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Mobile Health Applications to Improve Health Outcomes and Behaviors in Patients Type 2 Diabetes, A Meta-analysis

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Background

- In 2019, 37.3 million Americans of all ages had diabetes, with roughly 1.4 million new cases diagnosed.
- The American Diabetes association emphasizes the importance of optimizing self-management support for the patient, which includes healthy eating, exercise, medication adherence, and glucose self-monitoring.
- The reliance on smartphones serves as a promising avenue to promote diabetes self-management.

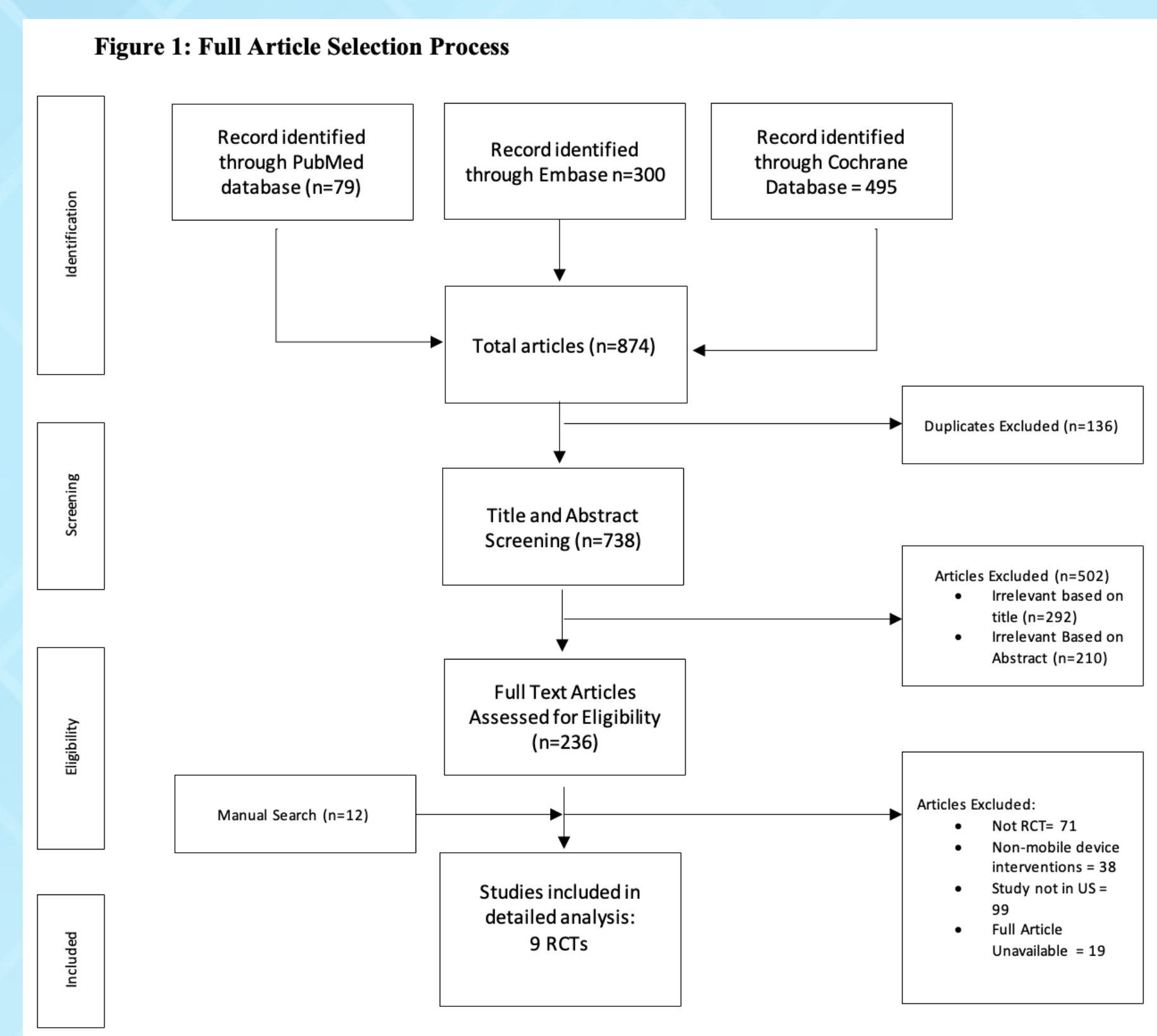
Problem Statement

What is the impact of smartphone applications on glycemic control and self-management behavior in American adult patients diagnosed with type 2 diabetes mellitus?

