Letter to Editor

Calculate the actual overlap in an overview

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An overview (a review of reviews) is a new type of evidence synthesis that has been recently considered. Due to the increasing number of systematic reviews, overviews compare the data of different interventions obtained from systematic reviews and provide decision-makers with a broader summary of current information. By comparing the results of systematic reviews and identifying their contradictions during an overview, health decision-makers face the latest and most reliable results (1, 2).

Each systematic review of an overview contains many primary studies, each of which may be included in more than a systematic review, so researchers should first investigate the extent of overlap to report the overview results accurately. If the report of overviews is narrative, the researcher presents the repeated studies only once and tries to avoid repetition, but in a meta-analysis of meta-analyses and presentation of network analysis, repeated studies may affect the results. This is because a primary study is presented in more than a systematic review, and this overlap provides results with bias (3). Therefore, it is recommended first to investigate the degree of study overlap in case of conducting overviews. Although some researchers recommend overlapping only in the case of meta-analysis, it is recommended to do it even in a narrative overview (2, 4). The purpose of the present paper is to investigate and calculate the actual overlap of studies entered an overview using valid measures introduced by Pieper et al. (2014) (2) in the form of a practical example entitled "effect of telemedicine on quality of life in patients with heart failure: an overview of systematic reviews".

To conduct an overview, after performing the search and screening stages, and selecting the studies, and reviewing their quality. Finally, 20 review papers with or without meta-analysis entered the overview. According to related formulas, their overlap was calculated by the visual tool called citation matrix and indices of % overlaps, corrected covered area (CCA), and covered area (CA).

Citation matrix is a visual tool that visually shows the overlap of primary studies entered selected reviews but is not very accurate. In this column matrix, selected systematic reviews to enter the overview. The rows of all primary studies enter selected systematic reviews, i.e., in the matrix, a column is drawn for each systematic review and a row for each primary study. Since a primary study may have been used in several systematic reviews, in this case, at the intersection of the primary study row with the review study column used in it, a sign is placed on the presence of that primary study in that review so in the present example (effect of telemedicine on quality of life in patients with heart failure: an overview of systematic reviews) is given (Table 1). In order to draw the citation matrix accurately

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and reduce errors, two persons supervised the drawing. In addition to the visual evaluation of the citation matrix, the overlap percentage can be determined using a simple method called % overlaps. This value is obtained from dividing the number of primary studies that have been used more than once in the overviews entered by the number of rows, i.e., the number of primary studies. The citation matrix's visual understanding is easy, but % overlaps calculated using it is not very accurate. In the % overlaps calculation formula, primary studies can be counted only once. Even if they are entered several other systematic reviews, they will be counted only once in the formula.

Another index used to investigate the overlap of papers in an overview is the covered area (CA) index. This index is obtained from dividing the total number of studies entered (regardless of overlap) by the product of multiplying the rows in columns of citation matrix. The disadvantage of this index is that its size increases as the number of primary papers in more than a systematic review increases, and the accuracy of the overlap reduces. This issue's importance becomes clear when one of the systematic reviews entered an overview has a larger number of primary studies than the other systematic reviews. The size of the CA index will be affected. Because increasing the number of primary studies means increasing the number of citation matrix rows, these primary studies may not be included in other systematic reviews and do not necessarily lead to an increase in overlap (2).

Pieper et al. (2014) introduced another measure called corrected covered area (CCA) to address this. According to their report, the first occurrence of a primary publication or the first occurrence of the primary study was introduced as index publication. The total index publications in all reviews used in the overview were considered index publications, which have the same citation matrix rows. CCA is a fraction whose index and denominator

include index publications. In the case of deduction, index publications will be deducted from the total of original articles, including duplicate articles. At the denominator, again, index publications is subtracted from the product of the number of columns in index publications is reduced. According to this formula, CCA reduces with increasing index publications. To investigate overlap status according to CCA, 0-5 shows mild overlap, 6-10 shows moderate overlap, 11-15 shows high overlap, and <15 shows very high overlap (2).

%Overlaps= primary publications included in more than one review in the overview/r

$$CA(\text{ covered area}) = \frac{N}{rc}$$

CCA (corrected covered area) $= \frac{N-r}{rc-r}$

N: Sum of primary studies published, and repeated studies are counted to calculate N

r: Number of rows or index publication

c: Number of columns or reviews (2).

