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Review Article

Communicable Disease Reporting Systems in the World: A Systematic Review Article

*Ali JANATI [1], *Mozhgan HOSSEINY [2], Mohammad Mehdi GOUYA [3], Ghobad MORADI [4,5], *Ebrahim GHADERI [4,5]*

1. *Dept. of Health Services Management, Faculty of Management and Medical Informatics, Tabriz University of Medical Science, Tbriz, Iran*
2. *Dept. of Health Services Management, Faculty of Management and Medical Informatics, Student Research Committee, Tabriz University of Medical Science, Tbriz, Iran*
3. *Center for Communicable Diseases Control, Ministry of Health and Medical Education, Tehran, Iran*
4. *Social Determinants of Health Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran*
5. *Dept. of Epidemiology and Biostatistics, School of Medicine, Kurdistan University of Medical Sciences, Sanandaj, Iran*

***Corresponding Authors:** Email: mozhgan.hosseiny@yahoo.com,

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Abstract

Background: Communicable disease reporting and surveillance system has poor infrastructure and supporters in most of countries. Its quality improvement is a challenge and requires an accurate and efficient care and reporting systems at all levels to achieve new and simple models. This study evaluates reporting systems of communicable diseases using systematic review.

Methods: This was a systematic review study. For data collection, we used the following database and search engines: Proquest, Science direct, Pub MED, Scopes, Springer, and EBESCO. For Persian databases, we used SID, Iranmedex and Magiran. Our key words were "Communicable Diseases", "Notifiable Disease", "Disease Notification", "Reporting System"," Surveillance Systems" and "evaluation". Two independent researchers reviewed the resources and the results were classified in different domains.

Results: From 1889 cases, only 66 resources were studied. The results were classified in several domains, including those who were reporting, reporting methods and procedures, responsibilities and reporting system characteristics, problems and solutions of the report, the reporting process, and receptor level.

Conclusion: Disease-reporting system has similar problems in all parts of the world. Change, improve, update and continuous monitoring of the reporting system are very important. Although the reporting process can vary in different regions, but being perfect and timely are important principles in system design. Detailed explanations of tasks and providing appropriate instructions are the most important points to integrate an efficient reporting system.

Keywords: Reporting, Diseases surveillance system, Disease control

Introduction

Communicable disease control is a public health priority at the international level to prevent the spread of contagious diseases (1, 2). The increase of emerging and re-emerging communicable diseases such as SARS, multi drug resistance tuberculosis (MDR TB), Ebola and increasing information needs causes increasing interest in communicable disease reporting and surveillance system(3-6). Therefore, part of the task of public health agencies in the national level is an efficient and effective policy making on reporting and control of infectious diseases (7, 8).

Policymaking and control of communicable disease requires an accurate and efficient surveillance and reporting system at all levels (7, 9). Disease reporting has been implemented traditionally with poor infrastructure and support in most of the countries; therefore, its quality improving has been a challenge (10, 11). Because of the heterogeneity about disease and lack of suitable financial resources, setting the standard for disease reporting and surveillance system is extremely difficult (7). Thus to achieve a new and simple model, there is a need to design, process and facilitate the flow of information and reporting systems (12, 13).

In Iran, reporting system of communicable diseases has been integrated into the health system for decades (14-16). In the recent years, it has also been tried to strengthen this reporting and surveillance system. However, there is a need to translate global evidence, to localize and convert them into effective action. Knowledge of global reporting systems may help to find and repair defects and gaps in the country`s reporting system such as communicable disease reports from hospitals and private sector.

Reform and repair of the Iranian communicable diseases reporting system require a study to assess the world evidence and experience of other countries, and assess the general characteristics of these reporting systems and determines the solutions for reducing the problems of the disease reporting system.

This systematic review aimed at gathering experiences of other countries in disease reporting system in order to improve Iran`s share of diseases reporting system.

Methods

Search Strategy

This study was a systematic review using the internet and manual searches. Data WERE collected using the following databases and search engines; Proquest, Science direct, Pub MED, Scopes, Springer, EBESCO. For Persian databases, we used; SID, Iranmedex and Magiran. The search was performed using keywords such as "Communicable Diseases", "Notifiable Disease", "Disease Notification"," Reporting System", " Surveillance Systems" and "evaluation" regardless of their date and range. Boolean Operators; AND, OR and NOT were also used during the search. In addition, paper and printed information sources were searched manually at the Iranian Center for Disease Management.

