Was bringt Telemedizin bei Diabetes, Hypertonie und Lipidstoffwechselstörung? Eine evidenzbasierte Analyse auf Basis von Systematic Reviews und Metaanalysen

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Conflicts of interest

The authors declare no conflict of interest in the development of this project

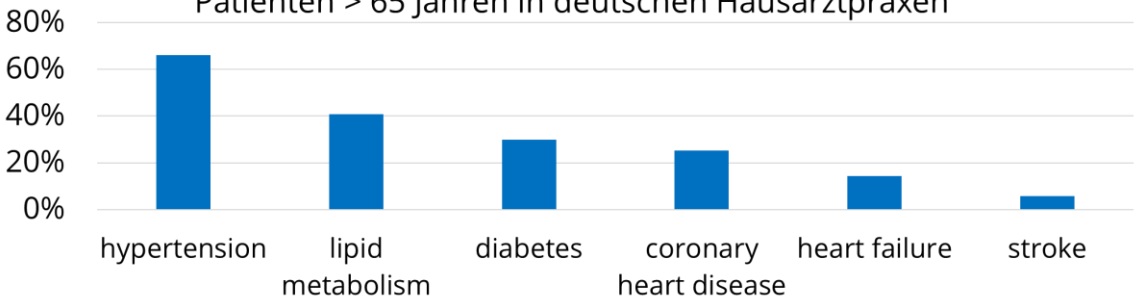
Hintergrund

Hintergrund I
Motivation und Forschungslücke

Motivation

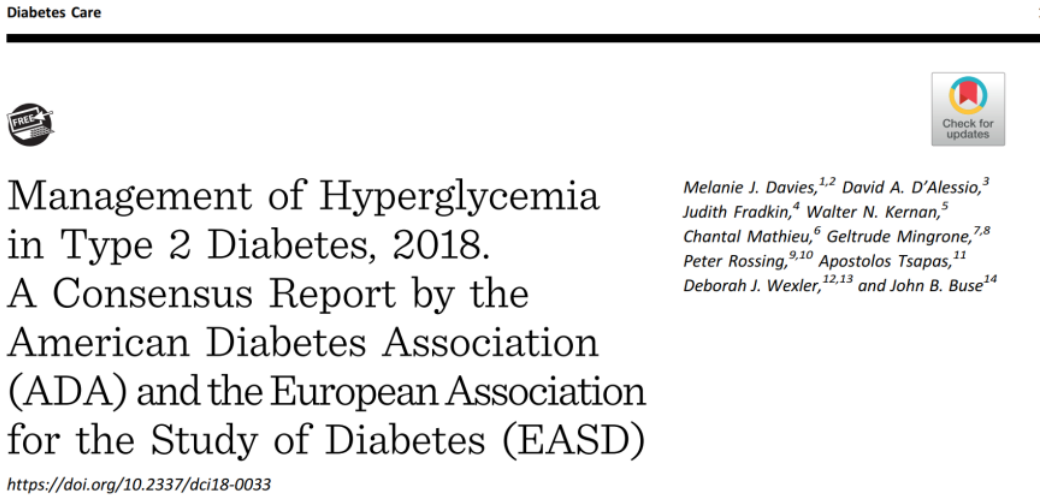
- Prävalenz chronischer Erkrankungen bei älteren Patienten (Abb. 1) [*Jacob et al. 2016*]
- Steigende Co-Prävalenz von Diabetes, Bluthochdruck und Lipidstoffwechselstörung [*Iglay et al. 2016; Song et al. 2016*]

Abb.1: Prävalenz ausgewählter chronischer Erkrankungen bei Patienten > 65 Jahren in deutschen Hausarztpraxen



Forschungslücke

- Unklare Wirkmechanismen von Telemedizin und ihren Komponenten [*Yasmin et al. 2016*]; methodische Schwächen in Telemedizinstudien [*Dinesen et al. 2016*]
- Fokus auf spezifische Zielgruppen oder Anwendungen (CAVE: Heterogenität der Anwendungsformen) in verfügbaren Reviews *[Kitsiou et al., 2017]*


Diabetes Care

Management of Hyperglycemia in Type 2 Diabetes, 2018. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD)

https://doi.org/10.2337/dci18-0033

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Hintergrund II

Ziel der Arbeit und Forschungsfrage(n)

Ziel der Arbeit

- Identifikation, Synthese und Bewertung internationaler Evidenz zur Wirksamkeit von Telemedizin und ihren Komponenten bei Diabetes, Hypertonie oder Lipidstoffwechselstörung

