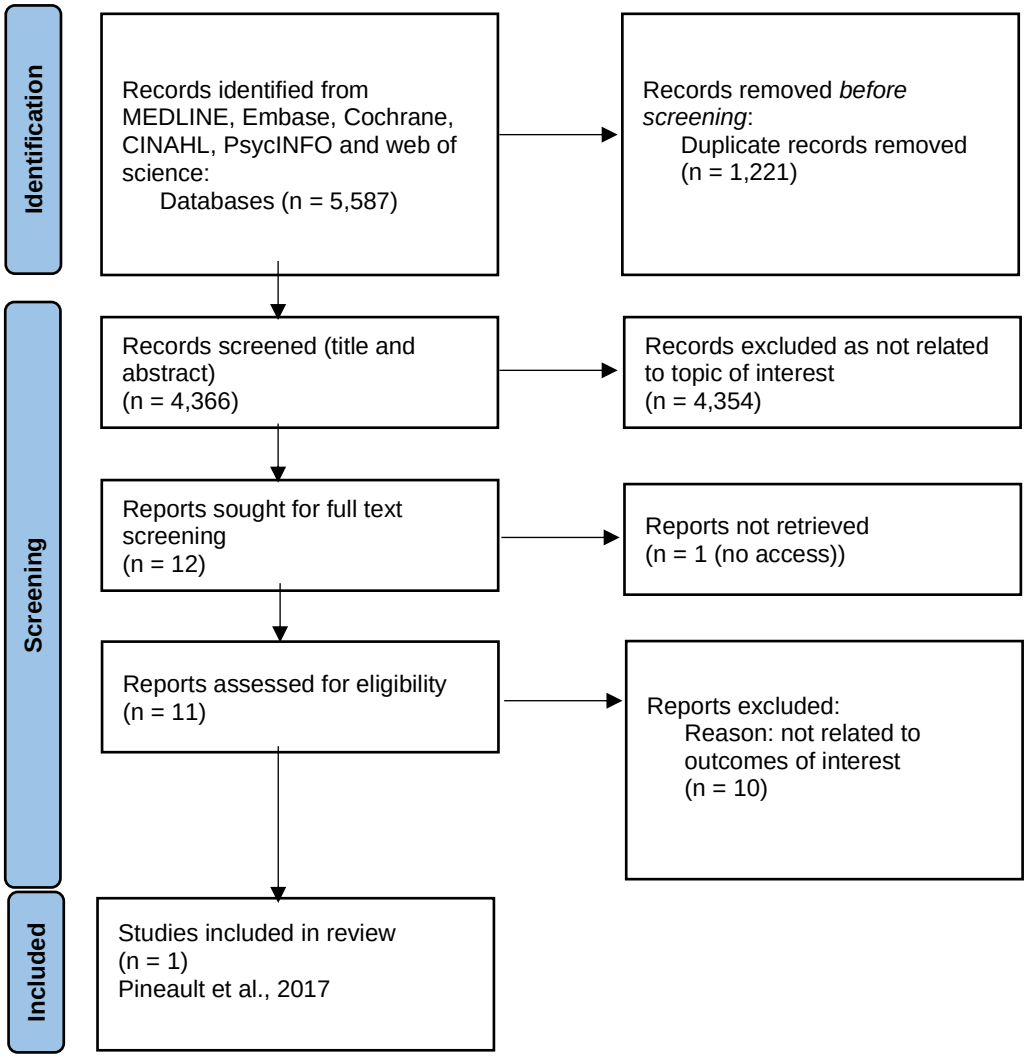
Supplementary material: Effect of GP teams and climate on staff and patient outcomes

Figure S1. PRISMA Diagram and Search Strategies for Search One: December 2021



Box S1. Search Strings

aOvid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions(R) <1946 to December 15, 2021>

1 *Primary Health Care/

2 *Family Practice/ or *General Practice/

3 "primary care".tw.

4 "general practice".tw.

5 *General Practitioners/

6 *Physicians, Family/ or family doctor*.tw.

7 1 or 2 or 3 or 4 or 5 or 6

8 *Health Workforce/

9 Medical Staff/

10 *Nursing Staff/

11 (workforce adj2 (role* or model* or composition* or structure)).tw.

12 skill mix.mp. or "Personnel Staffing and Scheduling"/

13 (team composition or staff composition or workforce composition).tw.

14 staff mix*.mp.

15 team mix*.tw.

16 (interprofessional team* or inter-professional team*).tw.

17 (interdisciplinary team* or inter-disciplinary team*).tw.

18 (multidisciplinary team* or multi-disciplinary team*).tw.

19 (interprofessional work* or inter-professional work*).tw.

20 (interdisciplinary work* or inter-disciplinary work*).tw.

21 multidisciplinary work*.mp. or multi-disciplinary work*.tw.

22 *Patient Care Team/

23 (care coordination or care co-ordination).tw.

24 ((collaboration or collaborative or collaborat*) adj2 (work* or team*)).tw.

25 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23

26 7 and 25

27 limit 26 to (english language and yr="2012 -Current")

28 LMIC.m_titl.

29 (Low- and Middle-Income Countries).m_titl.

30 exp Asia/ or exp Africa/ or exp South America/ or exp United States/

31 28 or 29 or 30

32 27 not 31

33 limit 32 to humans

Embase 1947-Present, updated daily

1 *Primary Health Care/

2 "Family Practice".tw. or *General Practice/

3 "primary care".tw.

4 "general practice".tw.

5 *General Practitioner/

6 (family physician* or family doctor*).tw.

7 1 or 2 or 3 or 4 or 5 or 6

8 *Health Workforce/

9 Medical Staff/

10 *Nursing Staff/

11 (workforce adj2 (role* or model* or composition* or structure)).tw.

12 (skill mix or "Personnel Staffing and Scheduling").mp.

13 (team composition or staff composition or workforce composition).tw.

14 staff mix*.mp.

15 team mix*.tw.

16 (interprofessional team* or inter-professional team*).tw.

17 (interdisciplinary team* or inter-disciplinary team*).tw.

18 (multidisciplinary team* or multi-disciplinary team*).tw.

19 (interprofessional work* or inter-professional work*).tw.

20 (interdisciplinary work* or inter-disciplinary work*).tw.

21 multidisciplinary work*.mp. or multi-disciplinary work*.tw.

22 "Patient Care Team".tw.

23 (care coordination or care co-ordination).tw.

24 ((collaboration or collaborative or collaborat*) adj2 (work* or team*)).tw.

25 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23

26 7 and 25

27 limit 26 to (english language and yr="2015 -Current")

28 LMIC.m_titl.

29 (Low- and Middle-Income Countries).m_titl.

30 exp Asia/ or exp Africa/ or exp South America/ or exp United States/

31 28 or 29 or 30

32 27 not 31

33 limit 32 to human

34 limit 33 to exclude medline journals

Cochrane CENTRAL issue 12 of 12, December 2021

#1 MeSH descriptor: [Primary Health Care] this term only

#2 MeSH descriptor: [Family Practice] this term only

#3 MeSH descriptor: [General Practice] this term only

#4 (primary NEXT care or general NEXT practice):ti,ab,kw

#5 MeSH descriptor: [General Practitioners] this term only

#6 MeSH descriptor: [Physicians, Family] this term only

#7 (family NEXT doctor*):ti,ab,kw

#8 #91 or #92 or #93 or #94 or #95 or #96 or #97

#9 MeSH descriptor: [Health Workforce] this term only

#10 MeSH descriptor: [Health Personnel] this term only

#11 MeSH descriptor: [Medical Staff] this term only

#12 MeSH descriptor: [Nursing Staff] this term only

#13 workforce NEXT (role* or model* or composition* or structure)

#14 (skill mix*):ti,ab,kw

#15 MeSH descriptor: [Personnel Staffing and Scheduling] explode all trees

#16 (team composition or staff composition or workforce composition)

#17 (staff NEAR mix*) or (team NEAR mix*)

#18 interprofessional NEAR (team or work*)

#19 interdisciplinary NEAR (team or work*)

#20 multidisciplinary NEAR (team or work*)

#21 MeSH descriptor: [Patient Care Team] this term only

#23 (care coordination or care co-ordination)

#24 (collaboration or collaborative or collaborat*) NEAR (work* or team*)

#25 #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23

#26 #8 and #25

#27 MeSH descriptor: [Africa] explode all trees

#28 MeSH descriptor: [Asia] explode all trees

#29 MeSH descriptor: [South America] explode all trees

#30 MeSH descriptor: [United States] explode all trees

#31 (LMIC or (low and middle income countries)):ti,ab,kw

#32 #27 or #28 or #29 or #30 or #31

#33 #115 NOT #121

Limit to CENTRAL, from 2015

Interface - EBSCOhost Research Databases
Database – CINAHL

Database - APA PsycInfo

Limiters - Published Date: 20150101-20221231

#	**Query**
S16	S10 NOT S12
S15	S10 NOT S12
S14	S10 NOT S12
S13	S10 NOT S12
S12	S10 AND S11
S11	MW africa OR MW asia OR MW (south america or latin america or central america) OR TX (united states or america or usa or u.s)
S10	S3 AND S9
S9	S4 OR S5 OR S6 OR S7 OR S8
S8	MJ patient care team OR TX care coordination OR TX ((collaboration or collaborative or collaborat*) N1 (work* or team*))
S7	TX (interprofessional N1 (team or work*)) OR TX (interdisciplinary N1 (team or work*)) OR TX (multidisciplinary N1 (team or work*))
S6	TX (skill mix or staffing mix) OR TX ((team composition or staff composition or workforce composition) OR TX team mix*
S5	TX workforce N2 (role* or model* or composition* or structure)
S4	MJ health workforce OR MJ medical staff OR MJ nursing staff OR MJ (personnel staffing and scheduling)
S3	S1 OR S2
S2	TI (general practitioner or gp or family doctor or primary care or physician) OR AB (general practice or gp or doctor or primary care)
S1	MJ primary health care OR MJ family practice OR MJ general practice

Web of Science Editions = Social Science Citation index

Search

#10 #8 AND #1 and **2021** or **2020** or **2019** or **2018** or **2017** or **2016** or **2015** or **2014** or **2013** or **2012** (Publication Years) and **ENGLAND** or **CANADA** or **NETHERLANDS** or **GERMANY** or **SWEDEN** or **SWITZERLAND** or **SPAIN** or **IRELAND** or **BELGIUM** or **SCOTLAND** or **FRANCE** or **DENMARK** or **NORWAY** or **GREECE** or **PORTUGAL** or **AUSTRIA** or **WALES** or **CZECH REPUBLIC** or **NORTH IRELAND** or **FINLAND** or **POLAND** or **SLOVENIA** or **BOSNIA HERCEG** or **HUNGARY** (Countries/Regions)

#9 #8 AND #1 and **2021** or **2020** or **2019** or **2018** or **2017** or **2016** or **2015** (Publication Years)

#8 #2 OR #3 OR #4 OR #5 OR #6 OR #7

#7 "multidisciplinary team" or "multidisciplinary work" (Topic)

#6 interdisciplinary and (team or work*) (Topic)

#5 interprofessional and (team or work*) (Topic)