Review process, Inclusion and exclusion criteria

Farsi and English articles about at least one of important characteristic of communicable surveillance diseases according to WHO guideline (17, 18). contains; Priority Diseases for Surveillance, Surveillance System Structure, Core Function of Surveillance Systems, Support Functions of Surveillance Systems, Surveillance Quality were included in the study since 1980. These criteria were used for reviewing and choosing the studies. From all those articles, only one disease surveillance and reporting system were excluded. Time and space limitations of this study were from 27 September to 7 October 2014.

Retrieved resources considering above-mentioned points were investigated by two reviewers and the rejection of each of the studies were expressed. In case of disagreement, the third party reviewer did the reviews. Finally, all the resources for our study were controlled and confirmed by an expert. The quality of the study was evaluated by a researcher according to the main purpose of our study.

Search Results

A total of 1856 articles and 33 print sources, including booklets and instructions relating to our study were found. Oversell, 1889 resources had inclusion criteria. After the elimination of duplicate recourses and considering exclusion criteria, we had only 236 resources. From 236 remaining cases, 179 were excluded from the study by literature review, and 57 articles remained in the study. By reviewing the references of these articles, 9 other articles were found and finally 66 resources were entered in this systematic review (Table 1). Diagram of the literature review is shown in (Figure 1).

Table 1: Criteria of included studies

Row	Year	Authors	Country	Criteria				
				Priority Diseases for Surveillance	Surveillance System Structure	Core Function of Surveillance Systems	Support Functions of Surveillance Systems	Surveillance Quality
1	2014	Troppy S (46)	USA	-	-	-	-	√
2	2014	Nnebue CC (47)	Nigeria	-	-	-	√	-
3	2014	Garcell HG (48)	Qatar	-	-	-	-	√
4	2013	Bino S (35)	South East Europe	-	√	-	-	-
5	2013	Rosewell A (49)	New Guinea	-	-	-	√	√
6	2013	Chandrasekar K (50)	Sri Lanka, UK	-	-	-	-	√
7	2013	Samoff E (51)	USA	-	-	-	-	√
8	2013	Nnebue CC (39)	Nigeria	-	-	-	-	√
9	2013	Kolahi A (52)	Iran	-	-	√	√	-
10	2013	Rajeev D (53)	USA	-	-	-	-	√
11	2013	Turner AM (29)	USA	-	√	√	√	-
12	2013	Yoo HS (54)	Korea	-	-	-	-	√
13	2012	Shinde RR (30)	India	-	-	√	√	-
14	2012	Karami M (55)	Iran	-	-	√	√	-
15	2012	Nogoudalla M (56)	Sudan	-	√	√	√	√
16	2012	Nnebue CC (42)	Nigeria	-	√	√	-	-
17	2011	Tandir S (57)	Bosnia	-	√	√	√	√
18	2011	Sahal N (45)	Sudan	-	√	√	√	√
19	2011	Sickbert-Bennett EE (20)	USA	-	-	-	-	√
20	2011	Sahal N (10)	Sudan	-	√	√	√	√
21	2011	Kebede S (1)	Rwanda	-	√	-	-	-
22	2011	Zahrai M (58)	Iran	-	-	√	-	-
23	2011	Sahal NH (18)	Sudan	-	√	√	√	√
24	2010	Xiong W (41)	China	-	-	-	√	-
25	2010	Jelastopulu E(5)	Greece	-	-	√	-	-
26	2010	Sahal N (36)	Sudan	-	√	√	-	-
27	2010	Vavalle EE (59)	USA	-	-	-	-	√
28	2010	Rajeev D (25)	USA	-	-	√	-	-
29	2010	Turnberg W (60)	USA	-	√	√	-	-
30	2010	Kosha A(61)	Iran	-	-	-	√	-
31	2009	Kolahi A (62)	Iran	-	-	√	√	-
32	2009	Tan H F (9)	Taiwan	-	√	√	-	-
33	2009	Nader F (43)	Iran	-	-	√	-	-
34	2009	Jennings JM (27)	Spain	-	-	√	√	-
35	2008	Kite Powell A (63)	USA	-	-	-	√	√
36	2008	Al-Jawadi A (64)	Iraq	-	√	-	√	√
37	2007	Reintjes R (7)	European Union countries	-	√	-	-	-
38	2007	Xiong Yi Wei (65)	Korea	-	-	-	-	√
39	2007	Rumisha SF (26)	Tanzania	-	-	√	-	√
40	2007	Lyons S (44)	Tunisia	-	√	√	√	-
41	2007	Tabatabai z (66)	Iran	-	-	√	-	-
42	2006	Safaie A (67)	Iran	-		√	√	-
43	2006	NelesoneT (12)	Pacific	-	-	-	√	√
44	2006	Richard LV(19)	USA	-	-	-	-	√
45	2006	Faensen D (31)	Germany	-	-	√	√	-
46	2006	Friedman SM (68)	Canada	-	-	√	√	-
47	2006	WHO-CDC (17)	------	-	√	√	√	√
48	2006	Zahrai SM (69)	Iran	-	-	√	√	-
49	2005	Krause G (70)	Germany	-	-	√	√	-

