# Change for the better? A systematic literature review into the effects of top management turnover in public organizations

#### Introduction

A great deal of management literature focuses on the impact of top managers on organizational performance. In accordance with the upper echelons theory by Hambrick and Mason (1984), organizational performance can to some degree be explained by the quality and background of the top executives. In public management research, Meier and O'Toole (2002), Gerrish (2015) and Avellaneda (2009, 2016) illustrate how the quality of top executives has a substantial impact on the performance of public organizations or public programs.

Based on previously mentioned findings (Hambrick and Mason, 1984; Meier and O'Toole, 2002; Gerrish, 2015; Avellaneda, 2009, 2016) it would be logical that if a top executive or multiple top managers are replaced (i.e., the turnover of management), this would have some effect on the performance of an organization or program (Price, 1989). Despite this importance of management and the turnover of management for performance, there has not been a literature review on the effects of top management turnover in public organizations.

For example, the research by Boyne and Dahya (2002) is an often-cited work on the topic of top management turnover in public organizations. This study provides an overview of the existing private sector theories on the turnover of management and provides a theoretical model on the topic. However, a lot of knowledge on the topic has been written after this publication. Furthermore, recent research by Løkke and Sørensen (2020) provides a quantitative study on the effects of top manager turnover on the performance of non-profit organizations. However, the literature review of this study is mainly focused on principal turnover and performance is only measured in terms of absenteeism, resulting in a limited theoretical synthesis.

This systematic literature review aims to fill this gap in academic literature by having a broad examination of the results from previous studies on the effects of top management turnover.

The research question this review aims to answer is:

"What are the effects of top-management turnover in public organizations and how can these be explained?"

This systematic review aims to serve two audiences. Firstly, practitioners in the field of management such as consultants and HR advisors. For example, an HR advisor might consider the findings of this review to predict the effect of a change in a top management position for their organization. The insights gathered in this review could thus provide a basis for these practitioners to form evidence-based policy. Secondly, by filling the gap in the academic literature, this review aims to serve the academic audience.

This literature finds that top management turnover generally, and in the long term, has a positive effect on the performance of an organization. However, turnover has a negative impact on organizational performance in the short term. This can be explained by the uncertainty regarding the new initiatives by the top manager. Furthermore, hiring a top executive from outside of the organization, as opposed to inside succession, is shown to cause more compressive internal and strategic changes for the organization. Lastly, there is evidence that suggests that the effect of turnover is only positive when incoming top managers enter the organization at a lowperforming state.

This review will be presented as follows. Firstly, an overview of the methodology will be given, and the process of article selection will be presented. Secondly, the results from these selected articles will be discussed. Lastly, the most important findings and implications for practice will be discussed in the conclusion.

#### Methodology

This literature review adhered to the PRISMA guidelines, an overview of the guidelines can be found in appendix A.

#### Literature search

The initial search for articles was conducted in the Web of Science databank. For this search, the search terms: 'top management turnover', 'top management change', and 'executive succession' were used<sup>1</sup>. The Web of Science databank searches for these terms in the title, abstract and keywords of the article.

Moreover, an additional search was conducted in five relevant Public Administration journals: Public Administration Review, International Public Management, Public Performance and Management Review, Journal of Public Administration Research, and Theory and Review of Public Personnel Administration. All of these searches were conducted on 10 December 2020.

It must be noted that the described method results in publication bias. A counteract to this bias, in the form of including working papers from scholars working on the topic, was not possible due to limitations in resources.