PICO-Forschungsfrage:

- *Bei PatientInnen mit Diabetes, Hypertonie und/oder Lipidstoffwechselstörung, welche Wirksamkeitsnachweise (effectiveness) besteht für die Anwendung von Telemedizin auf krankheitsspezifische klinische Outcomes (nach mindestens 3 Monaten)?*

Methode

Methoden I

Studiendesign, Studieneinschluss und Suchstrategie

PICO-Kriterien	
Population	Patienten mit mindestens einer der Erkrankungen: Diabetes, Hypertonie und/oder Lipidstoffwechselstörung
Intervention	Telemedizin definiert als (1) Anwendung von IuK (2) zur distanzüberwindenden (3) Patientenversorgung unter direkter Beteiligung eines Leistungserbringers
Control	usual care
Outcome	Primary outcome HbA1c, SBP, DBP, HDL-c, LDL-c, TC, TGC Secondary outcome: self-management related outcomes
Time	Follow-up time of at least 3 months
Study Design	Systematic reviews und/oder Metaanalysen von RCTs

Studiendesign

- Umbrella review von Systematic Reviews und Metaanalysen auf Basis von RCTs *[Aromataris et al. 2015]*

Suchstrategie

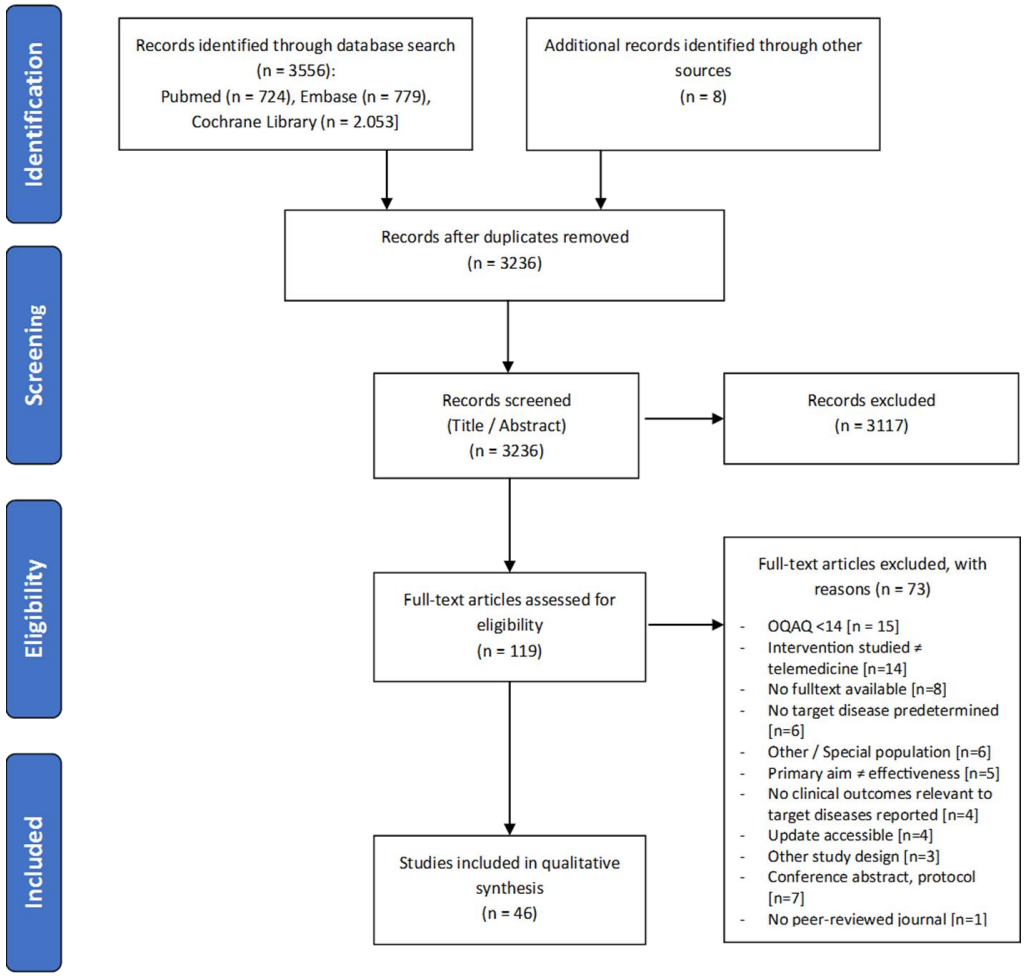
- Umfassende automatisierte und manuelle Suche in den Datenbanken Pubmed, Embase, and Cochrane Library + Handsuche