Table 1: Continued…

50	2005	Jansson A (71)	Sweden	-	-	√	-	√
51	2005	Gouya MM (72)	Iran	-	√	-	-	-
52	2004	Jacob John T (4)	India	-	-	√	-	-
53	2004	Miller M (37)	Australia	-	√	√	-	-
54	2004	Rolfhamre P (73)	Sweden	-	-	-	√	-
55	2003	Ofili AN (74)	Nigeria	-	-	-	√	-
56	2003	Nojoomi M (75)	Iran	-	-	√	√	-
57	2002	McNabb S JN (34)	Tanzania	-	-	-	√	-
58	2000	Bakarman MA (76)	KSA	-		√	-	-
59	2000	Allen CJ (77)	Australia	-	-	-	-	√
60	1996	Sockett PN (33)	Canada	-	√	√	√	-
61	1996	Karim S S A (78)	South Africa	-	-	-	√	-
62	1995	Chauvin P (79)	France	-		-	√	-
63	1992	Domínguez A (80)	Spain	-	-	-	-	√
64	1991	Birkhead G (81)	USA	-	-	-	-	√
65	1986	Valleron AJ (82)	France	-	-	-	√	-
66	1984	Konowitz PM (83)	USA	-	-	√	√	-

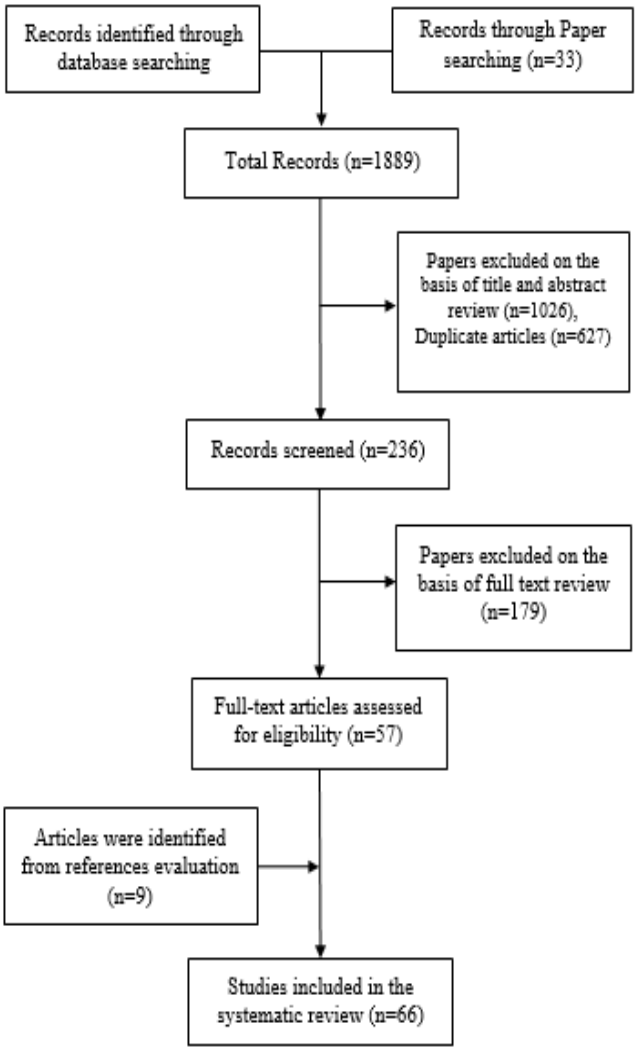

Fig. 1: PRISMA Flow Diagram

Analysis

Selected studies were reviewed carefully by two independent reviewers, and basic concepts and themes were extracted. Findings were categorized in the 3 main categories: 1-Specifications, objectives and duties of diseases reporting system, 2-Problems related to the disease reporting system and 3-Strategies for improving disease reporting system. Three subcategories were considered for data classification in each category (level of reporting).

Results

Several items were evaluated in the studies which we had found. Concerning "Priority Diseases for Surveillance", unfortunately, no study had mentioned the priorities of diseases. Nineteen studies (28.8%) discussed the "Surveillance System Structure." In addition, 34 studies (51.5%) had some comments and texts on the "Core Function of Surveillance Systems" and "Support Functions of Surveillance Systems." Finally, 26 studies (39.4%) presented the features of "Surveillance Quality."