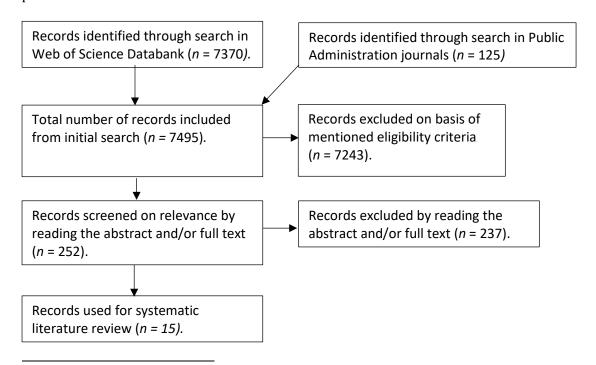
#### Eligibility criteria

This review used the following eligibility criteria for the selection of records. Firstly, as the scope of this review is limited to public organizations, only articles that were published in public administration journals were included. Secondly, records that were not written in English were excluded from the sample. This review did not select articles based on their research design (e.g., empirical, or purely theoretical). Moreover, no demarcation in the time frame of the articles was used.

#### Study selection

Figure 1 presents the selection process. The search in the Web of Science databank identified 7370 records. The search in Public Administration journals resulted in an additional 125 records.

Using the mentioned eligibility criteria, 7243 records were excluded from the sample. Subsequently, articles were screened on their relevance by reading the abstract and/or the full text. Based on these methods, the total of papers used for this review is 15 (see table 1).



<sup>&</sup>lt;sup>1</sup> For transparency purposes, the exact entered search term was: Top management turnover OR top management change OR top executive transition.

Table 1: included articles for the review and their characteristics.

Authors	Title	Country	Journal	Year	
Lokke, A.K., Sorensen, K.L.	Top Management Turnover and Its Effect on Employee Absenteeism: Understanding the Process of Change	Denmark	Review of Public Personnel Administration	2020	
Meier, K., An, S.H., Hawks, B. A., Amirkhanyan, A.A.	Learning on the Job: The Impact of Job Tenure and Management Strategies on Nursing Home Performance	USA	Administration and Society	2018	
Stewart, A.J., Diebold, J.	Turnover at the Top: Investigating Performance-Turnover Sensitivity among Nonprofit Organizations	USA	Public Performance and Management Review	2017	
Park, S., Cho, Y.J.	The Influence of Executive selection factors on the performance of public sector organizations in Korea	Public Performance and Management Review	2014		
Boyne, A., James, O., John P., Petrovsky, N.	Top Management Turnover and Organizational Performance: A Test of a Contingency Model	UK	Public Administration Review	2011	
Boyne, A., James, O., John, P., Petrovsky, N.	Does Public Service Performance Affect Top Management Turnover?	UK	Journal of Public Administration Research and Theory	2010	
Hill, G.C.	The effects of managerial succession on organizational performance	USA	Journal of Public Administration Research and Theory	2005	
Clingermayer, J.C., Feiock, R.C.	Leadership Turnover, Transaction Costs, and External City `Service Delivery	USA	Public Administration Review	1997	
Boyne, G., Dahya, J.	Executive sucession and the performance of public organizations	UK	Public Administration	2002	
McCabe, B,C., Feiock, R.C., Clingermayer, J.C., Stream, C.	Turnover among City Managers: The Role of Political and Economic Change	USA	Public Administration Review	2008	
Geys, B., Collony, S., Kassim, H., Murdoch, Z.	Follow the Leader? Leader succession and Staff attitudes in Public Sector organizations	European Commission	Public Administration Review	2020	
Villadsen, A.R.	New executives from inside or outside? The effect of executive replacement on organizational change	Denmark	Public Administration Review	2012	
Villadsen, A.R.	The relation between executive succession and corporate capacity.	Denmark	Journal of Public Administration Research and Theory	2014	
Collony, J.M.	Can managerial turnover be a good thing? The impact of city manager change on local fiscal outcomes.	USA	Public Administration Review	2018	
Boyne, A., John, P., Petrovsky, N.	Leadership succession and organizational success: when do new chief executives make a difference?	UK	Public Money & Management	2011	

#### **Results**

#### **Descriptive results**

Table 1 provides an overview of the selected articles. As evident from this table, all of the research on this topic has been conducted in an OECD context, with the research by Park and Cho (2014) being the only one conducted outside of the USA or Western Europe. Relatively speaking, the topic of the effects of top management turnover has only recently caught the attention of public administration scholars, whereas private-sector research on this topic was already well established in the 1990's. As put by Boyne et al.: "Very few studies examine the effects of staff turnover on the success or failure of public organizations, let alone the effects of top management turnover." (2011b, p.572).

