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Healthcare workers' perspectives on barriers and facilitators to referral to type 2 diabetes prevention programmes: a systematic review

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ABSTRACT

Objectives Diabetes is a growing global health concern. International guidelines recommend referral to diabetes prevention programmes (DPPs) for those at high risk of type 2 diabetes. However, many of those eligible to participate in DPPs are not referred. Healthcare workers (HCWs) are pivotal to the referral processes. This study aimed to identify, appraise and synthesise barriers and facilitators to referral to DPPs from the perspective of HCWs.

Design Systematic review using the best-fit framework synthesis.

Data sources MEDLINE, Embase, CINAHL, PsychINFO, Web of Science and Scopus were searched from January 1997 to July 2023.

Eligibility criteria Qualitative, quantitative and mixed methods primary studies exploring HCWs' perspectives of barriers and facilitators to referral to DPPs.

Data extraction and synthesis One author screened, extracted and appraised the literature while a second author independently verified at least a 20% sample at each stage. Quality was assessed using the Mixed Methods Appraisal Tool. The best-fit framework approach was used to synthesise the evidence with the Theoretical Domains Framework as the a priori framework.

Results Of 9998 studies identified, 31 met the inclusion criteria, with a further six identified from reference and citation searching. Barriers and facilitators were coded to 11 of the 14 TDF domains and to another category 'Expectation of Patient Barriers'. The most frequently occurring domains for both barriers and facilitators were Environmental Context and Resources, Expectation of Patient Barriers and Knowledge. HCWs felt that clear easy referral pathways to the programmes and additional staff or resources were essential to improve referral. HCWs' were concerned that attending the DPP would place a (time and/or financial) burden on their patients which left them conflicted about referral. HCWs lacked knowledge of the effectiveness, availability and accessibility of DPPs.

Conclusions Future strategies to improve referral to DPPs should include clear referral pathways and the resourcing of referral. Strategies are also needed to build awareness of DPPs and to address concerns among HCWs about their patients.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Best-fit framework synthesis allowed for the inclusion of quantitative, qualitative and mixed methods study designs giving a more comprehensive understanding of the perspectives of healthcare workers on referral to diabetes prevention programmes.
⇒ Inclusion criteria was not limited to healthcare professionals but open to all healthcare workers with knowledge of the referral, allowing for a broader understanding of the issue.
⇒ Included studies were all conducted in high-income countries and may not be generalisable to other settings.

BACKGROUND

Diabetes is a growing global health concern. An estimated 10.5% (536.6 million people) of the world's adults (20–79 years old) are living with the disease.[1] Type 2 diabetes accounts for more than 90% of all cases of diabetes[2] with prevalence projected to continue rising, driving calls for urgent preventative public health measures.[3] The prevalence of pre-diabetes is also rising. Pre-diabetes is a high-risk state for the development of type 2 diabetes, where blood glucose levels are above normal (impaired fasting glucose and/or impaired glucose tolerance) but not high enough to be diagnosed as type 2 diabetes.[4] The global prevalence of impaired glucose tolerance was 9.1% (414 million people)[5] in 2021. Having pre-diabetes is associated with an increased risk of developing type 2 diabetes with up to 50% progressing to type 2 diabetes over 5 years.[6]

Identifying people at high risk is essential to tackle the growing problem of type 2 diabetes. Randomised controlled trials investigating behavioural change programmes have demonstrated that type 2 diabetes can be prevented among those at high risk.[7–10]

A 2018 systematic review and meta-analysis synthesising global evidence of diabetes prevention programmes (DPPs) implemented under real-world conditions found that people participating in a DPP had a 29% lower risk of developing type 2 diabetes than people who did not participate.[11]

While international guidelines recommend referral to DPPs for those at high risk of developing type 2 diabetes,[12 13] many eligible people are not referred.[14–16] A nationally representative cross-sectional analysis of health data in the USA, investigating DPP referral and participation, found that only 4.2% of a population eligible to participate in a DPP were referred.[14]

Understanding the complex reasons for the low rates of referral to DPPs is key to identifying modifiable targets to improve rates in the future. Health professionals play a crucial role in the referral pathway.[17] A 2015 systematic review examining the implementation of DPPs suggested that high-risk people who were identified and referred by health professionals resulted in higher participation rates, highlighting the importance of the healthcare worker (HCW) in the referral process.[18] A 2022 meta-synthesis on the barriers and facilitators to lifestyle change from the perspective of those at risk of type 2 diabetes reported that the guidance and education given by healthcare professionals facilitated positive change.[19] However, a study examining reach and use of diabetes prevention services in the USA found that healthcare professionals were 2–3 times more likely to give lifestyle advice than to refer to a DPP.[16] A 2017 systematic review found that diabetes prevention in primary care was affected by healthcare professionals' workloads, lack of knowledge of pre-diabetes, the competing demands of other health conditions and perceptions of their patient's motivation to change;[20] however, this systematic review focused on health professionals' views on the *value* of diabetes prevention and the suitability of primary care as a *setting* for diabetes prevention.[20] No review has focused specifically on the barriers and facilitators to *referral*.