Methoden II
Datenanalyse und -aufbereitung

- Deskriptiv
- Fokus auf Komponenten-, Erbringungs- (Intensität, Häufigkeit), Subgruppen- oder Setting-spezififsche Wirksamkeit
- Klinisch relevanter Unterschied: Reduktion des HbA1c um ≥ 0.5 % [*Wilding et al. 2018; Dobson et al. 2018*]
- Heterogentät I^2 statistics):
  - < 25 % (low), 26 – 50 % (moderate) and > 50 % (high) *[Egger et al., 1997]*
- Grading of Recommendations, Assessment, Development and Evaluation (GRADE) Assessment of Certainty und RoB

Ergebnisse

Ergebnisse I
Studieneinschluss



PRISMA Flow Chart of study selection process

Studiendesign

- 16 Systematic reviews
- 7 Metaanalysen
- 19 Systematic Review + Metaanalyse
- 3 Systematic Review + Metaanalyse + Metaregression
- 1 Systematic Review + Netzwerkmetaanalyse

Publikationsjahr

Veröffentlicht zwischen 2009 und 2018, Mehrheit nach 2015

Übersichtsarbeiten je Erkrankung

- Diabetes (n=36), Hypertonie (n=6), Lipidstoffwechsel-störung(en) (n=0), Kombination (n=4)

Ergebnisse II

Spezifische Wirksamkeit bei Patienten mit Diabetes

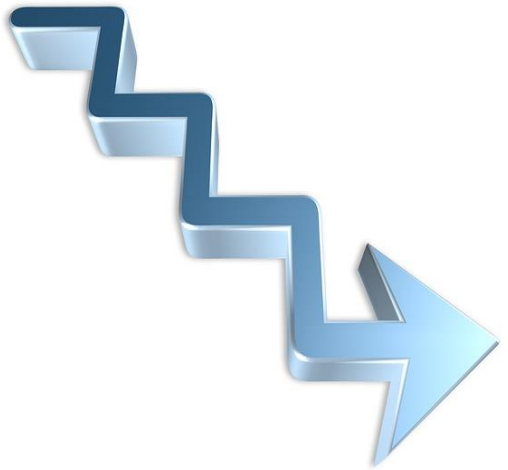
Insgesamt:

- klinisch relevante Verbesserungen durch Telemedizin bei Patienten mit Diabetes

Charakteristika die eine klinisch relevante HbA1c-Reduktion zur Folge hatten

Interventionscharakteristika:

- Häufiges und/oder intensives Feedback bzw. Interaktionen zwischen PatientIn und Leistungserbringer
- Interventionsdauer (≤ 6 Monate)



Patientencharakteristika

- kürzlich diagnostizierte PatientInnen (< 7 Jahre)
- jüngere PatientInnen (Alter <55 Jahre)
- verhältnismäßig stark erhöhter Baseline HbA1c (> 8 % mmol/l)

Ergebnisse III
Grade Assessment of Certainty

	HbA1c	SBP/DBP
GRADE*	n (%)	n (%)
⊕⊕⊕⊕	-	-
⊕⊕⊕⊖	2 (0,92%)	-
⊕⊕⊖⊖	42 (19,8%)	-
⊕⊖⊖⊖	170 (77,63%)	42 (100%)
n	219 (100%)	42

Tab. 4: GRADE Assessment of Certainty für die Outcomes HbA1c und SBP/DBP

** 6 Endpunkte (5 HbA1c, 1 BP) wurden von der Analyse ausgeschlossen, da in den Subgruppenanalysen der eingeschlossenen Metaanalysen lediglich Daten aus einer einzigen Studie gepoolt wurden*

Wichtigste Gründe für Abwertungen:

- RoB: fehlendes AC, fehlende Verblindung, Risiko für Selektionsbias und selektives Berichten
- Inkonsistenz: hohe Heterogenität, inkonsistente KI
- Indirektheit: Unterschiede der Populationen (Alter, Geschlecht, Diabetestyp, Baseline HbA1c, Diabetesdauer)
  Unterschiede der Interventionen (Devices und Komponente, Intensität und Frequenz des Feedbacks, beteiligte Professionelle)
  Unterschiede der Settings (ambulant, stationär, Nachbarschaft/Community)