### Central theories on the effects of top management turnover

There are two schools of thought on the possible directions and effects of top managerial turnover. The first school of thought holds the proposition that if a top manager has been in their position for a long time, they might become 'stale', meaning that it is less like that the manager would take on new initiatives aimed at improving performance. Furthermore, a top manager or executive who has been in position for a long time might be committed to a strategy that is out of tune with regard to the environment of the organization. By installing a new top manager, the organization can benefit from new ideas, innovation, and renewed motivation (Dalton and Todor, 1979). Furthermore, a new top manager might be more willing to implement a new strategy that is more attuned to the environment of the organization. According to Boyne and Dahya (2002), top managers in position would be less likely to do so as they themselves are responsible for the current strategy of the organization.

The second school of thought would argue that frequent changes in the top management team have disruptive effects on an organization, as priorities and normative frameworks change too often.

The new top manager would also need time to learn about the nuances of the organization, such as the social hierarchies and procedural routines. These opportunity costs would be negative for organizational performance. Moreover, turnover will lead to costs in terms of recruitment and the training of new personnel. Subsequently, top management turnover is expected to have negative effects on organizational performance (Hannen and Freeman, 1984; Futado and Rozef, 1987; Meier et al., 2018). Collony (2018) notes that most public administration scholars tend to support the second school of thought.

The work of Boyne and Dahya (2002) is often referred to in the literature on top management turnover in public organizations. In this work, the authors lay out the existing private sector theories which explain the effects of turnover and how these mitigate to the public sector. The authors argue that the impact of a new top manager can be explained along the lines of motives, means, and opportunities.

Motives are characterized as managerial style and the preferences of top managers. For example, some public managers might choose to orchestrate more organizational focus on efficiency, while others might want more organizational focus on responsiveness. As a result, the impact of the turnover of management on organizational outcome is mainly dependent on the motives, goals, and preferences between the old and the new executive (Boyne and Dahya, 2002, p.186). Boyne and Dahya (2002, p.186) theorize that outside executive successors have vastly different preferences than internal successors, as they are not accustomed to the internal culture and traditions of the organization.

Means are explained as the power, personal traits and 'fit' of a manager in the organization. New top managers will aim to implement their preferences through changes in the structures, processes, personnel, and budget. For example, a new executive might choose to readjust the budgeting system or the hiring procedures in the organization. These variables are subsequently expected to affect organizational performance (Boyne and Dahya, 2002, p.188).

Opportunities are defined as the degree of room managers have to implement new strategies within the organization. For example, new management might face external constraints, such as legislation and inter-governmental commitments, and internal constraints, such as formal responsibilities and corporate governance structures.

Boyne and Dahya (2002) would expect that in cases where external and internal constraints are high, the effect of a new manager on performance would be relatively low.

Combing these elements, Boyne and Dahya (2002, p.192-195) propose a model for the explanation of the effects of top management turnover (figure 2).

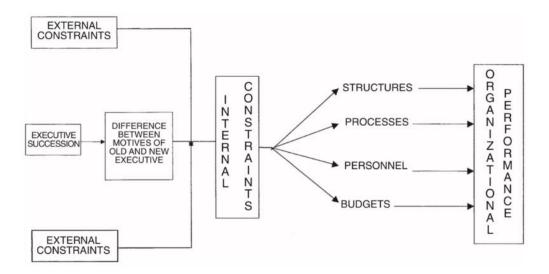


Figure 2: Theoretical model by Boyne and Dahya (2002).

### **Empirical findings on the effect of turnover**

In the application of the theory, all studies refer to the two schools of thought. However, not all use the Boyne and Dahya (2002) model.