A broad range of HCWs[21] are involved in or have knowledge of referral including primary care staff, community-based organisations, and DPP providers and educators who are tasked with encouraging referrals. DPPs can be delivered in a range of settings outside of primary care including community settings, pharmacies and online.[22 23] Therefore, the perspectives of this broader HCW group need investigation.

The aim of this review was to identify, appraise and synthesise the published evidence on barriers and facilitators to referral to DPPs from HCW perspectives.

METHODS

The review protocol has been previously published.[24] Deviations to the protocol are described in online supplemental appendix 1. The review was registered on PROSPERO (registration number CRD42022383023) and adheres to the Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) guidelines[25] (online supplemental appendices 2 and 3). A best-fit framework approach was employed to conduct the review which uses a stepped approach to identify a pre-existing framework for the initial coding and then adapts the framework to 'fit' the emerging evidence.[26]

Patient and public involvement

Patients or the public were not involved in the design or the conduct of this review.

Selection of the a priori framework

The Theoretical Domains Framework (TDF) was chosen as the a priori framework as it is a synthesis of systematically reviewed behaviour change theories, developed to identify the influences on healthcare professionals' behaviour in the implementation of evidence-based interventions.[27 28] It consists of 14 domains with 84 theoretical constructs and is used to understand behaviour at individual and organisational levels. The TDF has been used previously within the best-fit framework to review patients' perceptions of diabetes prevention and cardiovascular disease programmes.[29]

Eligibility criteria

The eligibility criteria (table 1) were informed by the Sample, Phenomenon of Interest, Design, Evaluation and Research (SPIDER) framework.[30]

Search strategy

Six databases commonly used in diabetes prevention research were searched: MEDLINE, Embase, CINAHL, PsychINFO, Web of Science and Scopus. A university librarian was consulted to refine the search strategy. The search used database-specific controlled vocabulary (eg, medical subject headings) as well as keywords in the title and abstract, spelling variants truncation and synonyms. Search dates for studies were from January 1997, when the first of the landmark trials on diabetes prevention was published,[7] up until July 2023 (online supplemental appendix 4).

Screening

All references were exported to Covidence, and duplicates removed. The lead author (CH) conducted title and abstract screening and full-text review for potentially eligible studies. A second author (JP) reviewed a random sample of 20% of titles and abstracts and fulltext review of all potentially eligible studies. Opinion was sought from the wider research team when consensus could not be reached (GO'D, FR).

Data extraction and quality appraisal

Data was extracted by the lead author (CH) for all included studies, and a second author (JP) extracted data for a random sample of 20% (see online supplemental appendix 5 for data extraction form). The quality of all included studies was appraised by the lead author (CH) using the Mixed Methods Appraisal Tool.[31] A further

Table 1 Eligibility criteria

SPIDER	Inclusion	Exclusion
S: Sample	HCWs involved in referral to DPPs	Perspectives of people at high risk of type 2 diabetes
P of I: Phenomenon of Interest	Studies that report HCWs' perspectives of barriers and facilitators to referral to DPPs	Studies that include HCWs' perspectives on referral to programmes for people with existing type 2 diabetes or gestational diabetes
D: Design	Qualitative, quantitative and mixed methods research designs	
E: Evaluation	Experiences, views, perspectives, beliefs, opinions, factors (barriers and enablers) that influence referral to DPPs	
R: Research	Primary research studies, in English, published from January 1997 to July 2023	Editorials, opinion pieces or commentaries

DPPs, Diabetes Prevention Programmes; HCWs, healthcare workers.

random sample of 20% was appraised by two other authors (JP, G'OD). Any discrepancies were resolved through discussion. The results of the appraisal are presented as % of quality criteria met. Studies with more than one article were linked to avoid duplicating data extracted.

Data synthesis

Data extracted on barriers and facilitators to referral were coded deductively using TDF Version 2.[27] A codebook was developed from the TDF to reflect the context of diabetes prevention, guided by the 14 domains and the 84 constructs, in an iterative process which required familiarisation with the data (online supplemental appendix 6). An 'Other' code was created to accommodate data that did not fit into the 14 domains. These data were arranged into similar broader concepts which were combined to generate a new theme. To start and to ensure consistency in analysis, three studies (qualitative, quantitative and mixed methods) were jointly coded by the lead author and a second author (CH, GO'D). Both authors discussed their coding decisions until consensus was reached. The lead author (CH) then coded data from the remaining studies, and a second author (GO'D) coded 20% of the studies. Themes were developed within the domains to synthesise the data. Relationships between these themes and domains were explored, yielding an adapted framework representing the whole dataset.