Diskussion

Diskussion
Limitationen

- initiale Suche und Studieneinschluss
  - Limitationen von RCTs zur Evaluation der Wirksamkeit digitaler Interventionen
  - Definition von „Telemedizin“
  - Aber: Umbrella Reviews minimieren das Risiko übergeordnete Trends zu verfehlen
- Reporting und Durchführung der eingeschlossenen Übersichtsarbeiten / Metaanalysen
  - Reporting: Baseline Daten, Fehlende Werte, Interventionsdauer
  - Durchführung: statistische Analyse, fehlende Analyse des Publikationsbias-Risikos
- Interpretation von SMDs und I^2-Teststatistiken
- Relevante Endpunkte wie Mortalität, Hypoglykämien, Kosten(-effektivität) und Inanspruchnahme nicht berücksichtigt
- GRADE Assessment durch Autorengruppe

Zusammenfassung

Implikationen

- systematischer Gesamtüberblick zur Wirksamkeit von Telemedizin bei Diabetes und Hypertonie
- Potential für Leitlinienupdates: identifizierte Wirksamkeitsnachweise relevant für evidenzbasierte Empfehlungen für die Nutzung von Telemedizin
- ABER → geringe Qualität der Evidenz bzw. Vertrauen in den Effektschätzer (GRADE)
- Forschungsbedarf auf Basis qualitativer Analysen
  - Größere Studien, längere Interventionsdauern, heterogenre Studienpopulationen
  - Potentielle Lösungeswege: neue Studiedesigns (adaptive / pragmatic) zur Evaluation multimodaler individualisierter Interventionen *[Lewin et al., 2009; Law et al., 2014]*
    - CONSORT-eHEALTH checklist *[Eysenbach et al., 2011]*
    - GRADE Assessment durch externe Expertengruppe
  - begleitende Implementierungsforschung jenseits der reinen Effektivität notwendig

Care4Saxony

Vielen Dank!

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Backup and alternative slides

Background

PICO research question

- *In patients with diabetes, hypertension or dyslipidaemia, what is the evidence for the effectiveness of telemedicine-supported chronic care on disease-specific clinical outcomes?*

		Methods used (SALSA)			
Label	Description	Search	Appraisal	Synthesis	Analysis
Systematic review	Seeks to systematically search for, appraise and synthesis research evidence, often adhering to guidelines on the conduct of a review	Aims for exhaustive, comprehensive searching	Quality assessment may determine inclusion/exclusion	Typically narrative with tabular accompaniment	What is known; recommendations for practice. What remains unknown; uncertainty around findings, recommendations for future research
Umbrella review	Specifically refers to review compiling evidence from multiple reviews into one accessible and usable document. Focuses on broad condition or problem for which there are competing interventions and highlights reviews that address these interventions and their results	Identification of component reviews, but no search for primary studies	Quality assessment of studies within component reviews and/or of reviews themselves	Graphical and tabular with narrative commentary	What is known; recommendations for practice. What remains unknown; recommendations for future research

Grant and Booth 2009

Synthesis of high-level evidence to inform policy and practice decisions

Methoden II
Datenanalyse und -aufbereitung

- Deskriptiv
- Fokus auf Komponenten-, Erbringungs- (Intensität, Häufigkeit), Subgruppen- oder Setting-spezififsche Wirksamkeit
- Klinisch relevanter Unterschied: Reduktion des HbA1c um ≥ 0.5 % [*Wilding et al. 2018; Dobson et al. 2018*]

Reduktionsrate des HbA1c in % (statistische Signifikanz)	≤ -0.5 (p > 0.05)	> -0.5 < 0 (p > 0.05)	> 0 (p > 0.05)	> -0.5 < 0 (p < 0.05)	≤ -0.5 (p < 0.05)
Guidance	↓	↘	↗	↘	↓

Tab.: Definition des klinisch relevanten Unterschieds unter Berücksichtigung des Signifikanzniveaus

- Heterogentät I^2 statistics):
  - < 25 % (low), 26 – 50 % (moderate) and > 50 % (high) *[Egger et al., 1997]*
- Grading of Recommendations, Assessment, Development and Evaluation (GRADE) Assessment of Certainty und RoB

Annex

QUALITY ASSESSMENT TOOL FOR SYSTEMATIC REVIEWS AND META-ANALYSES

A modified version of Oxman and Guyatt OQAQ assessment tool and scale was used to assess the quality of reviews. This consists of the following nine quality interrogations each answerable as 'yes', 'no' or 'partially/can't tell', carrying scores of 2, 0 and 1, respectively.