The work of Hill (2005) provides an empirical test of the model of Boyne and Dahya (2002). Using data from Texas school districts, Hill (2005) finds that a change in top management has a positive effect on performance in the long term (i.e., more than three years), regardless of the internal or external origin of this manager. However, when a manager is replaced by someone outside of the organization, there is a negative effect on organizational performance in the next year. Referring back to the model of Boyne and Dahya (2002), Hill (2005) finds that the motives and opportunities of incoming managers have a significant impact on performance, whereas opportunities do not.

The studies by Villadsen (2012, 2014) also empirically test the model provided by Boyne and Dahya (2002). Villadsen (2014) examines the relationship between executive turnover and corporate capacity in the case of Danish municipalities. This study finds that externally hired successors tend to have more operating expenses in their first year than internally hired successors. However, this effect decreases slightly over the next years. Villadsen (2014, p.27) argues that these increases operation expenses are aimed at gaining trust from the organization (means) to secure the preferences of the incoming manager (motives). In conclusion, the findings of Villadsen (2014) confirm the proposition that externally hired executives have vastly different motives and organizational preferences than internally hired successors. These changes get most notably implemented in terms of budget.

According to the study by Villadsen (2012) inside successors are significantly less likely to implement comprehensive changes in the organization than external successors. This finding is consistent with the expectation of the Boyne/Dahya model (2002), indicating that external successors bring in different cognitive and normative ideas into the organization, which results in more comprehensive structural changes (Villadsen, 2012, p.8). These findings are further underlined by the research of Geys et al. (2020) which finda that the replacement of a manager with someone outside of the organization has the biggest impact on organizational attitudes and values.

The research by Lokke and Sorensen (2020) investigates the relationship between topmanagement and executive turnover and employee absenteeism in Danish primary schools. This research finds that employee absenteeism rises following the turnover of a top manager. This rise in absenteeism can be contributed to the rise in uncertainty and stress, which is an effect of the planned changes by the new manager. In the long run, this effect of diminishes. turnover and employee absenteeism is back to normal (2020, p.17-18). This is similar to the findings of Geys et al., (2020) which finds that employees need to get adjusted to the new attitudes and preferences of the top manager. These findings (Lokke and Sorensen, 2020; Geys et al., 2020) also provide a possible explanation for the decreased performance in the first year of taking office as found by Hill (2005), as the organization needs to grow familiar with the preferences of the new executive.

The study by Collony (2018) examines the effect of managerial turnover at the local level in the USA. Using data from municipalities in California, this study finds that municipalities which appointed a new city manager have a higher fiscal performance than municipalities which did not change the city manager. The magnitude of the effect is however dependent on how long the new manager has had the time to implement new ideas and improve municipal performance.

Furthermore, Collony (2018, p.347) notes that data was gathered closely following the 2008 recession. As a result, the new city manager entered the organization at a point of low initial fiscal performance. The study by Clingermayer and Feiock (1997) also studies the effect of managerial turnover in the context of city management. This study found that managerial turnover had a substantial impact on the mode of service delivery, either contracting out or producing by the organization itself (1997). These findings add to the assumption by Boyne and Dahya (2002) and the findings by Hill (2005) that top management motives have a substantial impact on organizational outcomes.

Research by Park and Cho (2014) examines the relationship between top management turnover and performance in non-profit organizations in South-Korea. This research finds that top-management turnover has a positive effect on organizational performance. In the case of an externally hired successor, the improvement was however relatively lower compared to an internally hired successor. This is likely due to the comprehensive changes made internal to the organization, similar to the findings of Villadsen (2012). In contrast to the findings of Hill (2005) and Lokke and Sorensen (2020) performance takes more time to stabilize in South-Korean agencies.