Testing the synthesis

The best-fit framework assesses the risk of bias due to missing results by exploring the differences between the a priori framework and the adapted framework and by conducting a sensitivity analysis.[26] Therefore, the TDF and the new adapted framework were compared to assess and explain any differences (ie, the addition or absence of domains), and a sensitivity analysis was carried out to assess the effect of the quality of the studies (ie, the effect of excluding the studies which had the lowest score, 40% or less), the socioeconomic context of the studies and subgroups of HCWs (if reported) on the themes included the framework.[32]

RESULTS

The search yielded 9998 unique citations after duplicates were removed. Title and abstract screening excluded 9709 studies, and full-text screening excluded a further 258, leaving 31 studies for inclusion. Six further studies were identified from reference and citation screening (by CH) resulting in the inclusion of 36 studies corresponding to 37 full text articles (PRISMA figure 1). The majority of studies (n=33) were published since 2016 with three studies published between 2011 and 2014.[33–35]

Study characteristics and quality appraisal

The characteristics of the studies included are described in online supplemental appendix 7. Most took place in the USA [33 35–62](n=28), with seven in England[63–69] and one conducted jointly in the USA and Australia.[34] Most used qualitative methods[34 38 40–42 45 50 52 54 57 59 60 62–65 68] (n=17) or mixed methods[33 35 36 39 43 46–49 51 55 56 61 66 67 69] (n=16), with four quantitative studies.[37 44 53 58] A wide range of HCWs participated in the studies including physicians[38 44–46 48 49 55–58 60 62 63 65 68–70] (n=17), nurses[33 36 38 40 44–46 48 64 65 68] (n=17), lifestyle coaches or educators delivering the programmes[34–37 40–42 49 59–61 63 67 68] (n=13), pharmacists and pharmacy staff[44 52 53 65] (n=4), DPP administrative and management staff[39 41 47 50 54 62 67 68] (n=8), as well as insurance payers and commissioners[57 60 63 65 67–69] (n=7). Three studies sought the perspectives of community health workers who were lay people from the target communities trained to deliver the course.[33 35 49]

Nine studies described perspectives of HCWs serving diverse socioeconomic populations[36 39–42 51 63 64 68 69] with four specifically recruiting HCWs engaging with low-income populations.[40 47 49 51] One study compared lifestyle coaches' perceptions of barriers to participation in lower versus higher income DPP participants.[37] The socioeconomic status of the patient population was not reported in the remaining 17 studies.[35 38 44–46 48 50 52–58 60–62 65]

Most studies met 60% or more of the quality criteria (n=30) with six meeting 40% or less[33 43 47–49 51] (online supplemental appendix 8).