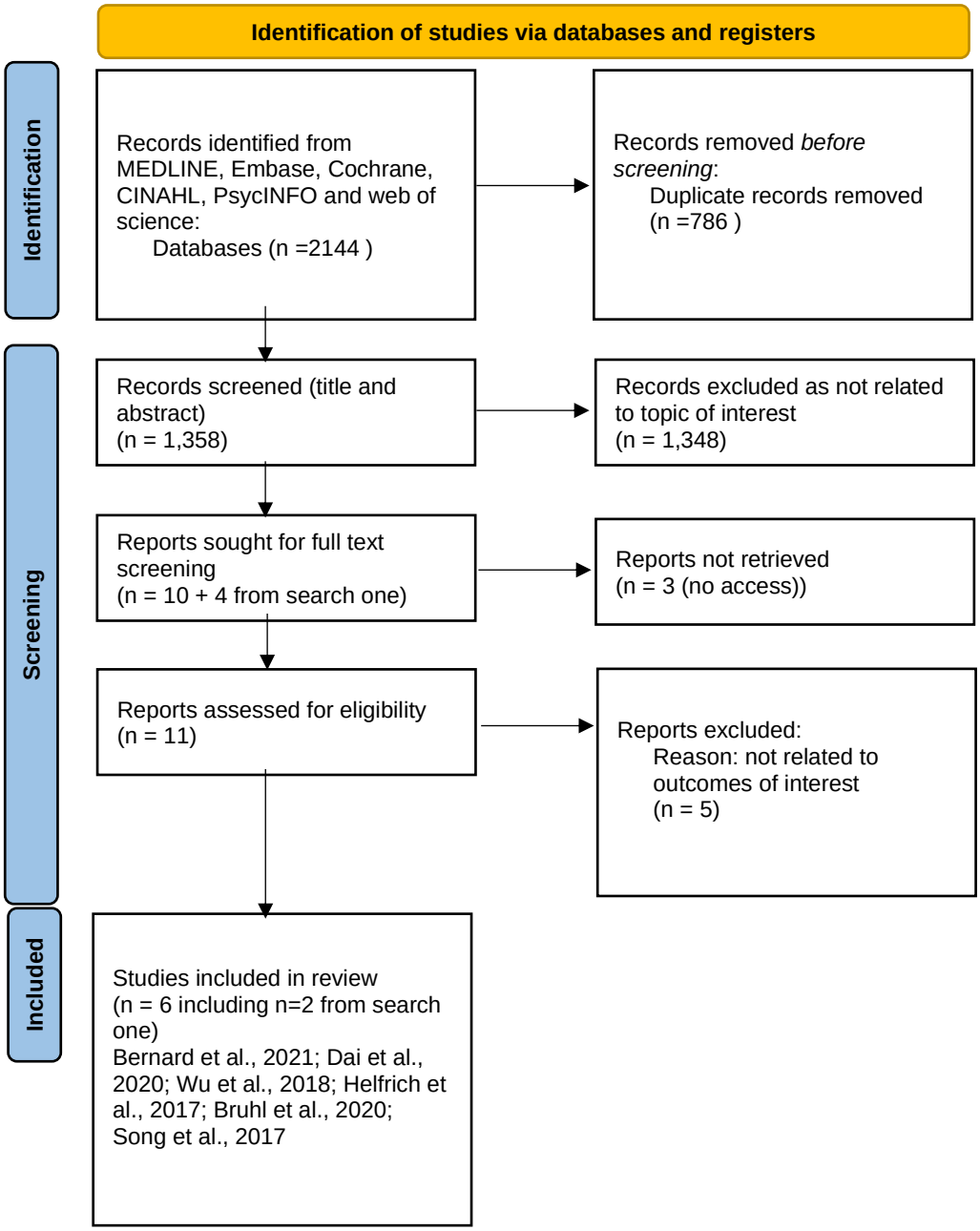
#4"team composition" or "staff composition" or "workforce composition" (Topic)

#3 "skill mix*" (Topic)

#2 workforce and (role* or model* or composition* or structure) (Topic)

#1 "primary health care" or "general practice" or "General Practitioner" or "family physician*" or "family doctor*" (Topic)

Figure S2. PRISMA Diagram and Search Strategies for Search two: January 2022



Box S2. Search Strings

Cochrane CENTRAL issue 1 of 12, January 2022

#91 MeSH descriptor: [Primary Health Care] this term only

#92 MeSH descriptor: [Family Practice] this term only

#93 MeSH descriptor: [General Practice] this term only

#94 (primary NEXT care or general NEXT practice):ti,ab,kw

#95 MeSH descriptor: [General Practitioners] this term only

#96 MeSH descriptor: [Physicians, Family] this term only

#97 (family NEXT doctor*):ti,ab,kw

#98 #91 or #92 or #93 or #94 or #95 or #96 or #97

#99 MeSH descriptor: [Health Workforce] this term only

#100 MeSH descriptor: [Health Personnel] this term only

#101 MeSH descriptor: [Medical Staff] this term only

#102 MeSH descriptor: [Nursing Staff] this term only

#103 workforce NEXT (role* or model* or composition* or structure)

#104 (skill mix*):ti,ab,kw

#105 MeSH descriptor: [Personnel Staffing and Scheduling] explode all trees

#106 (team composition or staff composition or workforce composition)

#107 (staff NEAR mix*) or (team NEAR mix*)

#108 interprofessional NEAR (team or work*)

#109 interdisciplinary NEAR (team or work*)

#110 multidisciplinary NEAR (team or work*)

#111 MeSH descriptor: [Patient Care Team] this term only

#112 (care coordination or care co-ordination)

#113 (collaboration or collaborative or collaborat*) NEAR (work* or team*)

#114 #99 or #100 or #101 or #102 or #103 or #104 or #105 or #106 or #107 or #108 or #109 or #110 or #111 or #112 or #113

#115 #114 and #98

#119 MeSH descriptor: [United States] explode all trees

#167 united states

#168 USA

#169 #167 or #168

#204 #119 or #169

#205 #204 and #115

Ovid MEDLINE(R) and In-Process, In-Data-Review & Other Non-Indexed Citations <1946 to January 20, 2022>

1 *Primary Health Care/

2 *Family Practice/ or *General Practice/

3 "primary care".tw.

4 "general practice".tw.

5 *General Practitioners/

6 *Physicians, Family/ or family doctor*.tw.

7 1 or 2 or 3 or 4 or 5 or 6

8 *Health Workforce/

9 Medical Staff/

10 *Nursing Staff/

11 (workforce adj2 (role* or model* or composition* or structure)).tw.

12 skill mix.mp. or "Personnel Staffing and Scheduling"/

13 (team composition or staff composition or workforce composition).tw.

14 staff mix*.mp.

15 team mix*.tw.

16 (interprofessional team* or inter-professional team*).tw.

17 (interdisciplinary team* or inter-disciplinary team*).tw.

18 (multidisciplinary team* or multi-disciplinary team*).tw.

19 (interprofessional work* or inter-professional work*).tw.

20 (interdisciplinary work* or inter-disciplinary work*).tw.

21 multidisciplinary work*.mp. or multi-disciplinary work*.tw.

22 *Patient Care Team/

23 (care coordination or care co-ordination).tw.

24 ((collaboration or collaborative or collaborat*) adj2 (work* or team*)).tw.

25 exp United States/

26 (USA or "united states").tw.

27 25 or 26

28 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24

29 7 and 28

30 27 and 29

31 limit 30 to (english language and yr="2015 -Current")

Embase <1996 to 2022 Week 02>

1 *Primary Health Care/

2 "Family Practice".mp. or *General Practice/

3 "primary care".tw.

4 "general practice".tw.

5 *General Practitioner/

6 "family doctor*".tw.

7 1 or 2 or 3 or 4 or 5 or 6

8 *Health Workforce/

9 Medical Staff/

10 *Nursing Staff/

11 (workforce adj2 (role* or model* or composition* or structure)).tw.

12 skill mix.mp.

13 (team composition or staff composition or workforce composition).tw.

14 staff mix*.mp.

15 team mix*.tw.

16 (interprofessional team* or inter-professional team*).tw.

17 (interdisciplinary team* or inter-disciplinary team*).tw.

18 (multidisciplinary team* or multi-disciplinary team*).tw.

19 (interprofessional work* or inter-professional work*).tw.

20 (interdisciplinary work* or inter-disciplinary work*).tw.

21 multidisciplinary work*.mp. or multi-disciplinary work*.tw.

22 (care coordination or care co-ordination).tw.

23 ((collaboration or collaborative or collaborat*) adj2 (work* or team*)).tw.

24 exp United States/

25 (USA or "united states").tw.

26 24 or 25

27 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23

28 7 and 26 and 27

29 limit 28 to (human and english language and yr="2015 -Current")

Interface - EBSCOhost Research Databases
Database - CINAHL

#	Query
S17	S11 AND S14
S16	S11 AND S14
S15	S11 AND S14
S14	S12 OR S13
S13	MJ united states
S12	TI (united states or usa or u.s) OR AB (united states or usa or u.s)
S11	S3 AND S9
S10	S3 AND S9
S9	S4 OR S5 OR S6 OR S7 OR S8
S8	MJ patient care team OR TX care coordination OR TX ((collaboration or collaborative or collaborat*) N1 (work* or team*))
S7	TX ((interprofessional N1 (team or work*)) OR TX (interdisciplinary N1 (team or work*)) OR TX (multidisciplinary N1 (team or work*))
S6	TX (((team composition or staff composition or workforce composition)) OR TX team mix* OR TX ((skill mix or staffing mix))
S5	TX workforce N2 (role* or model* or composition* or structure)
S4	MJ health workforce OR MJ medical staff OR MJ nursing staff OR MJ (personnel staffing and scheduling)
S3	S1 OR S2
S2	TI ((general practitioner or gp or family doctor or primary care or physician)) OR AB ((general practitioner or gp or family doctor or primary care or physician))
S1	MJ primary health care OR MJ family practice OR MJ general practice

Web of Science Core Collection – Social Science Citation index

#6 #4 AND #5

#5 united states or USA (Topic)