1. **Were the search methods used to find evidence on the primary question(s) stated?**
   (a) **Yes**, description of **databases** searched, **search strategy**, and **years** reviewed. **2 points**.
   (b) **Partially**, descriptions of methods not complete. **1 point**.
   (c) **No**, no description of search methods. **0 points**.
2. **Was the search for evidence reasonably comprehensive?**
   (a) **Yes**, at least one computerised database searched and also a search of unpublished or non-indexed literature. **2 points.**
   (b) **Can't tell**, search strategy partially comprehensive, at least one of the strategies performed. **1 point**.
   (c) **No**, search not comprehensive or not described well. **0 points**.
3. **Were the criteria used for deciding which studies to include in the review reported?**
   (a) **Yes**, inclusion and exclusion criteria clearly defined. **2 points**.
   (b) **Partially**, reference to inclusion and exclusion criteria can be found but are not defined clearly enough. **1 point**.
   (c) **No**, no criteria defined. **0 points**
4. **Was bias in the selection of articles avoided?**
   (a) **Yes**, issues influencing selection bias were covered. Both of the following bias-avoiding strategies were used: (1) two or more assessors independently judged study relevance, (2) assessors selected studies using predetermined criteria. **2 points**.
   (b) **Can't tell**, only one of the strategies used. **1 point**.
   (c) **No**, selection bias was not avoided or was not discussed. **0 points**.
5. **Were the criteria used for assessing the validity for the studies (i.e. meeting inclusion criteria) reviewed reported?**
   (a) **Yes**, criteria defined and used addressed the major factors influencing bias. **2 points**.
   (b) **Partially**, some discussion or reference to criteria. **1 point**.
   (c) **No**, validity or methodological quality criteria not used or not described. **0 points**.
6. **Were study quality assessment criteria used to inform the review analysis?**
   (a) **Yes**, criteria were used to inform the analysis, either by exclusion from the analysis if low quality or through sensitivity analysis. **2 points**.
   (b) **Partially**, some discussion but not clearly described application of criteria. **1 point**.
   (c) **No**, criteria not used or not described. **0 points**.
7. **Were the methods used to combine the findings of the relevant studies (to reach a conclusion) reported?**
   (a) **Yes**, qualitative and quantitative methods are acceptable. **2 points.**
   (b) **Partially**, partial description of methods to combine and tabulate; not sufficient to duplicate. **1 point**.
   (c) **No**, methods not stated or described. **0 points**.
8. **Were findings of the relevant studies combined appropriately relative to the primary question of the overview?**
   (a) **Yes**, combining of studies appears acceptable. **2 points**.
   (b) **Can't tell**, should be marked if in doubt. **1 point**.
   (c) **No**, no attempt was made to combine findings, and no statement was made regarding the inappropriateness of combining findings. **0 points**.
9. **Were the conclusions made by the author(s) supported by the data and/or analysis reported in the overview?**
   (a) **Yes**, data were reported that support the main conclusions regarding the primary question(s) that the overview addresses. **2 points**.
   (b) **Partially**. **1 point**.
   (c) **No**, conclusions not supported or unclear. **0 points**.

A maximum score of 18 is possible. Studies with a consented Quality assessment score < 14 are considered as low quality and were excluded from the analysis.