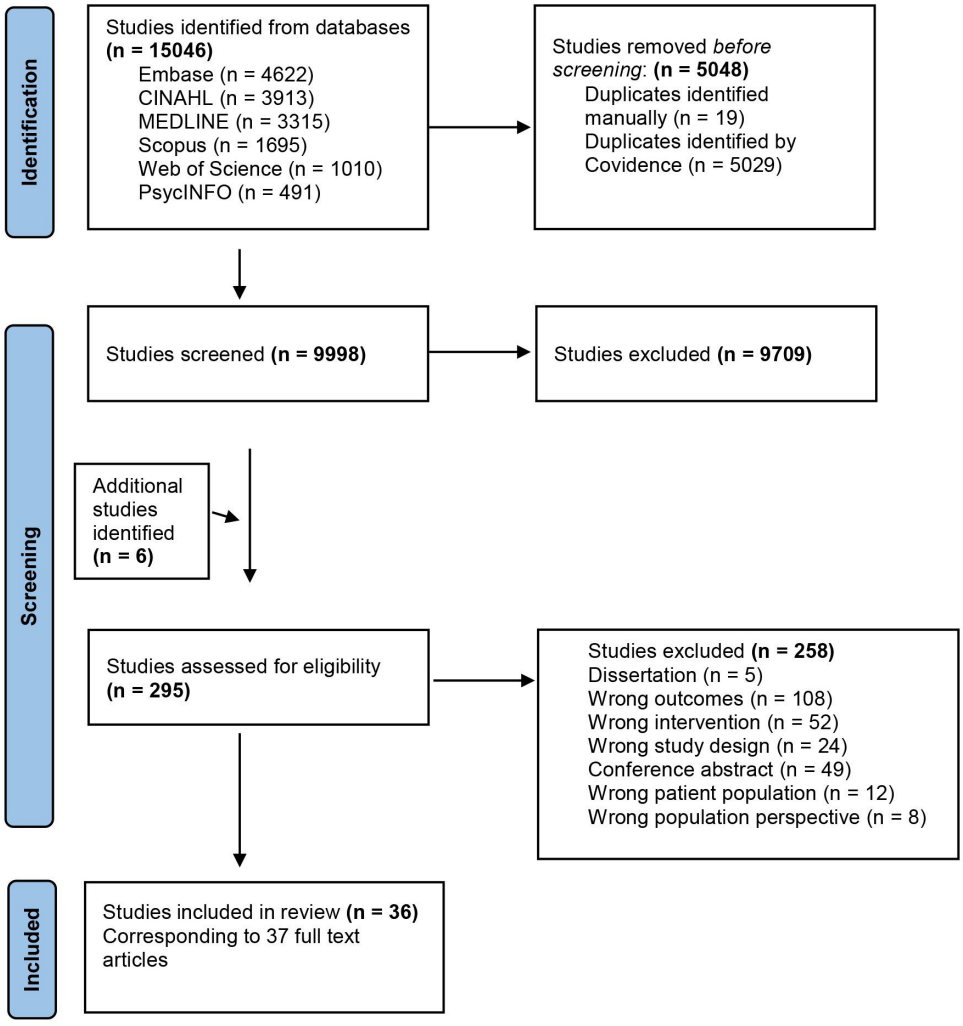

Figure 1 Preferred Reporting Items for Systematic review and Meta-Analysis flow diagram.

Data synthesis and best-fit framework

Data were coded to 11 of the 14 domains of the TDF and to an 'Other' domain. Data coded to the 'Other' category related to HCWs' expectations of barriers for their patients. Therefore, the 12th domain 'Expectation of Patient Barriers', described themes related to HCWs perceptions of the challenges for their patients if referred to a DPP. The domains in the adapted framework were: Environmental Context and Resources, Knowledge, Beliefs about Consequences, Social Influences, Social Professional Role and Identity, Emotion, Goals, Memory Attention and Decision Processes, Reinforcement, Optimism and Skills, and Expectation of Patient Barriers. Almost all domains in this adapted framework contained both barriers and facilitators except for Reinforcement which contained only facilitators and Optimism which contained only barriers (table 2). A narrative summary presents the themes in the five domains to which data were most frequently coded (ie, the number of studies coded to that domain). Direct quotes from the included studies are presented in italics, while the author's interpretations are presented in plain text.

Environmental Context and Resources (33 studies)

Referral pathway

The referral pathway from primary care was valued by DPP providers[34 41 44 47 50 61 65 66 69] with acknowledgement that this pathway resulted in more appropriate referrals than other routes. However, the lack of a clear referral pathway was challenging for potential referrers[38 45 54–57 62 63 66] especially when referring outside of their own practices or clinical systems:

> In our study, many physicians were unaware of the updated screening criteria, were unaware of local options for intensive behavioural interventions to which they could refer patients, and cited the lack of a formal, health system–wide referral process as a barrier to recommendation adoption and implementation.[56]

Contact with patients from a healthcare professional about the referral was seen to be a necessary step in the referral process by referrers and DPP providers, to facilitate referrals.[34 38 50 63] This was felt to avoid perceived ethical issues resulting from referring people to the programme who were unaware they had pre-diabetes (eg,

Table 2 Best-fit framework

Domain	Theme	Example quote	Relevant papers	Number of studies n=36
Environmental Context and Resources	Referral pathway	'Furthermore, the health system did not have a formal process for referral to community programmes and many providers were unsure how to make external referrals'.[59(p 19)]	33 34 36–50 53–69	33
	Time and staff	'High coherence, with all participants agreeing on the need for a prevention programme with patients at risk of diabetes, and agreement that existing practice resource was insufficient'.[66(p 6)]		
	Programme factors	'Providers wanted improved access to the DPP and recommended a standardised easy referral process, education about local DPPs, and more availability for DPP sessions'.[48(p 7)]		
Expectation of Patient Barriers ('Other')	Practical barriers	'They [clinicians] echoed patient-expressed improvements, with the biggest opportunity being to increase accessibility for the patients in regard to location, time, and cost of the National DPP and similar programmes'.[38(p 139)]	33 35–43 46–48 50–52 54–56 58 60 62–65 67–69	27
	Motivation to change	'*…There's no point in just sending people if they're not motivated, if they're not ready…*'[69(p 6)]		
	Awareness of risk and diabetes prevention	'Users' lack of awareness or confusion about elevated risk and lack of preparedness for the intervention offer were major issues for engagement and uptake, with potential to cause anxiety and uncertainty. This highlights the importance of improving effective communication of raised diabetes risk prior to, and as part of intervention referral, to increase engagement and avoid potential harm'.[63(p 9)]		
Knowledge	HCWs knowledge of the DPP	*'I have a pretty good idea of what they'll experience in the Diabetes Prevention Programme, but I don't exactly know where the location is and what the times are. Are they in the evening, in the morning? It's kind of a little bit of a black box'*.[38(p 137)]	36 38 39 41 42 44 45 47–50 55–57 60–62 66–69	20
Social Influence	Promotion of DPP	*'One factor we were concerned about was the actual primary care buy-in. We wanted them to be engaged and understand the benefits of the service and to make sure that they referred the appropriate patients onto it…We've done a lot of clinical education, in terms of we've attended protected learning times for GPs and nurses, to make them aware of the service'*.[69(p 5)]	34 36 38 40–42 47 50 59 61 63 65–69	15
Social Professional Role and Identity	Responsibility and roles	'Over the course of the pilot, the services all made efforts to improve their communication and understand each other's roles. This led to an appreciation of the need to collectively understand the issues from each other's perspective in order to resolve them'.[66(p 9)]	38 41 42 44 49 50 55 57 61 65 66 68 69	13
Emotion	Feelings about referral	'The staff had concerns about additional workload and sustainability; staff members spoke specifically about how to continue to screen, test and refer patients and maintain behaviour change when patients and providers faced competing medical problems and priorities'.[43(p 6)]	33 38 42 43 56 57 63 64 66 68	10