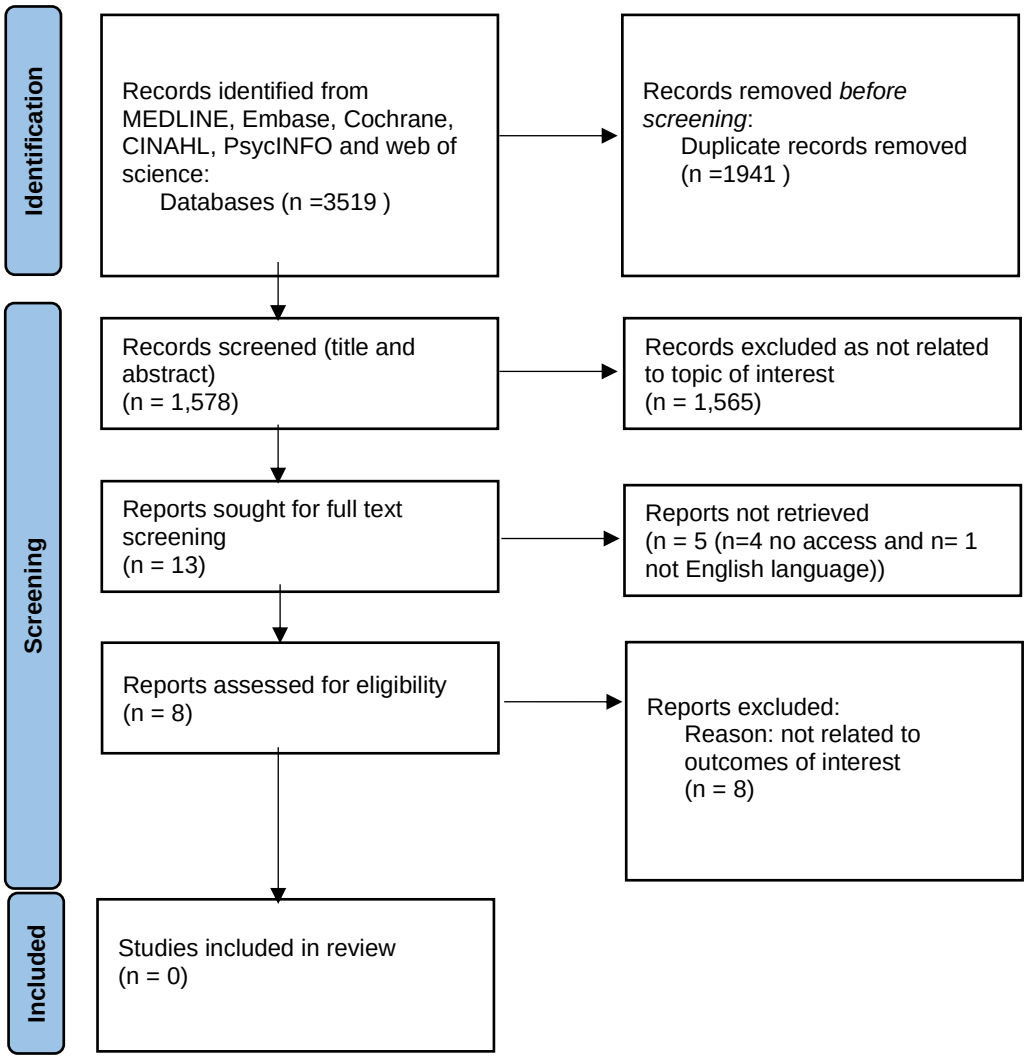
#4 #3 and **2022** or **2021** or **2020** or **2019** or **2018** or **2017** or **2016** or **2015** (Publication Years)

#3 #1 AND #2

2 #workforce and (role* or model* or composition* or structure) (Topic) or **skill mix*** (Topic) or **"team composition" or "staff composition" or "workforce composition"** (Topic) or **interprofessional and (team or work*)** (Topic) or **interdisciplinary and (team or work*)** (Topic) or **multisciplinary and (team or work*)** (Topic)

#1 "primary health care" or "general practice" or "General Practitioner" or "family physician*" or "family doctor*" (Topic)

Figure S3. PRISMA Diagram and Search Strategies for Search three: February 2022



Box S3. Search Strings

Ovid MEDLINE(R) and In-Process, In-Data-Review & Other Non-Indexed Citations <1946 to January 31, 2022>

1 (Design or characteristics or structure or ratio or size or composition or climate).tw.

2 teams.tw.

3 1 and 2

4 "general practice".tw.

5 "family practice".tw.

6 "primary care".tw.

7 4 or 5 or 6

8 3 and 7

9 Developing Countries/ or LMIC.mp.

10 (low and middle income countries).mp.

11 9 or 10

12 8 not 11

13 limit 12 to yr="2015 -Current"

Embase <1996 to 2022 Week 04>

1 (Design or characteristics or structure or ratio or size or composition or climate).tw.

2 teams.tw.

3 1 and 2

4 (General practice or family practice or primary care).tw.

5 3 and 4

6 developing countries.mp. or developing country/

7 "low and middle income countr*".tw. or LMIC.mp.

8 6 or 7

9 5 not 8

10 limit 9 to yr="2015 -Current"

11 limit 10 to exclude medline journals

Interface - EBSCOhost Research Databases

Database – CINAHL

Database - APA PsycInfo

Limiters - Published Date: 20150101-20221231

#	Query
S8	S6 NOT S7
S7	TI (developing countries or developing nations or third world or low income countries) OR AB (developing countries or developing nations or third world or low income countries) OR TI lmic OR AB LMIC
S6	S3 AND S4
S5	S3 AND S4
S4	TI (General practice or family practice or primary care) OR AB (General practice or family practice or primary care)
S3	S1 AND S2
S2	TI (Design or characteristics or structure or ratio or size or composition or climate) OR AB (Design or characteristics or structure or ratio or size or composition or climate)
S1	TI teams OR AB teams

Web of Science Core Collection

Editions = SSCI

Search

(TS=(teams) AND TS=(Design or characteristics or structure or ratio or size or composition or climate) AND TI=(General practice or family practice or primary care)) AND (PY==("2022" OR "2021" OR "2019" OR "2018" OR "2017" OR "2016" OR "2015"))

Cochrane Central Register of Controlled Trials

Issue 2 of 12, February 2022

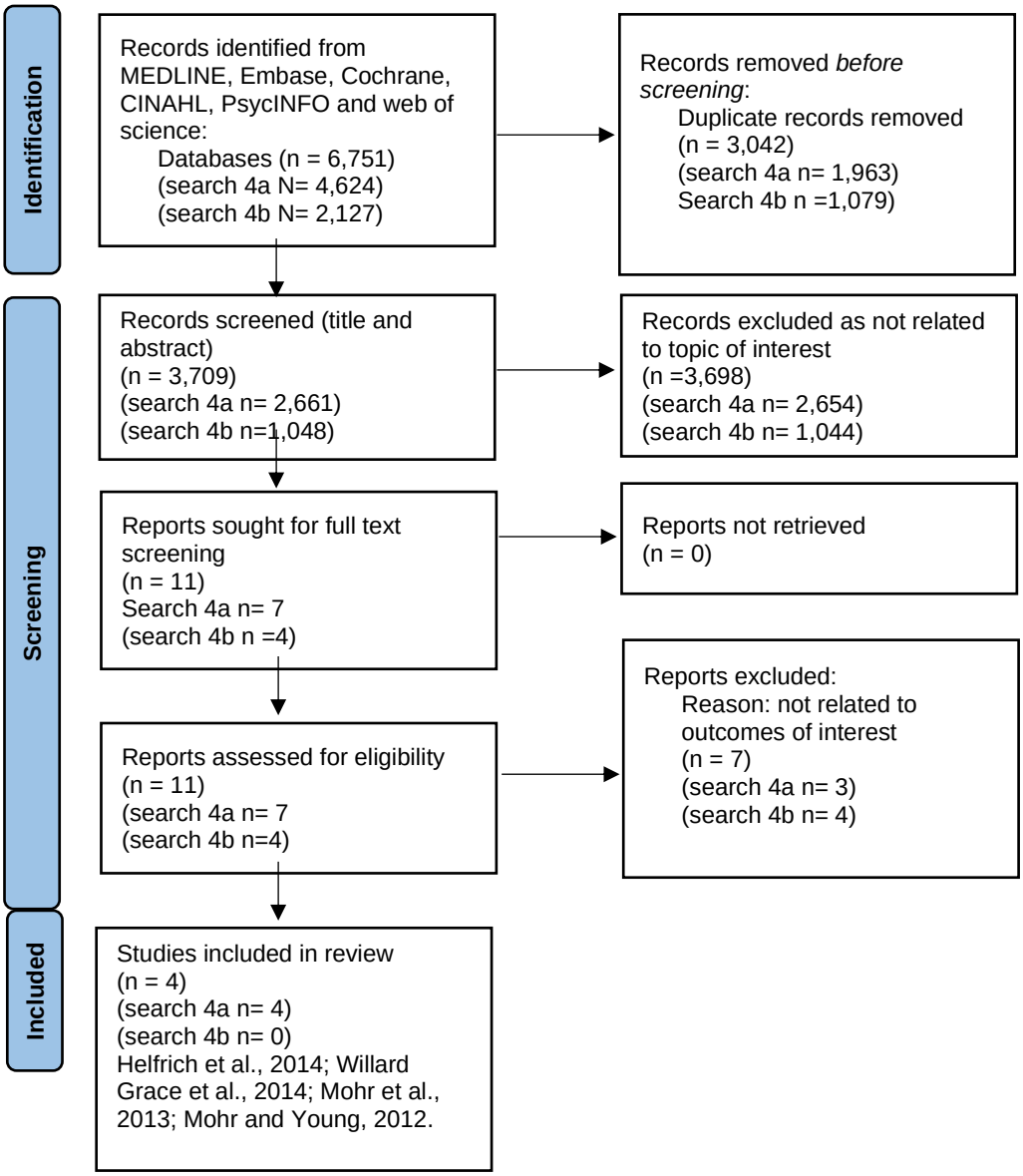
#1 (Design or characteristics or structure or ratio or size or composition or climate):ti,ab,kw

#2 (teams):ti,ab,kw

#3 "general practice" or "family practice" or "primary care"

#4 #1 and #2 and #3

Figure S4. PRISMA Diagram and Search Strategies for Search four: March 2022



Box S4. Search Strings

Ovid MEDLINE(R) and In-Process, In-Data-Review & Other Non-Indexed Citations <1946 to January 31, 2022>

1 (Design or characteristics or structure or ratio or size or composition or climate).tw.

2 teams.tw.

3 1 and 2

4 "general practice".tw.

5 "family practice".tw.

6 "primary care".tw.

7 4 or 5 or 6

8 3 and 7

9 Developing Countries/ or LMIC.mp.

10 (low and middle income countries).mp.

11 9 or 10

12 8 not 11

13 limit 12 to yr="2012 -Current"

Embase <1996 to 2022 Week 04>

1 (Design or characteristics or structure or ratio or size or composition or climate).tw.

2 teams.tw.

3 1 and 2

4 (General practice or family practice or primary care).tw.

5 3 and 4

6 developing countries.mp. or developing country/

7 "low and middle income countr*".tw. or LMIC.mp.