Annex

Quality Assessment of studies included after title/abstract screening

No.	Author, year	I	II	III	IV	V	VI	VII	VIII	IX	Score
1	(Alessa et al., 2018)	2	2	2	1	2	2	1	2	2	16
2	(Alharbi et al., 2016)	2	2	2	2	2	2	2	1	1	16
3	(Angeles et al., 2011)	2	2	2	2	2	2	2	2	2	18
4	(Aspry et al., 2013)	2	2	2	2	2	0	1	1	1	16
5	(Baron et al., 2012)	2	2	2	0	2	2	2	2	2	16
6	(Bonoto et al., 2017)	1	2	2	2	2	1	2	2	2	16
7	(Cassimatis and Kavanagh, 2012)	2	2	2	0	2	2	0	2	2	13
8	(Connelly et al., 2013)	2	1	2	2	2	1	2	2	2	16
9	(Cotter et al., 2014)	2	1	2	2	2	0	2	1	1	13
10	(Cui et al., 2016)	2	2	2	2	2	2	2	2	2	18
11	(David and Rafiullah, 2016)	2	1	1	0	2	0	2	2	2	12
12	(de Jongh et al., 2012)	2	2	2	2	2	2	2	2	2	18
13	(El-Gayar et al., 2013)	2	2	2	2	2	0	2	2	2	16
14	(Farmer et al., 2016)	2	2	2	1	2	2	2	2	2	17
15	(Faruque et al., 2017)	2	2	2	2	2	2	2	1	2	17
16	(Fu et al., 2017)	2	2	2	0	2	2	1	2	2	15
17	(Garabedian et al., 2015)	2	1	1	0	1	2	1	2	2	11
18	(Garcia-Lizana and Sarria-Santamera, 2007)	2	1	2	2	0	0	1	2	1	11
19	(Greenwood et al., 2014)	2	2	2	0	1	0	2	2	2	13
20	(Hamine et al., 2015)	2	1	2	2	1	0	2	1	2	13
21	(Holmen et al., 2017)	2	2	2	2	2	2	2	2	2	18
22	(Holtz and Lauckner, 2012)	1	2	0	2	1	0	2	2	2	12
23	(Hou et al., 2018)	2	1	2	2	2	2	2	2	2	17
24	(Huang et al., 2015)	1	2	2	2	2	2	2	2	2	17
25	(Kebede et al., 2018)	2	1	2	2	2	2	1	2	2	16
26	(Kelly et al., 2016)	2	2	2	2	2	2	2	2	2	18
27	(Krishna et al., 2009)	2	1	2	0	1	0	2	1	2	12
28	(Lee et al., 2017a)	2	2	2	1	2	2	2	2	1	16
29	(Lee et al., 2017b)	2	2	2	2	2	2	2	2	2	18

Annex

30	(Liang et al., 2011)	2	2	2	2	2	2	2	2	1	17
31	(Liu et al., 2013)	2	2	2	0	2	2	2	2	2	16
32	(Marcolino et al., 2013)	2	2	2	2	2	2	2	2	2	18
33	(Mushcab et al., 2015)	2	2	2	1	2	2	1	2	2	16
34	(Omboni and Guarda, 2011)	2	2	2	2	2	0	2	2	2	16
35	(Omboni et al., 2013)	2	2	2	2	2	2	2	2	1	17
36	(Or and Tao, 2014)	2	2	2	2	0	2	1	1	1	13
37	(Pal et al., 2014)	2	2	2	2	2	2	2	1	2	17
38	(Paré et al., 2010)	2	1	1	2	2	2	1	2	1	14
39	(Polisena et al., 2009)	2	2	2	2	2	2	1	2	1	16
40	(Porter et al., 2016)	2	2	2	2	2	2	2	2	1	17
41	(Riazi et al., 2015)	2	1	1	2	2	0	2	2	1	13
42	(Rush et al., 2018)	2	2	2	2	1	2	2	2	1	16
43	(Russell-Minda et al., 2009)	2	2	2	2	2	2	2	1	1	16
44	(Saffari et al., 2014)	2	2	2	2	2	2	2	2	2	18
45	(Shen et al., 2018)	2	2	2	2	2	2	1	2	2	17
46	(Spencer-Bonilla et al., 2017)	2	2	2	2	2	2	2	2	1	17
47	(Su et al., 2016a)	2	1	2	2	1	2	2	0	1	13
48	(Su et al., 2016b)	2	1	2	2	1	2	2	2	2	16
49	(Suksomboon et al., 2014)	2	2	2	2	1	2	2	1	1	15
50	(Sun et al., 2018)	2	1	2	2	2	1	2	2	1	15
51	(Tchero et al., 2018)	2	2	2	2	1	2	2	2	1	16
52	(Tildesley et al., 2015)	2	1	1	1	0	0	0	1	1	7
53	(Toma et al., 2014)	2	2	2	2	2	2	2	1	2	17
54	(Vargas et al., 2017)	2	2	2	2	2	2	2	1	2	17
55	(Verhoeven et al., 2010)	2	2	2	2	1	1	2	0	1	13
56	(Wang et al., 2017)	2	0	2	1	2	2	1	1	2	13
57	(Wu et al., 2017)	2	2	2	2	2	2	2	1	2	17
58	(Wu et al., 2018b)	2	2	2	2	2	2	2	2	2	18
59	(Wu et al., 2018a)	2	2	2	2	2	2	1	2	1	16
60	(Yoshida et al., 2018)	2	2	2	2	1	2	1	2	2	16
61	(Zhai et al., 2014)	2	2	2	2	2	2	2	2	1	17