Continued

Table 2 Continued

Domain	Theme	Example quote	Relevant papers	Number of studies n=36
Beliefs about Consequences	Beliefs about the programme	'The current study showed that providers' attitudes about the importance of making referrals to the National DPP LCP [lifestyle change programme] was associated with making referrals'.[44]	39 44–46 54 64 65	8
	Referral strategies	…outreach initiatives in referral and recruitment and adaptations to the programme were viewed as essential to reach a wider at-risk population'.[68(page 10)]		
Goals	Targets	*'…you need to generate these referrals. Then having generated them, they've come through at a volume whereby we didn't expect…And that's left the provider in a tricky position…'*[69]	36 43 59 66 68 69	6
Memory Attention and Decision Processes	Reminders about the DPP	*'Presenting the programme at a stand-up meeting in the morning for all the providers to remind them that the class is starting in March and to remember who is an ideal candidate to refer'*.[36]	36 41 56 57 59 62	6
Skills	Risk communication	*'For me, one of the main elements is not the eligibility…It's the communication of risk. In terms of a conversion rate, I think that's really, really important'*.[67]	38 50 55 63 67 68	6
	IT skills	'Organisation 2 indicated starting a point-of-care referral process with the larger EHR system change created a steep learning curve. Providers first needed time to master the new EHR system…'[50(p 468)]		
Reinforcement	Incentives to refer	'Many sites introduced financial incentives to stimulate this engagement [GPs referring to the DPP].'[69(p 5)]	67 69	2
Optimism	Referrer engagement	*'I think, also, there was an assumption that GPs would buy into this. Actually, some GP surgeries decided that they didn't want to be part of the programme. We've had varying degrees of GP engagement'*.[68(p9)]	56 68	2

DPP, Diabetes Prevention Programme; EHR, Electronic Health Record; GP, general practitioner; HCW, Healthcare Worker; IT, information technology; LCP, Lifestyle Change Programme.

letters or emails sent from electronic health record identification of patients).[50 63] Previous negative experience with the referral pathway was a barrier to future referral.[38]

Both the referrers and the DPP providers highlighted the importance of a standard, easy, referral process, with best practice alerts and electronic referral considered particularly helpful.[44 46 50 56 58 59 62] A study evaluating implementation strategies to increase DPP referrals found that:

> All the clinicians felt that the electronic DPP referral made it more likely that they would refer a patient.[46]

Having an established referral process for another programme could facilitate referral.[34 59] Piloting and involving referrers in discussions about the referral pathway was recommended to improve the process.[50 66 68 69]

While primary care was the preferred referral pathway, some studies explored other avenues for referral. Potential referrers and DPP providers suggested that pathways through community pharmacy or outreach to agencies or community groups could facilitate referrals and ease the pressure on primary care, while targeting communities at high risk of developing type 2 diabetes who are less likely to engage with primary care.[41 65 66 68]

Time and staff

Many potential referrers and DPP providers cited lack of time and staff as barriers to referral to DPPs.[36 38 39 42 43 50 55 59 61 64 66 68]

> *They [physicians] don't have time for [pre-diabetes], you know, they're having a hard-enough time just dealing with the [patients with] out of control diabetes] […], it's the old*

story about when you're killing alligators, it's hard to drain the swamp [Provider].[39]

Specifically, referrers cited workload pressures, lack of time in the clinical encounter and their patients' competing medical priorities as barriers to referral.[38 39 55 64 66–68] Referrers also reported a lack of time and staff to establish new work practices such as electronic referrals and using decision support tools to facilitate referral:

> Staff members reported challenges, such as not having enough staff members to query the EMR to identify Medicare patients at risk for pre-diabetes and to create a pre-diabetes registry. Staff members were also uncertain about the best ways to integrate identification and referral into busy clinical workflows at the point of care.[43]

DPP providers cited their lack of time and staff availability to promote the programme to potential referrers and their perceptions that referrers had competing priorities.[36 42 50 59 61 62]

A pre-diabetes champion[36 46 49 50 59] and additional clinical staff[61 63 66]or financial incentives to identify and refer,[67 69] along with support from administrative staff,[42] facilitated referral.