8 6 or 7

9 5 not 8

10 limit 9 to yr="2012 -Current"

11 limit 10 to exclude medline journals

Interface - EBSCOhost Research Databases

Database – CINAHL

Database - APA PsycInfo

Limiters - Published Date: 20120101-20221231

#	Query
S8	S6 NOT S7
S7	TI (developing countries or developing nations or third world or low income countries) OR AB (developing countries or developing nations or third world or low income countries) OR TI lmic OR AB LMIC
S6	S3 AND S4
S5	S3 AND S4
S4	TI (General practice or family practice or primary care) OR AB (General practice or family practice or primary care)
S3	S1 AND S2
S2	TI (Design or characteristics or structure or ratio or size or composition or climate) OR AB (Design or characteristics or structure or ratio or size or composition or climate)
S1	TI teams OR AB teams

Web of Science Core Collection

Editions = SSCI

Search

(TS=(teams) AND TS=(Design or characteristics or structure or ratio or size or composition or climate) AND TI=(General practice or family practice or primary care)) AND (PY==("2022" OR "2021" OR "2019" OR "2018" OR "2017" OR "2016" OR "2015" OR “2014” OR “2013” OR “2012))

Cochrane Central Register of Controlled Trials

Issue 2 of 12, February 2022

#1 (Design or characteristics or structure or ratio or size or composition or climate):ti,ab,kw

#2 (teams):ti,ab,kw

#3 "general practice" or "family practice" or "primary care"

#4 #1 and #2 and

Table S1. Study characteristics and data extraction

Table of data extracted from included studies (Bruhl et al 2020)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Bruhl, EJ, MacLaughlin, KL, Allen, SV, Horn, JL., Angstman, KB., Garrison, G., Maxson, JA, McCauley, DK, Lampman, MA, Thacher, TD. *Mayo Clinic Proceedings: Innovations, Quality and Outcomes, 2020*	Association of Primary Care Team Composition and Clinician Burnout in a Primary Care Practice Network	How do varying staff ratios of Nurse Practitioners (NPs) and Physicians Assistants (PAs) to family physicians (FPs) in care teams affect burnout, adjusting for clinical and team level factors?	One integrated care system in 59 midwestern communities in southern Minnesota, western Wisconsin, and northern Iowa, USA	Survey (emailed) 2018 to 420 primary care clinicians (253 family physicians, 167 NPs/PAs, 256 female) in 110 care teams covering 419,567 patients. Response rate 217/420, 51.7%, (123 physicians, 143 female). Burnout measured by (validated) single emotional exhaustion item from the Maslach Burnout Inventory. Administrative data 2017: including: profession, location, sex, FTE, time in practice, panel size and complexity; number of professionals in team and % of FTE that is physician. Quantitative/ multivariable linear regression modelling	% of team FTE that is physician. Median team size is 4 clinicians, each has defined panel of patients; physicians take more complex, NP, PA have smaller panels. Other team members (not surveyed) include nurses, medical assistants, social workers, pharmacists, behavioural health, administrative. Practitioner: - Type: FP vs NP/PA - Gender - Years in practice	-	Burnout (emotional exhaustion) – self report: *I feel burned out from my work*. 184/217 (84.8%) reported burnout symptoms (i.e. score >=4, once a week, on scale 0, never to 6, every day). Mean (SD) 4.1 (1.4); median 4; similar for physicians, NPs, PAs. Higher emotional exhaustion associated with lower % of care team FTE that was physician (all clinician groups) - female gender (positive) Burnout not associated with profession, panel size, panel complexity, clinician FTE, years in practice, clinic location.	-	Association not causal. Single item burnout measure. Combined NPs and PAs in one role which may disguise differences between these roles.

Table of data extracted from included studies (Bernard et al 2021)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Bernard, ME, Laabs, SB, Nagaraju, D, Allen, SV, Halasy, MP, Rushlow, DR, Garrison, GM, Maxson, JA, Matthews, MR, Sobolik, GJ, Lampman, MA, Foss, RM, Rosas, SL, Thacher, TD. *Mayo Clinic Proceedings: Innovations, Quality and Outcomes, 2021*	Clinician Care Team Composition and Health Care Utilization	To test if utilisation (emergency department [ED] visits, hospital admissions, and 30 day re-admissions) are associated with: - the proportion of physician time on primary care team - clinician and care team characteristics are associated with utilization Control for clinician and care-team level characteristics.	As Bruhl 2020	Administrative data 2017, as Bruhl 2020 Administrative data also covered, for each practitioner panel: - Utilisation (ED visits and hospital admissions/ readmissions) - Number of 'very good' ratings from patient survey across 10 questions (scored on 5 point scale with 'very good' being best). Quantitative/ multiple variable linear regression modelling	% of team FTE that is physician. As Bruhl 2020 Practitioner: - Type: FP vs NP/PA - Gender - Years in practice	-	-	Lower utilisation (all 3 measures) predicted by: - Less panel complexity/ comorbidity - More years in clinical practice (explained by greater clinical acumen and higher risk tolerance) ED visits lower in physician panels (vs NP, PA panels) 30 day re-admissions lower for female practitioners (possibly as more patient centred). No relationship between physician FTE on care teams and utilisation.	As Bruhl 2020 Also other professionals not included (e.g. social workers) who may affect utilisation The ideal team composition and physician to NP/PA ratios for reducing utilization is uncertain and may vary. Female practitioners – known for following EBM and more patient centred care

Table of data extracted from included studies (Dai et al 2020)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Dai, M, Willard-Grace, R, Knox, M, Larson, SA, Magill, MK, Grumbach, K, Peterson, Lars E. *Journal of the American Board of Family Medicine: JABFM, 2020*	Team Configuration, Efficiency, and Family Physician Burnout	To (i) characterise common team configurations, (ii) determine if some configuration are more efficient, (iii) assess if the odds of burnout are associated with perceived efficiency	N=2575 family physicians (FPs) who registered for the American Board of Family Medicine (ABFM) Family Medicine Certification Examination in 2017 and 2018, USA	Survey to 2,575 FPs. Burnout measured by (validated) single emotional exhaustion item from Maslach Burnout Inventory. Also covered: - team configuration - work environment - perceived teamwork efficiency - background details e.g. size and type of practice, deprivation, rurality. Quantitative/ logistic multivariable regression modelling, controlling for physician age and practice covariates.	N=800 different team configurations mapped to 3 groups (FP + 1, 2 or 3 others): - + MA or N (22%) - + MA or N + NP or PA or specialist (40%) - + MA or N + NP or PA + specialist (38%) MA: Medical Assistant; N: Nurse; NP: Nurse Practitioner; PA: Physician Assistant Specialists: midwife, psychiatric nurse, psychiatrist, social worker, pharmacist, occupational/physical therapist	Perceived teamwork efficiency: *The degree to which my team works efficiently together* (*poor/ marginal, 7%; satisfactory/ good, 80%; optimal, 14%)* *W*ork environment: *satisfaction, control over workload, value aligned with practice leaders:* generally found better in more expansive teams. {35% of physicians report burnout and satisfaction]	Burnout (emotional exhaustion) – overall 41% report*: I feel burned out from my work* >=once per week; not associated with team configuration; more common in <60 years, female, non-Asian, non Hispanic. Burnout affected by: - work environment (higher if not satisfied, no control over workload, values not aligned with practice leaders - perceived team efficiency: No difference between team configurations. After adjust for practice and physician factors, lower odds of burnout if optimal (vs poor) perceived efficiency - holds for all team configurations (46% / 60% lower odds for FP+2 and FP+3 teams; strong trend in FP+1 teams). Skill shortages possible catalyst to burnout.	-	Association not causal. Single item burnout measure Perceptions of teamwork efficiency, single item, self reported and lacked data to distinguish good and optimal. Limited team compositions.

Table of data extracted from included studies (Willard Grace et al 2014)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Willard-Grace, R, Hessler, D, Rogers, E, Dube, K, Bodenheimer, T, Grumbach, K. *Journal of the American Board of Family Medicine: JABFM 2014*	Team structure and culture are associated with lower burnout in primary care	To explore the relationship between team structure, team functioning and emotional exhaustion of clinicians and staff in primary care practices in the US	10 (of 11) clinics in a county administered health care system serving publicly insured and uninsured, and 6 (of 6) university-run primary care clinics in San Francisco, USA.	Survey 2012 (web and paper) to primary care staff. Responses: 231/ 420 (55%) clinicians, 50% attending physicians, 13% Nurse Practitioners or Physician Assistants, 37% residents (trainee physicians). 280/428 (65%) other staff. Lower response from non teaching teams Self-completed items covered: - Team structure – consistency of working in same teamlet and same physician/ assistant pairings, - Team culture, - Emotional exhaustion - Participant characteristics (hours and shifts worked, role, use of e-records). Emotional exhaustion measured by 5 item emotional exhaustion domain of (validated) Maslach Burnout Inventory Quantitative/ regression modelling, separate for clinicians and staff. General Estimating Equation multivariate models to account for clustering by clinic.	-	Team staffing/ structure 83% of clinicians worked part time; most staff were full time. 61% worked consistently in the same team; 72% worked with the same group of MAs, 18% always worked with same MA. Team culture defined as a sense of effective team functioning, assessed by adapted version of the Team Climate Inventory, 7 items, 10 point Likert scale (scored 1 to 10, negative statements reverse scored: - Group works well together - All in it together attitude - Feel unprepared for tasks - Skills not fully used - Hard to get things to change - Can rely on others - Time is spent on how to improve things Mean scores: clinician 6.17, staff 6.9	Emotional exhaustion high if mean >=3.2 (range 0 to 6, worst) or >=16 on sum score. 60% of clinicians, 43% of staff had high exhaustion (residents highest, 69%). *Clinicians*: More exhaustion if: - More half days worked - Transitioning to e-record - Being a resident *Clinicians*: Less exhaustion if: - Tighter team structure - Better team culture *Staff:* More exhaustion if: - Full time work - Longer tenure *Staff*: Less exhaustion if: - Better team culture Team structure and culture interact to predict exhaustion. Better team culture associated with less exhaustion. Team structure alone not enough if culture poor. 'Culture trumps structure'.	-	Associations, not causal. Narrow definition of team structure, i.e. team consistency. Definition of culture is unclear, uses Team Climate Inventory so potential confusion with team climate. Self reported data which may have influenced results Generalisability may be limited because of settings.

Table of data extracted from included studies (Mohr & Young 2012)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Mohr, DC, Young, GJ. *Medical Care, 2012*	Slack resources and quality of primary care	To examine the effect of organisational slack in resources (staffing) on quality of care.	568 clinics Veteran's Healthcare Administration USA	Administrative data, 6 months in 2006-7, including routine patient surveys: ● Prevention services - Influenza vaccinations (28,059 records) ● Clinic operations - continuity of care (i.e. seeing same provider, yes/no) (49,924 records) ● Patient experience / overall quality of care, 5 point scale (54,518 records) Covariates: ● Workforce: ratio of nurse to support staff, physician vs non-physician provider ratio, number of providers and FTEs ● Team functioning ● Patients: age, sex, marital status, visit frequency, health related quality of life (SF12, PCS, MCS) ● Clinic: type, maturity, rurality, awards Quantitative/ multilevel regression modelling (linear and quadratic). A curvilinear relationship between slack and quality of care hypothesised. Adjust for patient clustering, patient and clinic level variables.	-	Workload/ capacity: Two organisational slack variables:: ● Panel size / clinic capacity (vs VHA recommended 1200 patients/ physician provider, 900 patients/ non physician provider, i.e. nurse practitioner, physician assistant) ● Support staff per provider (vs VHA recommended 2 support staff/ provider) Slack expressed as staffing below, at or above recommendations. Group orientated team culture used for team functioning taken from VA all employee survey (no further details).	-	Care quality: ● Influenza vaccinations- significantly associated with both slack variables ● Continuity of care with same provider – associated with support staff / provider slack ● Overall quality of care (last 2 months) associated with panel size / clinic capacity slack. Results support curvilinear relation between slack in staffing and care quality. Insufficient resources / staff below recommended levels is threat to performance. Staff cannot meet demand and patients experience lower quality of care. Moderate slack may be beneficial, but additional staff beyond recommendations quickly exhibit diminishing returns / don't add extra benefit due to coordination problems and staff motivation ('social loafing'). Better group oriented organisational culture significantly contributed to continuity of care and overall quality of care	Associations, not causal. Findings support validity of VHA staffing guidelines but may not be generalisable beyond VHA. Nuances in staffing were not considered, including turnover, job rotations and vacancies. Clinic scores were aggregated and thus do not reflect variation.