Specifications, objectives and duties of diseases reporting system

People who were responsible for reporting disease in reporting systems include communicable diseases nurse, infection control nurses, physician, and nurse, health workers that reported their data using paper cards, paper forms, phone, Short

Message Service (SMS), fax, email, internet, and software. Characteristics of disease reporting system were noted. Some of these criteria included: determining the policies and legislation, specific budget allocation, assessing the needs of reporting and surveillance systems, quantitative and qualitative assessment, specifying responsibilities and duties, preparing booklets and guidelines, analysis of data based on the required variables and giving feedback to the reporting levels (Table 2).

Table 2: Specifications, objectives and duties of diseases reporting system

• People who were responsible for reporting disease in reporting systems include communicable diseases nurse, infection control nurses, physician, and nurse.
• Reporting methods contain: paper cards, paper forms, phone, Short Message Service (SMS), fax, email, internet, and internet base.
• Policy making on disease reporting and surveillance and local legislation regarding disease reporting
• Set clear goals and benchmarks for monitoring and diseases reporting system
• Allocating special funds to disease reporting and surveillance system and financial
• incentives for reporting diseases
• Needs assessment of disease reporting and surveillance system
• Monitoring and evaluating the systems quantitatively and qualitatively and to determine evaluation indicators
• Defining the responsibilities, duties, job description, workflow diagrams and plans of action and implementation activities
• Identifying the staff required skills in disease reporting and surveillance system
• Preparing manuals, guidelines and standards related to the reporting of the disease and updating them
• Creating warning and quick response teams , simulation exercises of epidemics and Designing interventions during epidemics
• Appropriate equipment for reporting diseases
• Collecting data based on: “who, when, where”
• Data analysis based on the required variables
• Giving feedback to the reporting levels
• Publishing data that are related to the disease reporting system
• Maintaining the confidentiality of information
• Coordinating with other sectors such as the private sector
• Giving reports from hospitals and clinics
• Giving reports from public and private laboratories
• To make disease reporting system as mandatory
• Having vaccine reserves in reporting resources

Problems related to the disease reporting system

The most important problems of the reporting system in reporter level, reporting process and recipient level included shortages in human resources, high workload of the person who is responsible for disease reporting and staff unconsciousness about the disease reporting system were problems at reporter level. Lack of standard processes for reporting diseases, lack of obligation to report, not analyzing reporting of diseases, lack of proper training to personnel about disease reporting and high costs for training and maintenance of electronic reporting systems are among problems in reporting process. Not giving feedback to the reporter levels, not having access to the private sector data and limited budget for disease reporting system was mentioned in recipient level problems (Table 3).

Table 3: Problems related to the disease reporting system

Level or Process of Reporting	Problems
Reporting Level	No substitute for reporting
	Insufficiency of human resources for reporting
	High workload of the person responsible for reporting diseases
	The lack of incentive to report disease
	Lack of staff awareness about the disease reporting system
	Interfere of reporting system with clinical practice
	Lack of skills in using the technology used in the disease reporting
	Overlap with other programs and the reporting responsibilities of the person responsible for reporting diseases
	Lack of trained personnel for reporting diseases
	Unawareness of disease reporting rules, fear of the law, and the privacy of patients
	Missing a reportable patient in hospital wards
Reporting Process	No standard process for reporting diseases
	Absence of binding rules on reporting diseases
	Difficult and complex process of reporting diseases
	Disease reporting system inflexibility with health system changes
	Variety of reporting methods in a private system of these methods
	Informal ways of reporting diseases
	Sophisticated technology used in the reporting of diseases
	Missing data due to the illusion of disease reported by others
	Lack of timely reports to higher levels
	Incomplete report submitted to higher levels
	No analysis and reporting of diseases
	Partial and incomplete documentation
	Long laboratory testing time
	Tardiness of non-electronic reporting system
	High costs for training and maintenance of electronic reporting systems Duplicate data, and many variables in the electronic reporting system
	Data security systems, electronic reporting
	Lack of consistent and clear instructions in reporting systems
Report Receiver Level	Weaknesses in infrastructure reporting systems
	Limited budget for disease reporting system
	No clear process for reporting disease in each level of the reporting
	No updated instructions and a list of reportable diseases
	Giving feedback to the reporting levels
	Lack of communication mechanisms with the reporting levels
	No access to the private sector
	Lack of adequate access to hospital data
	Failure in introducing the report and training on the disease reporting system
	No use in the data for planning and reporting system

Strategies for improving disease reporting system

Some of the strategies presented in these articles include; determining a specific process for disease reporting, simplifying the reporting forms, appoint a substitute for a person who is responsible for reporting, using and developing electronic

technology, operational guideline formulation for laboratories, private sectors and hospitals, using bulletins to publish information about the health care and reporting systems (Table 4).