Lastly, the direction and effect of the turnover of management are dependent on the current state of performance of the organization. Boyne et al. (2011a; 2011b) find that when the initial performance of the organization is low, top management turnover has a positive effect on the performance of the organization. However, when initial performance is high, turnover is likely to have a negative effect. Organizations with a medium performance were not very sensitive in terms of performance concerning top management turnover. This finding is underlined by the research of Collony (2018). Referring back to the mentioned schools of thought on managerial turnover, the good (in terms of new normative frameworks imposes by the new executive) does not seem to outweigh the bad when it comes already high performing organization.

## Possible feedback effect between performance and turnover

As illustrated in the previous section turnover has a substantial effect on performance. However, a fair amount of the literature notes the possibility of feedback between the variables, i.e. the possibility of performance influencing turnover among top management.

The research by Boyne et al. (2010) found a negative relationship between performance and the turnover of senior management. The research of McCabe et al. (2008) underlines this finding by showing that organizations faced with economic hardship experience more managerial turnover than organizations which do not. Furthermore, the research by Stewart and Diebold (2017) found that the poor financial performance of non-profit organizations is a predictor of top management turnover.

#### **Conclusion**

In conclusion, the following can be stated about the effects of top management turnover in public organizations. This review found that in general, top management turnover has a positive effect on the performance of an organization (Collony, 2018; Hill, 2005, Boyne, 2011a, 2011b, Lokke and Soresensen, 2020). This can mainly be explained by the introduction of new ideas and initiatives of the incoming manager, in other words, the preferences and motives of the incoming manager. In the short run however, the effect is of managerial turnover is however small or in some cases negative (Lokke and Sorensen, 2020; Hill, 2005). An explanation hereof is that new top managers need time to implement their new ideas and get to know the organization (Villadsen, 2014; Geys et al., 2020; Lokke and Sorensen, 2020). This is not to say that managerial turnover does not have negative effects, such as the loss of tacit knowledge in top management teams or the costs in terms of recruitment. This literature review however does indicate that in most circumstances and the long term, the benefits of managerial turnover outweigh the downsides of it.

Secondly, replacing top management with a candidate from outside of the organization is linked to more spending in organizational capacity and more comprehensive changes in the organization (Villadsen, 2012, 2014). This can be explained by the difference in motives of the incoming executive regarding the leaving executive, as was expected by the model by Boyne and Dahya (2002). An outside executive is less committed to the current strategy of the organization, and therefore more likely to implement strategic changes (Villadsen, 2012).

Lastly, some evidence suggests that the effect of top management is mediated by the initial state of performance. If the initial performance is low, turnover is likely to have a positive impact and vice versa (Boyne et al., 2011b). This finding would support the proposition of the second school of thought, arguing that the loss of tacit knowledge and relationship harms the organization more than new ideas benefit the organization. However, not all studies in the sample controlled for past performance, making it difficult to generalize this finding.

This review has the following implications for practitioners in the field. Firstly, when the performance of an organization is low over the long term and the top manager has had a long tenure, the hiring party should not hesitate to find a replacement. Based on the results of this review, the turnover would likely have a positive effect on organizational performance in the long term. Secondly, when the goal is to establish strong changes in an organization, preferences should be given to a candidate outside of the organization. The rationale behind this is that outsider hiring is linked to more comprehensive changes than insider successors.

It must be noted that research on the effects of top management turnover in the public sector is relatively limited, as compared to private-sector research (Boyne, 2011b). Further research on this topic could take a qualitative approach to the motives of incoming top managers as to their plans for change. For example: how does an incoming manager decide what the priorities of the organization should be?

Another possible avenue could be to research how incoming managers influence stakeholder groups to secure support for their initiatives since it is shown by Villadsen (2016) that managerial is related to more operational expenses. A more general option for further research on this topic is to expand the context of research more towards non-western countries.

The first limitation of this research is that most the studies on the topic of were conducted in a western context. As a result hereof, the results of this literature review cannot automatically be generalized towards other contexts. Another limitation is the degree of publication bias. As mentioned, it was due to resources limitations not possible to contact scholars in the field to acquire working papers on the topic.