In 20 systematic reviews selected for this overview, a total of 51 clinical trials reported quality of life. According to Table 1, in columns, 20 systematic reviews are from the lowest to the highest in terms of years, and in rows, 51 primary clinical trial studies are ranked from the lowest to the highest in terms of years. According to the introduced formulas, the size of %Overlaps, CA, and CCA was calculated as follows:

N: 149 **r:** 51 **c:** 20

% Overlaps = 32/51= 62.7%

$$CA(\text{ covered area}) = \frac{N}{rc} = \frac{149}{51 \times 20} = \frac{149}{1020} = 0.146$$

CCA (corrected covered area)
$$= \frac{N-r}{rc-r} = \frac{149-51}{(51\times20)-51} = \frac{98}{969} = 0.101$$

Table 1. Citation matrix

Number	Columns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Rows	Review Primary publication	Martinez 2006	Clark 2007	Schmidt 2007	Maric 2009	Polisena 2009	Inglis 2011	Ciere 2012	Munro 2013	Pandor 2013	Huang 2014	Hughes 2014	Cajita 2016	Knox 2017	Or 2017	Coorey 2018	Farina 2018	Hui 2018	Muzas 2018	Yun 2018	Zhu 2019
	Number of primary studies	5	5	5	4	6	12	5	3	8	3	2	5	24	15	5	20	2	2	10	8
1	Ades 2000			*																	
2	Barth 2001		*				*			*				*							
3	de Lusignan 2001	*	*	*		*	*							*	*					*	
4	Arthur 2002										*										
5	Kasper 2002																				*
6	Artinian 2003	*			*	*			*					*	*						
7	Benatar 2003	*		*	*	*		*				*			*		*				
8	Goldberg 2003	*	*		*	*	*			*				*	*		*				*
9	Jerant 2003	*				*		*						*			*			*	
10	LaFramboise 2003				*	*		*							*						
11	Dunagan 2005			*										*			*				
12	Gesica 2005		*				*							*							*
13	Körtke 2005			*																	
14	Smith 2005													*							
15	Wu 2005																*				
16	Blum 2006						*														
17	DeWalt 2006						*							*							
18	Riegel 2006		*				*			*				*			*				
19	Sisk 2006						*							*							
20	Strömberg 2006													*	*						
21	Dalal 2007										*					*					
22	Ramachandran 2007						*														
23	Antonicelli 2008						*	*		*				*			*			*	*
24	Schwarz 2008					*								*	*		*			*	
25	Wakefield 2008						*			*				*			*			*	
26	Woodend 2008					*	*	*		*							*			*	
27	Dar 2009									*				*	*		*			*	
28	Tomita 2009								*					*	*						
29	Wootton 2009													*			*				
30	Copeland 2010												*	*			*				
31	Ferrante 2010																				*
32	Piotrowicz 2010												*		*		*				
33	Koehler 2011													*	*		*			*	*

#	Study																			
34	Konstam 2011												*		*					
35	Oerkild 2011								*											
36	Wade 2011														*				*	
37	Angermann 2012							*												
38	Reid 2012						*													
39	Seto 2012											*	*	*						
40	Boyne 2013												*		*					
41	Delaney 2013												*							
42	Madigan 2013												*		*		*			
43	Blum 2014														*		*			
44	Varnfield 2014													*		*	*			
45	Frederix 2015														*					
46	Hägglund 2015											*		*					*	
47	Piotrowicz 2015												*							
48	Piotrowicz 2015												*							
49	Widmer 2015													*						
50	Zan 2015											*								
51	Johnston 2016													*			*			

Discussion

In the present study, the citation matrix clearly shows the overlap of primary studies over time in review studies, based on which Overlaps (62.7%), CA (0.146), and CCA (0.101) were obtained. Overlaps and CCA-based evaluations show different interpretations. CCA is between 0 and 2, indicating a slight overlap, and % Overlaps indicates an overlap above 50%. Given that CCA is more accurate and calculates the overlap of primary studies in more than a study, it is recommended to report the extent of overlap of CCA (2).

The broader the research question of an overview, the more systematic reviews are included in an overview, such as investigating different interventions in different populations for a situation. In this case, the calculated overlap reduces with the increasing number of systematic reviews because various primary studies are included in systematic reviews. According to the above, mentioning the outcome, type of intervention, and conditions of the participants accurately in systematic reviews selected by their researchers can greatly help researchers who wish to overview in the analysis. Variety of inclusion criteria and multiple intervention methods of the same name in selected systematic reviews affect the degree of overlap (5). In general, in some systematic reviews, several interventions using different methods may be compared. It is even possible to investigate the effect of an intervention on participants with different problems. Only one group of them includes those who aim to study overview are consistent. Therefore, in this situation, the number of primary papers entered only a selected review will increase, but no overlap was found with other reviews due to the difference in interventions or participants (2, 5, 6). In the present paper, to increase the matrix accuracy and accurately investigate the overlap status, the researchers focused on only a consequence. They tried to review all primary papers that entered systematic reviews investigating the quality of life. According to Cochrane, such

a situation can reduce the potential error of calculating the overlap to a large extent.

Conclusion

The authors of an overview should report on study overlap status before reporting the results of their work. The overlap report's importance is such that it should be included in the overview evaluation checklist; however, it has not yet been considered much by the researchers. The CCA report's overlap is more accurate than % overlaps because its calculation formula calculates primary studies used in more than one review. Therefore, to investigate the overlap in overview studies, it is recommended to determine CCA because its calculation is more comprehensive and easier to understand in addition to accuracy. The low overlap also confirms the need for conducting an overview.

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