Table of data extracted from included studies (Mohr et al 2013)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Mohr, DC, Benzer, JK, Young, GJ. *Medical Care, 2013*	Provider workload and quality of care in primary care settings: moderating role of relational climate	To explore the relationship between workload and patients' quality of care, and whether relational climate moderates this relationship.	222 clinics Veteran's Healthcare Administration USA	Administrative data, 2006-7, 12 months • Workload: panel size adjusted for clinic staffing (physicians and non- physician providers, support staff) and patient intensity (from diagnoses and visit frequency), to estimate clinic capacity • Patient experience survey (43,966 responses) to 3 quality of care items related to clinic visits • Relational climate, 3 items from VA all employee survey (71% response) (33 responses / clinic) Covariates: - Patients: age, sex, marital status, visit frequency, health related quality of life (SF12, PCS, MCS) - Clinic: type, maturity, rurality, awards Quantitative/ multilevel regression modelling: 1. Effect of workload on quality of care including patient level and clinic level factors 2. Add relational climate and interaction term	-	Workload / clinic capacity – whether panel size exceeds >1, equals =1 or falls short <1 of VA staffing recommendations (see Mohr 2012) after adjusting for support staff, patient intensity and number of examination rooms Relational climate / cohesion of the work group, assessed through perceptions of: • Spirit of cooperation • Differences respected and valued • Disputes and conflict resolved fairly	-	Care quality/ patient experience: • Complaints (yes/no) • Enough provider time available during visit (yes/no) • Overall quality of visit, 5 point scale. Workload is significantly associated with quality of care in all three models (positively with complaints, negatively with patients reporting adequate time in consultations, and with overall quality of care). Interaction term between workload and relational climate significant in complaints and adequate provider time models, marginally significant for overall quality of care. Relational climate can mitigate the effects of high workload; it becomes more influential as workload increases. Quality of care ratings are not affected by workload if relational climate is good. Workload negatively affects quality of care if relational climate is poor. Employing more staff may have diminishing returns without good team working.	Associations not causal. Findings may have limited generalisability beyond the VHA. Clinic data are aggregated which limits nuance in findings. .

Table of data extracted from included studies (Helfrich et al 2014)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Helfrich, CD, Dolan, ED, Simonetti, J, Reid, RJ, Joos, S Wakefield BJ, Schectman, G, Stark, R, Fihn, SD, Harvey, HB, Nelson, K. *Journal of General Internal Medicine , JGIM, 2014*	Elements of team-based care in a patient-centered medical home are associated with lower burnout among VA primary care employees	To explore the association between elements of team based care and burnout amongst primary care staff two years into implementing the Patient Aligned Care Team (PACT) programme. 4 roles in PACTs: - a primary care practitioner (PCP, i.e. physician /MD or Nurse Practitioner (NP) or Physician Assistant (PA)), - a nurse care manager, - a clinical associate (licensed nurse or medical assistant), - an administrative clerk.	Patient Aligned Care Teams (PACTs) in Veteran's Health Administration, USA	Survey, 2012, web based, to all staff at VHA sites in the US (19 sites). 4,819 surveys received in the 4 occupations across 626 clinics, (estimated 25% response). Burnout measured using the validated single item from the Physician Worklife study, 5 point ordinal scale. Also covered: - Team structure, - Team processes (functioning and delegation) - Team effectiveness - Length of tenure and supervisory responsibility Administrative data for clinic workload and capacity Quantitative/ logistic regression modelling, adjusting for clustering, respondent characteristics, clinic level workload	-	Team structure: - Respondent in 1 or >1 PACT - PACT fully staffed (PCP+3) or not - Daily huddles Team functioning: 4 items adapted from Survey of Organizational Attributes of Primary Care: - communicate about conflict, - participatory decision making, - stressful work environment, - history of successful change in the clinic PCP delegation in 3 tasks: - Patient care - Assessing patients - Responding to messages Team effectiveness: - Confidence/self-efficacy - If working at top of competency Team workload: Panel over capacity (>1200 patients /PCP), adjusted for clinical intensity	Burnout item - self report: 1. *I enjoy my work …* 2. *Occasionally under stress ….* 3. *Definitely burning out….* 4. *Symptoms of burnout won't go away….* 5. *Completely burned out and wonder if I can go on ….* 45.4% of PCPs, 31.7% of clinical assistants scored >=3, indicating signs of burnout. Lower rates of burnout when: - Team fully staffed (PCP+3) - Participatory decision making Higher rates of burnout, when: - Chaotic working environment/ employees feeling overwhelmed - Spending 25-50% of time doing work that could be done with less training - Being assigned to> 1 PACT - Longer tenure Team effectiveness not significant.	-	Associations not causal. Study explored VHA team – based care initiative so findings may not be generalisable, (note-organisational change has been associated with the high burnout (Beaulieu et all 2014). No defined sampling frame as survey distributed by clinic leads. Response rate estimated and low (25%). In sensitivity analysis: burnout measure compared to 3 emotional exhaustion items of the Maslach Burnout Inventory finding 78% sensitivity, 88% specificity for detecting burnout.

Table of data extracted from included studies (Helfrich et al 2017)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Helfrich, CD, Simonetti, JA, Clinton, WL., Wood, GB, Taylor, L, Schectman, G, Stark, R, Rubenstein, LV, Fihn, SD. Nelson, KM. *Journal of General Internal Medicine, JGIM, 2017*	The Association of Team-Specific Workload and Staffing with Odds of Burnout Among VA Primary Care Providers	To assess the association between burnout among primary care employees and team-specific staffing and workload, as well as among each of the four occupations that constitute the PACT team (see Helfrich 2014)	Patient Aligned Care Teams (PACTs) in Veteran's Health Administration, USA Not all teams are fully staffed	National VA primary care personnel survey 2014 [4,610 responses, 20.9%] for team staffing, backgrounds and burnout, measured using a validated single item from the Physician Worklife study, 5 point ordinal scale. Administrative data on team workload, clinic location. Quantitative/mixed effects logistic regression modelling, adjusting for team structure, workload and respondent characteristics (occupation, VA tenure and clinic); sensitivity analysis with propensity score mapping (PSM).	-	Team workload: - Panel over capacity (>1200 patients /PCP) - Patient appointments out of hours - High comorbidity in panel Team structure -3 items from survey: - On more than one team? - Team staffed at the recommended ratio (PCP+3)? - Staff change in last 12 months?	Burnout (as Helfrich 2014) overall 40.8% (49.2% PCPs, 32.0% clinical associates). In adjusted models, burnout (all professions) associated (additively) with: - Team not fully staffed - Turnover in team in last 12m - Patient panel overcapacity - [In >1 team – PSM only] Odds of burnout 58.6% if not fully staffed, had turnover and overcapacity (vs 28.5% fully staffed, no turnover, not overcapacity).	-	Associations, not causal. Response bias-lower response from administrative clerks, longer tenure and medical centres. Findings may not be generalisable: VA centres often have lower panel sizes, higher patient comorbidities, predominantly male patients, longer visit times and different salary structures.

Table of data extracted from included studies (Wu et al 2018)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Wu, FM, Rubenstein, LV, Yoon, J. *Health Care Management Review, 2018*	Team functioning as a predictor of patient outcomes in early medical home implementation VHA Primary Care Medical Homes(PCMH) initiative, delivered by interdisciplinary teams (Patient Aligned Care Teams - PACTs), aimed to provide comprehensive and responsive care. Daily 'huddles' to improve team communication – see also Helfrich et al 2014, 2017).	To assess the relationships between primary care team functioning and outcomes (patients use of acute care, and all cause mortality) allowing for contexts that affect implementation (inner and outer primary care settings). Theoretical framework of Consolidated Framework for Implementation Research (CFIR) Hypothesis that higher team functioning will reduce utilisation and mortality	Veteran's Healthcare Administration USA, All patients from all VHA practices with >5000 patients in one Veterans Integrated Service Network (South California and Nevada -VISN 22), over 2 fiscal years after PACT implemented	Administrative data on a longitudinal cohort of patients, N=65,559, 95% male, over 70% over 55 years, 32% >1 comorbidity, 63% had poor health, 7% homeless • Patient demography (age, gender, income, homeless status, health status/ severity, • Practice features (type, size), • Care quality / patient outcomes (hospital admissions – all, ambulatory care sensitive conditions (ACSC), ED visits, all cause mortality). 2 wave survey 2012, 2013 to providers and staff, N=515 (65%) and 484 (48%) responses overall, higher amongst staff than clinicians. Covered: • Practice team functioning, • Staffing and sufficiency, • Readiness for PCMH change, • Implementation climate. Quantitative/ multilevel regression modelling, controlling for practice level factors (leadership, burnout, staff sufficiency) and individual patient characteristics, Subgroup analysis of vulnerable patients	-	Inner setting: Team functioning- 5 items, scored 0-100, adapted from the Team Diagnostic Survey; to assess: • team cognitive traits (does team possess the skills needed for team work, the knowledge and they need, and more than enough talent and experience) • team process (skilled at capturing lessons that can be learned and actively share special knowledge) Leadership engagement and support (for culture of change) – 2 items reflecting vision, goals, norms and rewarding progress Provider and staff emotional exhaustion- 9 item from(validated) Maslach Burnout Inventory Staffing sufficiency: If staff/provider ratio met the VHA recommended (PCP+3)	-	For all patients: higher team functioning associated with lower all cause mortality (small effect), and marginally with lower all cause inpatient admissions Vulnerable patients (homeless, mental health conditions, dementia): higher team functioning associated with lower all cause admissions and lower ACSC admission (not with all cause mortality). Effect of team cognitive traits and team processes similar, but combined the effects are stronger. Leadership not significant in any model. Some findings contrary to hypotheses: Higher emotional exhaustion associated with lower ACSC admissions for all and vulnerable patients (possibly as a result of attending to patient needs). Staffing sufficiency associated with higher all cause admissions (possibly as a result of better access to care).	Associations, not causal. VHA specific and may not be generalisable. Care received by patients outside the VHA not included

Table of data extracted from included studies (Song et al 2017)