Programme factors

Availability, accessibility and affordability of the DPPs were highlighted as both important barriers and facilitators to referral. Lack of DPP availability or long wait times after referral[37 38 42 44 55 57 62 68] were barriers, which for some physicians created a 'learnt helplessness' which discouraged further referrals.[57] Both potential referrers and DPP providers felt it was more difficult to refer to DPPs in more rural, less populated areas or areas with poor transportation.[36 40 42 46 54 56 65] Increasing the availability of DPPs,[36 38 40 41 44 48 58] situating the DPPs in more populated areas[42] or areas with transportation links,[67] or offering the DPP virtually[40 62] were facilitators.

Uncertainty about insurance cover for the DPP was only reported as a barrier for referral in the USA.[42 45 55 57] For DPPs with an associated cost, health insurance cover for the DPP facilitated referral.[42 45 58]

> Most PCPs [primary care physicians] strongly believe that system-level interventions for improving the management of pre-diabetes should include increasing insurance coverage of and coordinated referral to National DPP lifestyle change programmes.[58]

Expectation of Patient Barriers (27 studies) ('Other' domain)

Practical barriers: time and cost

Some potential referrers anticipated or expected barriers to participation for their patients which dissuaded them from making the initial referral. They were concerned that the cost or lack of insurance cover for the programme[36 38 42 51 54–56 60] and the time commitment[35 41 42 48 51 56] would be a burden for their patients. For example, in a study exploring physicians' perceptions of pre-diabetes guidelines, one physician described how their perception of these patient barriers affected their decision to refer:

> *As far as the referral to the behavioural interventions, I would say that in practice I don't do that very frequently, and maybe part of it on my part is that I think that I worry that patients may not have the time or resources to do that [Physician].*[56]

Motivation to change

Perception of their patients' motivation to change affected some HCWs' views on referral; higher motivation facilitated referral.[33 46 58 68] Conversely, one article described that some physicians referred people they perceived as having low motivation to change.[46]

Awareness of risk and diabetes prevention

Both referrers and DPP providers identified the low awareness patients had of pre-diabetes and diabetes prevention.[50 52 63 68 69] A study with health professionals involved in the implementation of the DPP in England outlined:

> …How this [low awareness] may have affected engagement and the need for this to be improved before referral or with offer of intervention.[63]

Knowledge (20 studies)

Healthcare workers' (HCWs) knowledge of the Diabetes Prevention Programme (DPP)

Potential referrers had limited awareness of DPPs and a lack of practical knowledge about DPP delivery including timing, location of classes, insurance cover or programme cost, and how to refer.[36 38 41 42 44 48–50 55 57 60 62 69] Lack of knowledge about the diagnosis and treatment of pre-diabetes[36 38 41 42 45 47 48 55–57 62 69] was also identified as a barrier. For example, a cross-sectional survey of 1503 physicians, nurse practitioners and pharmacists found:

> …50% of the sample reported not being familiar with the National DPP LCP [Lifestyle Change Programme] and over 70% reported that the programme was either not available or they were not sure if it was…[44]

Knowledge of the evidence of the effectiveness, the content and the availability of the DPP[36 39 40 44 48–50 66 68] facilitated referral for HCWs. Personal contact from the DPP provider to educate and inform referrers about the programme also facilitated referral.[36 49 66 69]

> ….they [academic detailers promoting the DPP] received feedback that using health professional peers as academic detailers worked particularly well. Detailers ascribed this to a shared understanding of how best to treat and approach patients.[49]

Social Influence (15 studies)

Promotion of Diabetes Prevention Programme (DPP)

'Social Influence' were related to DPP providers' promotion of the programme to potential referrers and patients. In-person education was important to both the DPP providers and the potential referrers.[34 36 38 47 59 66 69]

> *I think you should kind of more advertise this programme because we truly don't know about it…why don't you come in and talk to us about this and tell us [Clinician].*[38]

> *I went to all of their staff meetings. I went to a staff meeting for every department in our area. So, I went and introduced myself and the programme [DPP educator].*[36]

Using agencies involved with high-risk groups in the community to promote the DPP,[40 41 68] pre-diabetes champions[34 36 38 59 66 69] and having more clinical team members[38] involved in referral were other facilitators.