#### References

- Amirkhanyan, A. A., An, S. H., Hawks, B. H., & Meier, K. J. (2019). Learning on the Job: The Impact of Job Tenure and Management Strategies on Nursing Home Performance. *Administration & Society*, 52(4), 593–630. https://doi.org/10.1177/0095399719874755
- Avellaneda, C. N. (2009). Municipal Performance: Does Mayoral Quality Matter? *Journal of Public Administration Research and Theory*, 19(2), 285–312. https://doi.org/10.1093/jopart/mun001
- Avellaneda, C. N. (2016). Government Performance and Chief Executives' Intangible Assets: Motives, Networking, and/or Capacity? *Public Management Review*, *18*(6), 918–947. https://doi.org/10.1080/14719037.2015.1051574
- Boyne, G. A., James, O., John, P., & Petrovsky, N. (2010). Does Public Service Performance Affect Top Management Turnover? *Journal of Public Administration Research and Theory*, 20(Supplement 2), 261–279. https://doi.org/10.1093/jopart/muq024
- Boyne, G. A., James, O., John, P., & Petrovsky, N. (2011a). Leadership succession and organizational success: when do new chief executives make a difference? *Public Money & Management*, *31*(5), 339–346. https://doi.org/10.1080/09540962.2011.598345
- Boyne, G. A., James, O., John, P., & Petrovsky, N. (2011b). Top Management Turnover and Organizational Performance: A Test of a Contingency Model. *Public Administration Review*, 71(4), 572–581. https://doi.org/10.1111/j.1540-6210.2011.02389.x
- Boyne, G., & Dahya, J. (2002). Executive Succession and the Performance of Public Organizations. *Public Administration*, 80(1), 179–200. https://doi.org/10.1111/1467-9299.00299
- Clingermayer, J. C., & Feiock, R. C. (1997). Leadership Turnover, Transaction Costs, and External City Service Delivery. *Public Administration Review*, *57*(3), 231. https://doi.org/10.2307/976654
- Connolly, J. M. (2018). Can Managerial Turnover Be a Good Thing? The Impact of City Manager Change on Local Fiscal Outcomes. *Public Administration Review*, 78(3), 338–349. https://doi.org/10.1111/puar.12892
- Dalton, D. R., & Todor, W. D. (1979). Turnover Turned over: An Expanded and Positive Perspective. *The Academy of Management Review*, 4(2), 225. https://doi.org/10.2307/257776
- Furtado, E. P. H., & Rozeff, M. S. (1987). The wealth effects of company initiated management changes. *Journal of Financial Economics*, *18*(1), 147–160. https://doi.org/10.1016/0304-405x(87)90065-1
- Gerrish, E. (2015). The Impact of Performance Management on Performance in Public Organizations: A Meta-Analysis. *Public Administration Review*, 76(1), 48–66. https://doi.org/10.1111/puar.12433
- Geys, B., Connolly, S., Kassim, H., & Murdoch, Z. (2020). Follow the Leader? Leader Succession and Staff Attitudes in Public Sector Organizations. *Public Administration Review*, 80(4), 555–564. https://doi.org/10.1111/puar.13189