Author, Journal, Year	Title	Aim / Research question	Setting	Data sources. Methods, Response rates	Team composition variables	Team climate related variables	Staff outcomes	Patient outcomes	Comments
Song, H, Ryan, M, Tendulkar, S, Fisher, J, Martin, J, Peters, AS, Frolkis, JP, Rosenthal, MB. Chien, AT. Singer, SJ. *Health Care Management Review, 2017*	Team dynamics, clinical work satisfaction, and patient care coordination between primary care providers: A mixed methods study	To assess the impact of team dynamics on clinical work satisfaction and patient care coordination	18 hospital- and community-based, academically affiliated (Harvard) primary care practices in a learning collaborative - the Academic Innovations Collaborative (AIC), USA	Convergent mixed methods. Survey, emailed, 2012, 548 responses (65% overall, range 55%-86%), 267 clinicians (Family Physicians, Nurse Practitioners, Physician Assistants) and 281 resident/ trainee physicians; 57.7% female. Covers: - Team composition - Team dynamics, - Patient care coordination - Single item work satisfaction Ordered logistic and linear regression modelling and mediation analysis controlling for demographic characteristics of survey respondents. All practitioners and separate groups Semi structured Interviews, 36 team leaders, constant comparison analysis, 4 coders.	Respondents were asked to describe their team and then use that as the reference for answering subsequent questions about team dynamics etc. Team membership descriptions varied, typically included nurses, medical assistants, receptionists, in addition to clinicians.	**Climate - Team Dynamics** Good team dynamics defined as feelings and activities that foster effective team performance and hence benefits for professionals (work satisfaction) and patients (care coordination). 29-item instrument/ 7 factors, 5 point Likert scale (1, strongly disagree to 5,strongly agree): - Conditions for team effectiveness (e.g. colocation, clear roles) - Shared understanding - Act and feel like a team - Perceived team effectiveness - Processes for accountability, conflict resolution, communication/ information exchange. Scores - neutral to positive	**Clinical work satisfaction** – *Thinking about your clinical work in this primary care setting, please indicate how satisfied you are* 5 point scale (1, very dissatisfied to 5, very satisfied), selected as known association with workforce participation. Different wording for residents. *I get a lot of enjoyment from continuity clinics.* Scores – moderate to positive.. Strong positive association between team dynamics and clinician work satisfaction	**Patient care coordination** between clinicians. 8 part questionnaire - views about quality of care by colleagues for complex patients: understanding the care plan; tests/ imaging; referrals; prescribing; counsels; follow-up; involves patient; informs colleagues. Scores: moderate to positive Strong positive association between team dynamics and patient care coordination Patient care coordination mediated the relationship between team dynamics and work satisfaction for clinicians, but not residents. Interviews confirmed clinicians derive satisfaction from better patient care coordination that comes from better team dynamics	Associations, not causal Does not consider patient experience. Evaluation during first year of AIC so may still be affected by change. Possibly positive team dynamics are a result of good communication, role clarity and clear work processes as well as greater reliance on team members creating psychological safety, efficiency and social inclusion.

Theoretical / conceptual framework

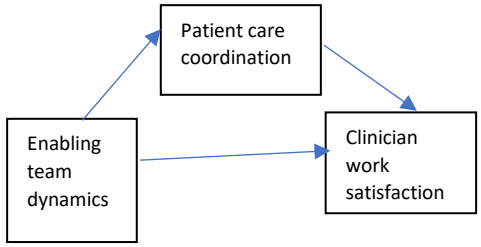


Table of data extracted from included studies (Pineault et al 2017)									
Author, Journal, Year	**Title**	**Aim / Research question**	**Setting**	**Data sources. Methods, Response rates**	**Team composition variables**	**Team climate related variables**	**Staff outcomes**	**Patient outcomes**	**Comments**
Pineault, R, Borges Da Silva, R, Provost, S, Fournier, M, Prud'homme, A, Levesque, J-F, *Inquiry: a Journal of Medical Care Organization, Provision and Financing, 201*	Do Gender-Predominant Primary Health Care Organizations Have an Impact on Patient Experience of Care, Use of Services, and Unmet Needs?	To compare female- and male-predominant types of primary health care organisations with respect to patient and organisation characteristics and assess the influence of gender-predominance on patients' experience of care, preventive care delivery, use of services, and unmet needs.	Canada, 43% of population of Quebec province (2 densely populated areas)	Two linked surveys, 2010 1. Random digit dialling, population telephone survey of 9,180 adults (6,084, 56% response rate). Questionnaire adapted from the Primary Care Assessment Survey and the Primary Care Assessment Tool for patients' assessment of quality of care, i.e. - experiences of care (continuity, comprehensiveness, responsiveness, perceived outcome), - use of services (usual source of primary care, hospital, ED), - unmet needs previous 6 months (didn't consult doctor when needed) - preventive care (counselling, cancer, cardio metabolic screening) according to clinic guidelines (10 point scale). 2. Telephone contact with primary health care organisations (n=606) for information on workforce and patient means of access, and to establish contact person for mailed survey (393 physicians responded, 62%). Surveys linked through population respondents' identification of primary care source. 403/ 6,885 could not be identified. Solo practices excluded Quantitative / chi square and multilevel regression modelling controlling for patient level and organisation characteristics and doctor age.	**Gender predominance** measured by: - % of female physicians - whether female physicians have leadership position Female predominant practice if >55% of practice physicians are female (44.2% of practices, 39.7% of patient responses) Male predominant practice if >55% of practice physicians are male (55.2% of practices, 60.3% of patient responses) Practices with 45-55% gender split of physicians allocated to group according to gender of leader,	**Organisation questionnaire** covered: - vision, values, norms, goals - resources – human, materials, finances - structure – governance, rules, procedures - administrative and professional processes to ensure adequate service delivery		**Patient experiences/ quality of care**: Practices with higher ratio of female physicians often: - had more nurses with expanded roles, - had younger doctors, - had higher % female patients - allowed more time for patient visits, - provided a broader range of preventative care - were more collaborative - had more part time working, Patients at female predominant practices reported better comprehensiveness and responsiveness of care, more counselling and screening, but lower accessibility to services. In adjusted models, only access to care was significantly different between male and female predominant practices (worse in female). There was no difference between male and female predominant practices on any other element (i.e. patient experiences, use of services, preventive care, unmet needs) The positive influence of female predominant practices may have been more related to having younger doctors, rather than gender having an effect. Poor access may be related to greater part time working. Organisational factors not associated with quality of care.	Associations, not causation. Authors suggest doctors may choose practices that align with their values and career choices and not that doctors can influence these. Organisational variables included reflect culture and came from one key contact which may have been inaccurate or biased. Gender predominance based on a dichotomised variable. No information on individual physician characteristics. Patients were linked with organisations, not with individual physicians Study only undertaken in urban and suburban Quebec

Figure S5. Mapping of studies to research questions

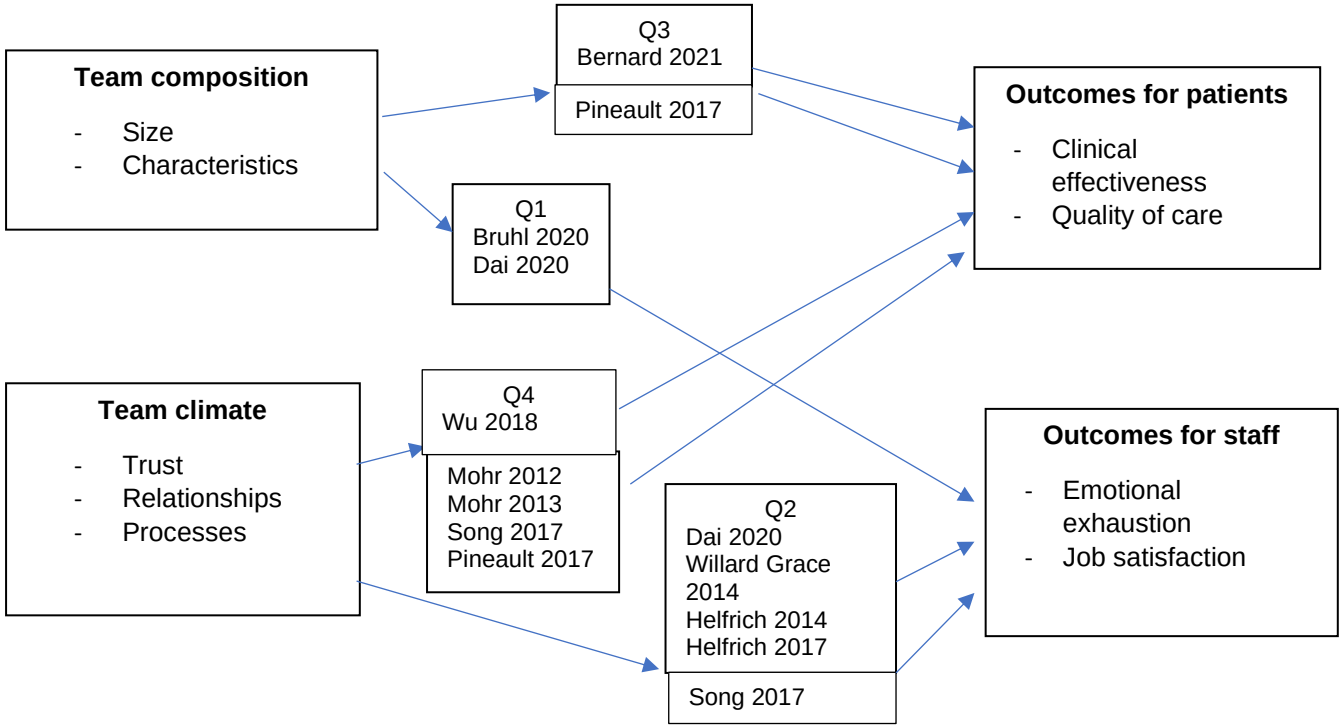


Table S2. Review papers overview with measures and definitions

FTE Full time equivalent; N Nurse; NP Nurse Practitioner; Physician Assistant; MA Medical Assistant; PCP Primary Care Practitioner

Aim/ research question, setting, data, author	Measure of Composition	Measure/ definition of Climate	Outcomes for staff	Outcomes for patients
To test if utilisation (emergency department visits, hospital admissions, 30 day re-admissions) are associated with: - the proportion of physician time on primary care team - clinician and care team characteristics Control for clinician and care-team level characteristics. Mayo healthcare system administrative data 2017 (26)	- % of care team FTE that is physician - Practitioner type (Family Physician vs NP or PA, - Practitioner gender Practitioner years in practice	-	-	Adjusting for clinician and care team level characteristics, utilisation, i.e. ED visits, hospital admissions, 30 day re-admissions – all associated positively with panel complexity (comorbidity) and fewer years in practice - A&E less in physician vs NP/PA panels - 30 day re-admission less for female practitioners No association between utilisation and % of care team FTE that is physician
How do varying staff ratios of NPs and PAs to family practitioners in care teams affect burnout, adjusting for clinical and team level factors? Mayo health care system administrative data and practitioner survey 2018 (27)	- % of care team FTE that is physician - Practitioner type (Family Physician vs NP or PA) - Practitioner gender - Practitioner years in practice	-	Adjusting for clinical and team level factors, burnout (emotional exhaustion), single item: - Inversely related to % of care team FTE that is physician (all clinician groups) - Positively related to female gender - Unrelated to type of practitioner, panel size or complexity, years in practice -	-
To (i) characterise common team configurations, (ii) determine if some configuration are more efficient, (iii) assess if the odds of burnout are associated with perceived efficiency Data from national survey of family physicians 2017, 2018 (28)	800 different team configurations mapped into 3 groups: Family physician - + MA or N (22%) - + MA or N + NP or PA or specialist (40%) - + MA or N + NP or PA + specialist (38%) [Specialists: midwife, psychiatric nurse, psychiatrist, social worker, pharmacist, occupational/physical therapist]	• Single item perceived team efficiency (*The degree to which my care team works efficiently together:* poor/ marginal, 7%; satisfactory/ good, 80%, optimal, 14%) • Work environment: - Satisfaction - Control over workload - Values aligned with practice leaders Generally better work environment in more expansive teams	Adjusting for physician and practice covariates, burnout (emotional exhaustion), single item: - More common female, non Asian, non Hispanic, less than 60 years - Not associated with team configuration - Positively associated with adverse work environment Higher odds of burnout if poor vs optimal perceived efficiency in all team configurations Skill shortages a possible catalyst for burnout. 35% of physicians report both burnout and satisfaction	-