Social Professional Role and Identity (13 studies)

Responsibility and roles

Physicians in primary care saw their role as helping their patients to access services such as the DPP:

> *I would be interested to know more about it [DPP], how to access it. Because we're our patients' number one cheerleader so we can help them access those resources [Physician].*[57]

Providing follow-up information to referrers about their patients' participation was also recommended to encourage trust in the DPP to provide care for their patients and therefore facilitate referral.[38 47 49 50 65 69]

Clarifying HCWs' roles within the referral pathway was important, especially when referring from outside of established clinical pathways, with community groups, for example.[38 41 66 68 69]

It was important to potential referrers that a healthcare professional was in the role of promoting the programme.[49 50 61 66] Potential referrers' perception that the DPP provided a service that they could not provide in their own clinical setting also facilitated referral.[65 66]

Testing the synthesis

Differences between the TDF and the adapted framework were considered. Overall, there were three domains without data—Intentions, Behaviour Regulation and Beliefs about Capabilities which, therefore, were not included in the adapted framework. The review findings were more focused on environmental processes and pathways; therefore, the Intentions and Behaviour Regulation domains may be more relevant when a referral process has already been established. Given that HCWs routinely make referrals, their perception of their capability to make the referral may not have been a factor affecting referrals, and therefore Beliefs about Capabilities is a less relevant or applicable domain. A new domain Expectation of Patient Barriers was required in addition to the TDF domains, as HCWs' perceptions of barriers for their patients were very important to referral but related to their patients' barriers and not specifically HCWs' barriers.

Sensitivity analysis

The synthesis was not sensitive to the quality of the studies as the main findings did not change when lower quality studies were excluded (online supplemental appendix 9). Sensitivity to socioeconomic context and HCW subgroups could not be analysed as these factors were not reported separately in many studies.

DISCUSSION

This review identified and synthesised qualitative, quantitative and mixed methods research on barriers and facilitators to referral to DPPs from HCWs' perspectives. Barriers and facilitators were mapped to the TDF and an 'Other' domain to develop an adapted framework using the best-fit framework to be specific to the context of referral to DPPs. Domains most frequently coded were Environmental Context and Resources, Expectation of Patient Barriers, Knowledge, Social Influence, and Social and Professional Role and Identity. Using the best-fit framework with the TDF provided a useful structure to progress from the identification of determinants of HCWs' perspectives to the selection and tailoring of future strategies to improve referral and ultimately DPP participation.[71]

In relation to the environmental context, experiences with the referral pathway were similar despite different health systems (USA, England, Australia). The referral pathway from primary care involving healthcare professionals was perceived as more successful in generating appropriate referrals. Identifying patients through the electronic health record decreased the burden on busy HCWs but led to ethical issues referring people who were not aware of their diagnosis. While we found that HCWs recognised the potential for wider reach by seeking referrals from community groups, this referral route was considered the most difficult to implement. A narrative review of the DPP evaluation in England highlighted the complex relationships involved in the referral pathway including tension between the referrers and external DPP providers.[72] The domains of Social Influence and Social Professional Role and Identity were linked, as clarifying the HCWs' roles along the referral pathway and having a healthcare professional promoting the programme were both important factors affecting referral. The findings suggest that good communication between the DPP providers and referrers is essential to build trust in the referral system and the programmes.

Previous systematic reviews have identified health professional workload and limited resources (ie, time and staff) as barriers to diabetes prevention service provision in primary care.[20] Our review demonstrates that these factors also apply to *referral* to DPPs. The findings suggest that incentivising the referral to DPPs is required to support under-resourced HCWs. In England, financial incentives provided to primary care practices based on the number of referrals to the national DPP, resulted in 84% more referrals than no incentives.[73]

Table 3 Summary of barriers with potential solutions

Barrier	Potential solutions
Referral pathway is unclear to potential referrers	► DPP providers inform potential referrers of the criteria for referral and how to refer. ► DPP providers use existing pathways (eg, primary care) for referral. ► DPP facilitates electronic referrals from referrers. ► DPP providers use a standard easy referral process. ► DPP providers pilot referral pathways with potential referrers.
Ethical issues using electronic health records to refer people who are unaware of their pre-diabetes status	► Involve healthcare professionals in the referral process.
Difficulty engaging those at high risk who do not use primary care	► Consider alternate pathways such as pharmacies or community groups. ► Clarify roles within the referral process.
Potential referrers lack the time or staff to identify and refer people to DPPs	► Pre-diabetes champion. ► Additional clinical staff. ► Financial incentives for referrers. ► Administrative support for referral.
Lack of availability of DPPs or long waiting times after referral	► Increasing availability of DPPs. ► Virtual DPPs. ► Provide information to referrers on their referrals and waiting times.
Uncertainty about insurance cover	► Provide insurance cover for DPPs. ► Simplify the process of applying for insurance cover. ► Inform referrers about the insurance cover available.
Referrers' perception of time and financial burden on their patients	► Inform referrers about available insurance cover for DPPs (eg, Medicaid and Medicare). ► Reframe the DPP as support for behaviour change.
Low awareness of pre-diabetes and diabetes prevention among people with pre-diabetes	► Referrers discuss risk and the effectiveness of DPPs with people with pre-diabetes before referral.
Lack of knowledge of DPPs among potential referrers	► Personal contact from the the DPP provider or other healthcare professional to promote the programme and to inform potential referrers about the effectiveness of the programme.

