technique to support self-management (5%). It appeared that in the 879 intervention arms, a specific combination of support techniques was frequently offered: sharing information plus self-monitoring (n = 418), sharing information plus skills training (n = 359), sharing information plus problem-solving (n = 308) and self-monitoring plus goal setting (n = 279) (**Figure 1**).

4.2. Expected Self-Management Behaviors

Expected self-management behaviors refer to decisions and behaviors that patients with chronic diseases are expected to engage in to improve their health. These behaviors are the focus of the self-management interventions and support techniques. In the intervention arms, the number of expected behaviors mentioned varied between 1 and 12 (median 3, IQR 2–5). Expected behaviors of T2DM patients most often included healthy eating (62%) and physical activity (61%), both being lifestyle-related behaviors; self-monitoring (63%), condition-specific behaviors like checking your feet (48%) and medication use (41 were also frequently mentioned; behaviors in relation to work and social roles, healthy sleep, alcohol or smoking reduction and communicating with health care were seldomly reported (**Figure 2**). **Figure 2** also shows that in the 879 intervention arms, the combinations of healthy eating and physical activity (n = 474), healthy eating and self-monitoring (n = 390) and physical activity and self-monitoring (n = 380) are addressed together.

4.3. Mode of Delivery

Support delivery methods. In the intervention arms, half of the arms (53%) used support sessions; 10% used clinical visits, 11% were self-guided, and a quarter (26%) of the interventions used a combination of methods. Almost half of the interventions were conducted face-to-face; one-third of the interventions used a combination of face-to-face contacts and remote mediums, mainly phones. Two-thirds of the interventions were given to individual patients. One-third in groups (not in table).

Type of location. Most interventions took place in a single location (75%). Outpatient care (43%) and homecare (24%) were the locations mentioned most often; 16% of the interventions took place in a virtual surrounding; 15%

in community settings; SMIs for diabetes were hardly given in hospitals, long-term care facilities or at the workplace.

Type of provider. In the majority of the interventions (58%), only one provider was involved in the intervention arm, most of the time being a nurse (36%), educator (29%), physician (20%) or nutritionist (18%). Peers and laypersons, psychologists or social workers were hardly involved in SMIs for T2DMs. In one-third of the intervention arms, two or more providers were involved.

5. Outcomes Reported in the Included RCTs

Table 1 shows the frequency of reported outcomes in the 665 included RCTs. Clinical outcomes were most frequently used as outcomes for the effectiveness of SMIs in T2DM, including HbA1c (83%), weight (53%), lipid profile (45%) and blood pressure management (42%). Quality of life and physical activity were reported as outcomes in 27% of the studies. Other outcomes, such as adherence to a diet or medication, were reported in less than 16% of the trials. One out of six addressed outcomes related to empowerment, such as self-efficacy (18%) or knowledge (16%). Other empowerment outcomes, such as patient activation or level of health literacy, were not used as outcome measures. The same counts for outcomes related to experiences with care and healthcare use (<5%).

Category of Outcomes	Туре	n	%
	Self-efficacy	120	18%
Docio omnourormont	Knowledge	109	16%
basic empowerment	Patient activation	11	2%
	Health literacy	3	0%
	Physical activity	153	23%
	Dietary habits	106	16%
	Self-management activities in general	111	17%
Adherence to	Medication	92	14%
	Smoking cessation	14	2%
	Self-monitoring	63	10%
Clinical	HbA1c	550	83%
	Weight	353	53%

Table 1. Frequency in which Core Outcomes (COS) were addressed in studies (N = 665).

Category of Outcomes	Туре	n	%
	Lipid profile	296	45%
	Blood pressure	281	42%
	Hypoglycemia	28	4%
	Hyperglycemia	13	2%
	Complications	15	2%
	Life expectancy	2	0%
Quality of life	Quality of life	180	27%
Core nereentions	Participation in decision-making	4	1%
Care perceptions	Experience/satisfaction with care	34	5%
	Unscheduled care	26	4%
Health care use	Scheduled care	13	2%

in targeting other outcomes such as self-eπicacy, blood pressure and quality of life, education, monitoring and goal setting for T2DM patients are favorite. Other techniques, such as enhancing problem-solving skills, learning how to handle emotions, and shared decision-making, were used relatively less often.

		T2D9# / Core Outcome Sets																						
		Basic empowerment				Adherence to						Clinical								y of lif	Care perceptions		Health care	
Self-management Support te Interventions	Support techniques	Saff-efficary	Krewindpa	Packett activation	Huste Roracy	Physical activity	Detaryhoots	Self-management activities in general	Androstedd	Andreas (mattern	Self-montring.	17 Miles	magen	Lipid profile	Brood pressure	Mpoph camia	Horsel/Granite	Completions	Life expectancy	Quality of Mis	Participation in decision mailing	Experiment/satisfaction with care	Unscheduled care	Schelded care
Educational 5	Sharing information	10								÷.,				۲	۲			1		ø	ж			28
	Skills training			1	1		٠			4			0	•	.0	1			1			2		
Monitoring	Self monitoring	65	٠											•						8	19			- 14
	Prompts use			•						\$									0	24		1	1	
Behavioural change -	Goal setting	12	٠		3	82					٠	۲							1	-	36	2	14	19
action based	Enhancing problem s.	٠			1	.0				1									1	- 58		z		
Behavioural change -	Coaching	40				57						10	•	•			0		0	61	7			12
emotion based	Errotional managam.								1	0										27		0	- 2	1
Social support	Social support	24	۰.		ø	34				3	۰.	104		٠	٠				1	36	6	1	2	6
Shared decision making	som	18			0					1		R			1				0	12	5	4	1	0
Use of external resources	Services use	*	¥.3		0		(4)	10		1							0		0	v		1		
	E QUIDING THE PRIMARY	- 45										100									- 24			

Figure 3. Support techniques for SMIs used to address outcomes for T2DM. The size and color of the bubble indicates the number of studies including each combination presented, with bigger size and darker color referring to more studies included.

7. Risk of Bias of the Included Studies

Figure 4 shows that most studies had a low risk of bias in the sequence generation of the random number for the allocation of participants, but there was a lack of clarity in reporting the methods for concealment of the allocation.

The main methodological limitation of the included studies was the lack of blinding of the intervention. This limitation affected the assessment of the subjective outcomes (i.e., quality of life) and objective outcomes that might be influenced by the assessor (i.e., blood pressure). Around 40% of the studies also have a significant number of drop-outs during follow-up, raising concerns about the high risk of bias due to attrition in those studies. The risk of selective reporting was more difficult to evaluate as few studies made available their protocols before the publication of the results.



Figure 4. Risk of bias of included RCTs.

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