To explore the association between elements of team based care and burnout amongst primary care staff two years into implementing the Patient Aligned Care Team (PACT) programme. 4 roles in PACTs: - a primary care practitioner (PCP,or NP or PA), - a nurse care manager, - a clinical associate (licensed nurse or medical assistant), - an administrative clerk. Veteran's Healthcare Administration staff survey 2012 and administrative data (29)	-	• Team structure: - In 1 or >1 team - Team fully staffed (PCP+3) • Team functioning: - communicate about conflict, - participatory decision making, - stressful work environment, - history of successful change • PCP delegates in: patient care, assessing patients, responding to messages • Team effectiveness: confidence/ self-efficacy; work at top of competency • Workload: Panel over capacity (>1200 patients /PCP), adjusted for clinical intensity	Adjusting for clustering, clinic workload and patient characteristics Lower rates of burnout when: - Team fully staffed (PCP+3) - Participatory decision making Higher rates of burnout, when: - Chaotic working environment/ employees feeling overwhelmed - Spending 25-50% of time doing work that could be done with less training - Being assigned to> 1 PACT - Longer tenure Team effectiveness not significant	-
To assess the association between burnout among primary care employees and team-specific staffing and workload, as well as among each of the four occupations that constitute the PACT team (see Helfrich 2014) Veteran's Healthcare Administration staff survey 2014 and administrative data (30)	-	• Team structure: - In 1 or >1 team - Team fully staffed (PCP+3) - Staff change in last 12 months • Workload: - Panel over capacity (>1200 patients /PCP) - Patient appointments out of hours - High comorbidity in panel •	Adjusting for respondent characteristics, burnout associated (additively) with: - Team not fully staffed - Turnover in team in last 12m - Patient panel overcapacity - In >1 team – in sensitivity analysis only Odds of burnout 58.6% if not fully staffed, had turnover and overcapacity (vs 28.5% fully staffed, no turnover, not overcapacity).	-
To examine the effect of organisational slack in resources (staffing) on quality of care. Data from Veteran's Healthcare Administration databases (includes patient feedback), 2006-7 (31)	-	• Organisational slack/ clinic capacity: - Panel size (vs recommended 1200 patients/ physician provider, 900 patients/ non physician provider) - Support staff per provider (vs recommended 2 support staff/ provider) • Group orientated organisational culture (from staff survey) used to reflect team functioning - no details given.	-	Adjusting for patient characteristics and clinic level variables, care quality better with organisational slack: • Flu vaccination (both slack variables significant) • Continuity of care with same provider (slack in support staff significant) • Overall quality of care (slack in panel size significant) Curvilinear relation i.e. diminishing returns to more staff above recommended levels (due to coordination problems, 'social loafing'). Better group organisational culture contributed to continuity of care and overall quality of care.
To explore the relationship between workload and patients' quality of care,	-	• Workload / clinic capacity: if panel size >, =, or < VA staffing recommendations (see Mohr 2012)	-	Workload is significantly associated quality of care\; • positively with complaints,

and whether relational climate moderates this relationship.
 	
Data from Veteran's Healthcare Administration databases (includes patient feedback), 2006-7 (32)
		adjusted for support staff, patient intensity.
		• Relational climate / cohesion of work group, perceptions of:
		  • Cooperation
		  • Differences respected and valued
		  • Disputes and conflict resolved fairly
		• Control for patient level and clinic level factors
				• negatively with patients reporting adequate time in consultations,
				• negatively with overall quality of care.
				Relationship is moderated by relational climate.
				Quality of care not affected by workload if relational climate is good. Workload negatively affects quality of care if relational climate is poor.
				Employing more staff may have diminishing returns without good team working.

To assess the impact of team dynamics on clinical work satisfaction and patient care coordination Harvard Collaborative staff survey and interviews with practice leaders 2012 (33)	Respondents were asked to describe their team and then make that the reference for answering subsequent questions about team dynamics etc. Team membership descriptions varied, typically included nurses, medical assistants, receptionists, in addition to clinicians.	• Good team dynamics defined as feelings and activities that foster effective team performance and hence benefits for professionals (work satisfaction) and patients (care coordination). 7 factors in team dynamics: - Conditions for team effectiveness (e.g. colocation, clear roles) - Shared understanding - Act and feel like a team - Perceived team effectiveness • Processes for accountability, conflict resolution, communication/ information exchange.	Controlling for demographic characteristics of the respondents, strong positive association between team dynamics and clinician work satisfaction (single item – *Thinking about your clinical work in this primary care setting, please indicate how satisfied you are.* 1 = very dissatisfied to 5 = very satisfied). Wording changed for resident / trainee clinicians: *I get a lot of enjoyment out of continuity clinic*)	Controlling for demographic characteristics of the respondents, strong positive association between team dynamics and clinician ratings of patient care coordination. Patient care coordination mediated the relationship between team dynamics and work satisfaction for clinicians, but not residents. Interviews confirmed clinicians derive satisfaction from better patient care coordination that comes from better team dynamics.

To explore the relationship between team structure, team functioning and emotional exhaustion of clinicians and staff in primary care practices in the US
 	
Data from survey of primary care staff in San Francisco area, USA, 2012 (34)
		• Team structure: working in the same team / with same staff
		• Team culture defined as a sense of effective team functioning, assessed by adapted version of the Team Climate Inventory, (negative items reverse scored):
		  - Group works well together
		  - All in it together attitude
		  - Feel unprepared for tasks
		  - Skills not fully used
		  - Hard to get things to change
		  - Can rely on others
		• Time is spent on how to improve things
		Control for clinic clustering, participant characteristics and team structure
			6 item Maslach Burnout inventory emotional exhaustion domain.
			Clinicians: Emotional exhaustion higher if: work a larger number of half days; transitioning to e-record; a resident (trainee)
			Clinicians: Emotional exhaustion lower if: tighter team structure/ work with same team/ assistants; better team culture
			Staff: Emotional exhaustion higher if: work full time; longer tenure
			Staff: Emotional exhaustion lower if: better team culture
			Team structure and culture interact to predict exhaustion. Better team culture associated with less exhaustion. Team structure alone not enough if culture poor. 'Culture trumps structure' (but possible confusion with climate)	

To assess the relationships between primary care team functioning and outcomes (patients use of acute care, and all cause mortality) allowing for contexts that affect implementation (inner and outer primary care settings). Theoretical framework of Consolidated Framework for Implementation Research (CFIR) Hypothesis that higher team functioning will reduce utilisation and mortality Veteran's Healthcare Administration 2 wave staff survey 2012, 2013 and administrative data (35)	-	• Team functioning - team cognitive traits (team possesses the skills needed for team work, the knowledge and they need, and more than enough talent /experience) - team process (skilled at learning and sharing knowledge) • Leadership engagement and support (for culture of change) covers vision, goals, norms and rewarding progress • Staffing sufficiency: If staff:/ provider ratio met the VHA recommended (PCP+3) • Staff emotional exhaustion/ burnout Control for patient characteristics.	-	All patients: higher team functioning associated with lower all cause mortality (small effect), and marginally with lower all cause inpatient admissions Vulnerable patients (homeless, mental health conditions, dementia): higher team functioning associated with lower all cause admissions and lower ambulatory care sensitive condition (ACSC) admissions (not with all cause admissions. Effect of team cognitive traits and team processes similar, but combined the effects are stronger. Leadership not significant in any model. Some findings contrary to hypotheses: - Higher emotional exhaustion associated with lower ACSC admissions for all and vulnerable patients (possibly because of good attention to patient needs) - Staffing sufficiency associated with higher all cause admissions (possibly because of better access to care).
To compare female- and male-predominant types of primary health care organisations with respect to patient and organisation characteristics and assess the influence of gender-predominance on patients' experience of care, preventive care delivery, use of services, and unmet needs. Data from surveys 2010 of patients and staff in practices in Quebec, Canada; organisational data from key informants in practices. (36)	Female vs male predominant practices. Predominance is if >=55% of physicians are female (or male) Where gender breakdown was 45-55%, practice assigned according to gender of practice leader	• Organisational factors: - Visions, values, goals, norms - Resources - Governance rules and procedures • Administrative and professional processes to ensure adequate service delivery		Female (vs male) predominant practices: doctors younger, more part time; care is more comprehensive and responsive, with more counselling and screening. In adjusted analyses, controlling for patient and organisation factors and doctor age, only access to care distinguished female from male predominant practices (worse in female), attributed to more part time working. Positive features of care in female predominant practices related to age not gender. Organisation factors not associated with quality of care. Authors suggest doctors may choose practices on basis of organisational factors (i.e. culture) rather than have an influence on this.

Table S3. Quality assessment

Title	Date	Journal	Authors	Quality appraisal tool used	Rating 1) High quality and well reported; 2) Good quality; 3) Lower quality or badly reported but still relevant. Reviewer 1 (RA	Reviewer 2 (BJ)
Do Gender-Predominant Primary Health Care Organizations Have an Impact on Patient Experience of Care, Use of Services, and Unmet Needs?	2017	Inquiry : a journal of medical care organization, provision and financing	Pineault, Raynald; Borges Da Silva, Roxane; Provost, Sylvie; Fournier, Michel; Prud'homme, Alexandre; Levesque, Jean-Frederic;	MMAT 2018	2	3
The Association of Team-Specific Workload and Staffing with Odds of Burnout Among VA Primary Care Team Members	2017	Journal of general internal medicine	Helfrich, Christian D. and Simonetti, Joseph A. and Clinton, Walter L. and Wood, Gordon B. and Taylor, Leslie and Schectman, Gordon and Stark, Richard and Rubenstein, Lisa V. and Fihn, Stephan D. and Nelson, Karin M.	MMAT 2018	1	1
Team Configurations, Efficiency, and Family Physician Burnout	2020	Journal of the American Board of Family Medicine : JABFM	Dai, Mingliang and Willard-Grace, Rachel and Knox, Margae and Larson, Samantha A. and Magill, Michael K. and Grumbach, Kevin and Peterson, Lars E.	MMAT 2018	1	2
Association of Primary Care Team Composition and Clinician Burnout in a Primary Care Practice Network	2020	Mayo Clinic Proceedings: Innovations, Quality and Outcomes	Bruhl, E. J. and MacLaughlin, K. L. and Allen, S. V. and Horn, J. L. and Angstman, K. B. and Garrison, G. M. and Maxson, J. A. and McCauley, D. K. and Lampman, M. A. and Thacher, T. D.	MMAT 2018	1	3