Methods

- We conducted the systematic search in 3 electronic databases (PubMed, the Cochrane Library, and EMBASE) using a predefined search strategy
- We identified articles published from 2012 to December 2021. We included articles that reported on the effectiveness of an intervention for type 2 diabetes via mobile technology. Of the 874 articles retrieved, 9 RCTs were included (Figure 1). Analysis plan involved narrative synthesis and meta-analysis.

Results



	ARMS	HbA1cB (%)			HbA1cF (%)			HbA1cB (mmol/mol)			HbA1cF (mmol/mol)		
		mean	SD	n	mean	SD	n	mean	SD	n	mean	SD	n
Agboola_2016_mobile	Mobile	9.02	1.63	64	8.59	1.6	46						
Agboola_2016_UC	UC	8.38	1.37	62	8.17	1.6	49						
Forjuoh_2014_CDSMP	CDSMP	9.4	1.7	101	8.7	1.9	101						
Forjuoh_2014_PDA	PDA	9.3	1.6	81	8.7	1.7	81						
Forjuoh_2014_CDSMP+PDA+CDSMP	PDA	9.2	1.4	99	8.6	1.4	99						
Forjuoh_2014_standard UC	UC	9.2	1.6	95	8.4	1.6	95						
Fortmann_2017_DulceD DD	DD	9.5	1.2	63	8.5	1.2	50						
Fortmann_2017_standards UC	UC	9.6	1.4	63	9.4	2	59						
Greenwood_2015_remo TRM	TRM	8.5	1.1	45	7.4	-	40						
Greenwood_2015_standards UC	UC	8.2	1.1	45	7.5	-	40						
Hsu_2016_cloud	CB Mobile	10.8	1.2	20	7.7	1.6	20						
Hsu_2016_standardcare UC	UC	10.9	1.2	20	8.9	2.2	20						
Kerfoot_2017_DSME	DSME							75	14	227	71	(68 to 73)	227
Kerfoot_2017_booklet	Booklet							74	13	229	70	(68 to 72)	229
Presley_2020_mobile	DSME + Mobile	10.1	1.7	62	9.6	1.9	62						
Presley_2020_dsme	DSME only	9.8	1.7	35	9.1	1.9	35						
Quinn_2012_UC	UC	9.2	1.7	56	8.6	2	27						
Quinn_2012_CO	Coach Only	9.3	1.8	23	7.6	1.1	15						
Quinn_2012_COP	Coach Portal	9	1.8	22	7.6	0.7	11						
Quinn_2012_COPBMA	Portal + Decision making	9.9	2.1	62	7.5	1.2	39						
Sevick_2012_SCTmobile Tech Support Behavioral Support		7.7	2.2	131	7.1	1.3	131						
Sevick_2012_standardcare UC	UC	7.5	1.7	132	7.3	1.6	132						
Wang_2018_mobileBI	Mobile	8.4	2.3	11	6.9	1	11						
Wang_2018_diaryBI	Paper	10.4	2.4	9	9.1	1.8	9						
Wang_2018_standardcare UC	UC	8.9	2.4	6	8.9	1.6	6						

Discussion

- Across 9 included trials involving 1763 participants, smartphone application-based interventions were associated with a clinically significant reduction in HbA1c
- There were mixed effects on the impact of smart phone devices on healthy behavior modulation, given the variability of measurement across studies
- In promoting the patient empowerment aspect of value-based patient center care, the use of technology as an adjunct tool for chronic patient management may be promising.
- There is great value in learning the PRISMA methodology for creating meta-analyses, particularly in analyzing many small studies for clinical relevance.

Conclusions

- This systematic review and meta-analyses demonstrated that mobile application-based interventions may have a modest beneficial effect on a diabetic patient's glycemic control and may promote healthy behaviors.

REFERENCES

1. Page M J, McKenzie J E, Bossuyt P M, Boutron I, Hoffmann T C, Mulrow C D et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews *BMJ* 2021; 372 :n71 doi:10.1136/bmj.n71