DPP, Diabetes Prevention Programme.

In the US studies, given the associated cost to attend DPPs, HCWs were concerned that referral would place an unacceptable financial burden on patients—and were less inclined to refer. However, in the USA, numerous employers, insurance companies and states now cover the cost of DPPs. Since 2018, Medicare (federal health insurance for those over 65 years) began to reimburse clinical and community settings to offer DPPs.[74] Cover has also been expanded to Medicaid (federal health insurance for people with low income) in certain states, providing access to the DPP for people under 65 years. However, this cost reduction has not yet translated into significant increases in referrals or enrolment.[75] Our review findings suggest that providing insurance cover for the programme, simplifying the process of applying for this cover and increasing potential referrers' knowledge of cover could reduce HCWs' concerns and improve referrals.

HCWs were also concerned about the length of the programme and the burden for their patients. HCWs held this view even when the programme they were recruiting or referring to was delivered in 3 months as opposed to the usual 9–12 months.[42] A recent qualitative study in Ireland explored factors affecting participation in an online national DPP.[76] While programme educators considered the programme length (12 months) a barrier for some people who declined to attend, they reported that programme participants saw it, not as a yearlong commitment, but 'ongoing support' for behaviour change. Reframing the programme as a support rather than a burden could change HCWs' perspectives on referral.

Evidence in support of DPPs has existed for over 20 years; therefore, it was surprising that our review found HCWs still have low awareness of DPPs and their benefits. A 2023 systematic review in the USA, examining quantitative evidence of knowledge, practice and attitudes towards pre-diabetes, found that healthcare professionals had poor knowledge of pre-diabetes and less than 36% would consider referring their patients to DPPs.[77] While our review highlights some of the barriers potentially contributing to these figures (practical knowledge of the timing, location, and availability of classes, cost, insurance cover, how to refer) and facilitators to increase HCWs' knowledge (in-person education about the DPPs), this alone will not be enough to increase referrals. A survey

assessing the effects of clinical guidelines on screening and referral to DPPs in the USA reports physicians overestimate the congruence of their practices in relation to DPP screening and referral guidance.[56] This suggests that while increasing awareness of the risk of diabetes and the value of DPPs for HCWs and people with pre-diabetes should be a priority for policy makers, further strategies may be needed to increase referrals. A summary of the barriers identified and potential solutions is provided in table 3.

Strengths, limitations and future research

This review is the first to specifically explore factors affecting referral to DPPs from HCWs' perspectives. Understanding these perspectives can indicate changes needed to improve referral to the programmes in the future. This review considered the perspectives of a broad range of HCWs, as limiting the review to healthcare professionals would have excluded the views of people who are knowledgeable about programme implementation such as managers and commissioners. Including qualitative, quantitative and mixed methods studies provided a more complete picture of HCWs' perspectives.

One limitation is that the studies identified took place mainly in the USA and England with one in Australia. While the factors affecting referral were largely similar across these very different health systems, the findings may not be generalisable to other settings. As such, this review has highlighted that limited research has been conducted among HCWs from countries other than the USA and England. This gap may be because other countries may have less well-established national DPPs. Exploring HCW perspectives on referrals in different countries with different healthcare systems would also be valuable to maximise the generalisability of the results. Due to time constraints, our review searched for papers in English only. Including papers in other languages may have yielded more results from a wider range of countries. Future research should consider the inclusion of studies in languages other than English.

Despite the evidence of low referral to DPPs, few strategies have been developed to improve referrals. This systematic review has identified modifiable factors that could be targeted with strategies to improve referrals to DPPs in the future. Future research is recommended to develop and test implementation strategies to improve referral to DPPs.

Conclusion

Identifying barriers and facilitators to referral to DPPs from HCWs' perspectives is a necessary step in the development of strategies to improve future participation. HCW barriers and facilitators relate to their knowledge of DPPs, the referral pathway and concern for their patients. Future strategies should include building awareness of DPPs, ensuring clear referral pathways and better resourcing of the referral of people with pre-diabetes to DPPs.

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