- Hannan, M.T. and Freeman, J. (1984) Structural Inertia and Organizational Change. *American Sociological Review*, 49, 149-164. http://dx.doi.org/10.2307/2095567
- Hambrick, D. C., & Mason, P. A. (1984). Upper Echelons: The Organization as a Reflection of Its Top Managers. *The Academy of Management Review*, 9(2), 193. https://doi.org/10.2307/258434
- Hill, G. C. (2005). The Effects of Managerial Succession on Organizational Performance. *Journal of Public Administration Research and Theory*, 15(4), 585–597. https://doi.org/10.1093/jopart/mui034
- Løkke, A. K., & Sørensen, K. L. (2020). Top Management Turnover and Its Effect on Employee Absenteeism: Understanding the Process of Change. *Review of Public Personnel Administration*, 40(3), X. https://doi.org/10.1177/0734371x20931911
- McCabe, B. C., Feiock, R. C., Clingermayer, J. C., & Stream, C. (2008). Turnover among City Managers: The Role of Political and Economic Change. *Public Administration Review*, 68(2), 380–386. https://doi.org/10.1111/j.1540-6210.2007.00869.x
- Meier, K. J., & O'Toole, L. J. (2002). Public management and organizational performance: The effect of managerial quality. *Journal of Policy Analysis and Management*, 21(4), 629–643. https://doi.org/10.1002/pam.10078
- Park, S., & Cho, Y. J. (2014). The Influence of Executive Selection Factors on the Performance of Public Sector Organizations in Korea. *Public Performance & Management Review*, *37*(3), 412–440. https://doi.org/10.2753/pmr1530-9576370304
- Price, J. L. (1989). The Impact of Turnover on the Organization. *Work and Occupations*, *16*(4), 461–473. https://doi.org/10.1177/0730888489016004005
- Stewart, A. J., & Diebold, J. (2017). Turnover at the Top: Investigating Performance-Turnover Sensitivity among Nonprofit Organizations. *Public Performance & Management Review*, 40(4), 741–764. https://doi.org/10.1080/15309576.2017.1340900
- Villadsen, A. R. (2012). New Executives from Inside or Outside? The Effect of Executive Replacement on Organizational Change. *Public Administration Review*, 72(5), 731–740. https://doi.org/10.1111/j.1540-6210.2012.02565.x
- Villadsen, A. R. (2014). The Relation Between Executive Succession and Corporate Capacity. *Journal of Public Administration Research and Theory*, 26(1), 19–29. https://doi.org/10.1093/jopart/muu036

### Appendix A: PRISMA guidelines checklist

TITLE			page
Title	1	Identify the report as a systematic review, meta-analysis or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	1
Objectives	4	Provide an explicit statement of questions being addressed-with reference to participants, interventions, comparisons, outcomes and study design (PICOS).	1
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g. Web address) and, if available, provide registration information including registration number.	NA
Eligibility criteria	6	Specify study characteristics (e.g. PICOS, length of follow-up) and report characteristics (e.g. years considered, language, publication status) used as criteria for eligibility, giving rationale.	2
Information sources	7	Describe all information sources (e.g. databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	2
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	2
Study selection	9	State the process for selecting studies (i.e. screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	2
Data collection process	10	Describe method of data extraction from reports (e.g. piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	2
<del>Data items</del>	11	· · · · · · · · · · · · · · · · · · ·	NA
Risk of bias in individual studies	<del>12</del>	Describe methods used for assessing risk of bias in individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	NA
Summary measures	<del>13</del>	State the principal summary measures (e.g. risk ratio, difference in means).	NA
Synthesis of results	<del>14</del>	Describe the methods for handling data and combining results of studies, if done, including measures of consistency (e.g. I) for each meta-analysis.	NA
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g. publication bias, selective reporting within studies).	2
Additional analyses	<del>16</del>	Describe methods of additional analyses (e.g. sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	NA
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	2
Study characteristics	<del>18</del>	For each study, present characteristics for which data were extracted (e.g. study size, PICOS, follow-up period) and provide the citations.	NA
Risk of bias within studies	<del>19</del>	Present data on risk of bias for each study and, if available, any outcome level assessment (see item 12).	NA

Results of	<del>20</del>	For all outcomes considered (benefits or harms), present, for each study:	NA
individual studies		(a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency	4-6.
Risk of bias across studies	<del>22</del>	Present results of any assessment of risk of bias across studies (see Item 15).	NA
Additional analysis DISCUSSION	<del>23</del>	Give results of additional analyses, if done (e.g. sensitivity or subgroup analyses, meta-regression [see Item 16]).	NA
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g. healthcare providers, users, and policy makers).	7-8
Limitations	25	Discuss limitations at study and outcome level (e.g. risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	7-8
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	7-8
FUNDING		,	
<del>Funding</del>	<del>27</del>	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	NA