Team dynamics, clinical work satisfaction, and patient care coordination between primary care providers: A mixed methods study	2017	Health care management review	Song, Hummy and Ryan, Molly and Tendulkar, Shalini and Fisher, Josephine and Martin, Julia and Peters, Antoinette S. and Frolkis, Joseph P. and Rosenthal, Meredith B. and Chien, Alyna T. and Singer, Sara J.	MMAT 2018	2	3
Team functioning as a predictor of patient outcomes in early medical home implementation	2018	Health care management review	Wu, Frances M. and Rubenstein, Lisa V. and Yoon, Jean	MMAT 2018	2	2
Clinician Care Team Composition and Health Care Utilization	2021	Mayo Clinic Proceedings: Innovations, Quality and Outcomes	Bernard, M. E. and Laabs, S. B. and Nagaraju, D. and Allen, S. V. and Halasy, M. P. and Rushlow, D. R. and Garrison, G. M. and Maxson, J. A. and Matthews, M. R. and Sobolik, G. J. and Lampman, M. A. and Foss, R. M. and Rosas, S. L. and Thacher, T. D.	MMAT 2018	1	1
Slack resources and quality of primary care	2012	Medical care	Mohr, David C. and Young, Gary J.	MMAT 2018	3	2
Provider workload and quality of care in primary care settings: moderating role of relational climate	2013	Medical Care	Mohr, D. C. and Benzer, J. K. and Young, G. J.	MMAT 2018	3	3
Team structure and culture are associated with lower burnout in primary care	2014	Journal of the American Board of Family Medicine : JABFM	Willard-Grace, Rachel and Hessler, Danielle and Rogers, Elizabeth and Dube, Kate and Bodenheimer, Thomas and Grumbach, Kevin	MMAT 2018	2	2
Elements of team-based care in a patient-centered medical home are associated with lower burnout among VA primary care employees	2014	JGIM: Journal of General Internal Medicine	Helfrich, Christian D. and Dolan, Emily D. and Simonetti, Joseph and Reid, Robert J. and Joos, Sandra and Wakefield, Bonnie J. and Schectman, Gordon and Stark, Richard and Fihn, Stephan D. and Harvey, Henry B. and Nelson, Karin	MMAT 2018	3	3

Table S4a. Outcomes for staff 1: Emotional exhaustion / burnout

Factor	Variable	Association with emotional exhaustion / burnout	Study	Burnout measure
Composition	Percentage of total team FTE that is physician	Higher % of team FTE that is physician FTE associated with less emotional exhaustion in all clinician groups i.e. family physician, nurse practitioners, physician assistants. (Panel size, years of practice not significant)	Bruhl et al., 2020	Single item, 5 point scale *I feel burned out* … Burnout defined as: >= once a week
	Practitioner gender	Female clinicians - higher likelihood of burnout than male	Bruhl et al., 2020; Dai et al., 2020	
	Team composition: 3 groups: Family physician + 1 or 2 or 3 other clinical staff Medical Assistant (MA); Nurse (N); Nurse Practitioner (NP); Physician Assistant (PA); Specialists (midwife, psychiatric nurse, psychiatrist, social worker, pharmacist, occupational/physical therapist)	Burnout not associated with team configuration [Family physician + MA or N (22%); Family physician + MA or N + NP or PA or specialist (40%); Family physician + MA or N + NP or PA + specialist (38%) However, generally more expansive teams have better work environments (see climate section below)	Dai et al., 2020	
Climate related	Perceived teamwork efficiency (single item: T*he degree to which my team works efficiently together* ……poor/marginal, good, optimal)	Odds of burnout lower, for all team configurations, for optimal vs poor perceived efficiency; team configuration (family practitioner with 1 or 2 or 3 other roles) not significant	Dai et al., 2020	
	Adverse work environment (low satisfaction, no control over workload, values not aligned with practice leaders)	(As above), more expansive teams have better work environments. Adverse work environment - higher emotional exhaustion 35% of physicians report satisfaction and burnout	Dai et al., 2020	
	Team not fully staffed	Incomplete team - higher burnout	Helfrich et al., 2014, 2017	Single item, 5 point scale burnout item from Physician Worklife Survey. Burnout defined as: Definitely burning out
	Panel over capacity	Staff insufficiency - higher burnout	Helfrich et al., 2017	
	Team functioning- stressful work environment	Stressful work environment - higher burnout	Helfrich et al., 2014	
	Team functioning – participatory decision making	Participatory decision making - lower burnout. [Note, team effectiveness (confidence/ self efficacy; working at top of competency) not significant]	Helfrich et al., 2014	
	Working below competency: spending 25-50% of time doing jobs that could be done with less training	Working below competency - higher burnout	Helfrich et al., 2014	
	Longer tenure	Longer tenure - higher burnout	Helfrich et al., 2014	
	Team structure – in more than 1 team	Assigned to more than 1 team - higher burnout	Helfrich et al., 2014, 2017	
	Team structure – staff turnover in last 12 months	Change of team member in last 12 months – higher burnout	Helfrich et al., 2017	
	Team structure – consistently work in same team; with the same group of assistants	Consistent team membership and assistants – lower emotional exhaustion, but structure not enough on own if culture is poor	Willard Grace et al., 2014	5 item emotional exhaustion scale from Maslach Burnout Inventory
	Team culture, from Team Climate Inventory (group works well together, all in it together attitude, can rely on others, skills fully used, time spent improving things, feel well prepared).	Less emotional exhaustion with better team culture, as defined by the Team Climate Inventory. 'Culture trumps structure'	Willard Grace et al., 2914	

Table. S4b. Outcomes for staff 2: Work satisfaction

Factor	Variable	Association with work satisfaction	Study	Work satisfaction measure
Climate related	Team dynamics (co-location; clear roles; shared understanding; act and feel like a team; perceived team effectiveness; processes for accountability, conflict resolution, communication).	Good team dynamics defined as feelings and activities that foster effective team performance. Strong positive association between team dynamics and clinician work satisfaction. Patient care coordination mediated the relationship between team dynamics and work satisfaction for clinicians, but not residents (see further table 3d).	Song et al., 2017	Single item, 5 point scale (1 very dissatisfied to 5 very satisfied)

TableS4c. Outcomes for patients 1: Clinical effectiveness

Factor	Variable	Association with clinical effectiveness	Study	Clinical effectiveness measure
Composition	Percentage of total team FTE that is physician	Physician FTE not associated with any hospital utilisation measure (admissions, ED visits, 30 day readmissions)	Bernard et al., 2021	Administrative data on hospital admissions, ED visits and 30 day readmissions NB: panel complexity was the best predictor of utilisation
	Practitioner type (family physician vs nurse practitioner / physician assistant)	Less A&E visits in physician panels vs nurse practitioner and physician assistant	Bernard et al., 2021	
	Practitioner gender	30 day readmissions lower for female practitioners vs male	Bernard et al., 2021	
	Years in practice	Fewer years in practice - higher admissions	Bernard et al., 2021	
Climate related	Team functioning: cognitive traits (team has skills for team working, more than enough knowledge and experience) and team processes (for learning and sharing knowledge)	Higher team functioning: - lower all cause mortality (small effect), - lower all cause hospital admissions (vulnerable patients, marginal for all patients) - lower ACSC admissions (vulnerable patients). Cognitive traits and team processes similar effects but stronger combined. Leadership culture for change, norms, goals, vision not significant.	Wu et al., 2018	Administrative data: - All cause mortality - Hospital admissions: all cause and ambulatory care sensitive conditions (ACSC) - ED visits
	Staff sufficiency / meets VHA ratio of 1 provider to 3 other staff	Staff sufficiency – higher all cause admissions	Wu et al., 2018	
	Staff emotional exhaustion	Higher emotional exhaustion – lower ACSC admissions	Wu et al., 2018	

Table S4d. Outcomes for patients 2: Quality of care

Factor	Variable	Association with quality of care	Study	Quality of care measure
Composition	Gender dominance of physicians in primary care team (female (or male) dominance if >=55% of physicians female (male); where gender balance is 45-55%, gender of leader determines team assignment)	Female dominant practices – patients report: more comprehensive and responsive care, more counselling, more screening, but this was associated with younger age of female physicians, rather than gender. In adjusted analyses, patients in female dominant practices reported worse access (possibly due to more part time working), but no other differences.	Pineault et al., 2017	Patient survey covers: - Experience of care - Use of services - Unmet needs (didn't consult doctor with a need) - Preventive care
Climate	Gender dominance of physicians in primary care team (female (or male) dominance if >=55% of physicians female (male); where gender balance is 45-55%, gender of leader determines team assignment	Organisational factors, 3 groups, culture related: views, vision, goals, norms; resources; administrative and professional processes for service delivery – not associated with quality of care, but authors suggest physicians may choose practices based on organisational factors	Pineault et al., 2017	
	Workload / staff sufficiency/ clinic capacity - extent of organisational slack in staffing resources, i.e. if staff level is above, equal to or below VHA recommendations for - Panel size (1200 patients / physician provider; 900 patients / non physician provider, i.e. nurse practitioner or physician assistant) - Support staff (2 / physician provider)	Over capacity negatively affects - Flu vaccination (if panel or support staff capacity exceeded) - Continuity of care (if support staff capacity exceeded) - Overall quality of care (if panel capacity exceeded) Curvilinear relation: patients experience lower quality of care if staff insufficient/ below recommended levels. Moderate slack (capacity) may be beneficial, but additional staff beyond recommendations exhibit diminishing returns / don't add extra benefit due to coordination problems and staff motivation ('social loafing').	Mohr and Young, 2012	Administrative data: - Influenza vaccination - Continuity with same care provider - Overall quality of care (5 point scale) in last 2 months from routine patient surveys
	Team functioning – group oriented organisational culture from VA all employee survey	Better group oriented organisational culture significantly contributed to continuity of care and overall quality of care	Mohr and Young, 2012	
	Workload / staff sufficiency / clinic capacity – whether panel size exceeds, equals or below VHA staffing recommendations (1 physician/ 1200 patients; 1 non physician provider/ 900 patients – i.e. nurse practitioner or physician assistant), after adjust for support staff, patient intensity, number of examination rooms	Workload is significantly associated quality of care: - positively with complaints, - negatively with patients reporting adequate time in consultations - negatively with overall quality of care.	Mohr et al., 2013	Administrative data – 3 items from routine patient visit experience survey: • Complaints (yes/no) • Enough provider time available at visit (yes/no) • Overall quality of care (5 point scale)
	Relational climate / cohesion of the work group, from VA all employee survey, assessed through perceptions of: • Spirit of cooperation • Differences respected and valued • Disputes and conflict resolved fairly	Relational climate can mitigate the effects of high workload and becomes more influential as workload increases. Workload has no effect on quality of care if relational climate is good but workload negatively affects quality of care if relational climate is poor. Employing more staff may have diminishing returns without good team working	Mohr et al., 2013	

	Team dynamics (co-location; clear roles; shared understanding; act and feel like a team; perceived team effectiveness; processes for accountability, conflict resolution, communication), Good team dynamics defined as feelings and activities that foster effective team performance.	Strong positive association between team dynamics and patient care coordination. Patient care coordination mediated the relationship between team dynamics and work satisfaction for clinicians, but not residents (see also Table 3b). Interviews (36) confirmed clinicians derive satisfaction from better patient care coordination that comes from better team dynamics	Song et al., 2017	Patient care coordination: physician views about quality of care of colleagues for complex patients (8 item): understanding the care plan; tests; referrals; prescribing; counsels; follow-up; involves patient; informs colleagues.