Table 4: Strategies for improving disease-reporting system

Level or Process of Reporting	Improving Advices
Reporting Level	Defining a specific process for reporting diseases in the system
	Using simple forms of disease reporting, which are the same in any system
	Knowledge, attitudes and practices of personnel involved in the reporting system to identify factors affecting the disengagement
	Personnel training on the disease reporting system and related laws
	Determine the punishment for not reporting
	Creating incentives and motivation in individuals for reporting diseases
	Designating a person in charge and a substitute for reporting diseases
	The process of preparing the system to create a logical flow of information and knowledge of the patient in the hospital
Reporting Process	Determining a specific process for reporting common diseases
	The use of electronic technology and its development (such as email, mobile, software)
	Learning about technology used in the reporting of diseases
	Training methods for data analysis (using charts, tables, maps, and reports)
	Strengthening the disease reporting by documentation
	Coordination of procedures for reporting diseases
	Providing a clear guideline for integrated reporting at all levels
	Increasing Laboratory Equipment for reportable diseases
	Developing operational guidelines for laboratories to report disease
Report Receiver Level	Preparing a national policy for reporting diseases and revision of laws relating to the reporting of diseases
	Using the SWOT approach in planning for the disease reporting system
	Determine the duties of individuals in the reporting system
	Enforcement of reporting diseases and legislation
	Engaging the private sector in disease reporting
	Hospitals involved in disease reporting
	Updating the definitions, list of reportable diseases, guidelines and standards for reporting
	Providing the protocols for the reporting of diseases
	Giving feedback on the level of reporting and exchange of information between different levels
	Annual meetings of the disease surveillance and reporting systems
	Publication of bulletins for information on system status and disease surveillance and reporting

Discussion

Given that some items were incomplete in the literature, it seems that the procedure of reporting communicable diseases with high priority is based on the local guidelines presented to the health care system. These guidelines are not available online, and based on the experiences of the authors, many countries, for example, have a list of reportable diseases that is not mentioned in any article. Therefore, there is a need to publish these documents online; additionally, the articles about disease reporting systems should cover these issues more comprehensively.

The main purpose of reporting communicable diseases is to prevent the spread of the disease, epidemics, death or disability resulting from the disease. The best communicable disease reporting and surveillance system should provide rapid identification, timely response and information on the

incidence and prevalence of disease (7). Completeness and timeliness of data are principles of disease reporting system (7, 19-21) and all attempts to reform disease reporting system must be done in order to achieve these two goals.

Based on the results, disease reporting is performed in health centers, hospitals, clinics, private offices and laboratories (22, 23). Physicians and primary care staff are the most qualified people for reporting communicable diseases and efforts should be made to obtain the report from these individuals (13, 24). These individuals transfer the data during the reporting process to data collecting levels in different ways, such as paper forms, phone, mobile, SMS, wireless, fax, email, Internet and electronic software. Diversity in disease reporting systems is due to differences in regulatory requirements, reporting date, reporting process and available financial resources (7). However, this diversity must not result in the loss of two important principles namely completeness and timeliness. Considering low sources and problems related to the use of traditional techniques such as paper forms and missing data, to overcome ineffectiveness in transferring information, there is a need for simple and efficient methods for communicable disease reporting and surveillance system (25-27). Increasing tendency to use email, mobile phones and electronic systems, these methods can be fast, effective, efficient and cost-effective tool for collecting data (28-30). However, there are challenges using electronic methods (27, 31). The use of electronic systems requires resources, funding to set up, and maintenance. A partnership between the health sectors, personnel training and maintaining the confidentiality of patient information (20, 27, 31) should be considered in disease reporting system of Iran as well.

Considering epidemiology of the diseases, reporting the diseases based on laboratory confirmation (32) or without laboratory confirmation (33) is different. Given the important role of laboratories, specially private laboratories, in addition to clinical assessment in the diagnosis of many diseases, laboratory reporting development, organizing, training, and coordination in laboratory procedures an also the inclusion of mandatory reporting laboratories alongside the medical report as a contributory mechanism is required. It can improve the communicable disease reporting and surveillance system (14, 20, 34, 35) which is important in Iran.

In order to provide the right decisions and achieving goals, communicable disease surveillance and reporting systems should be assessed in terms of quality, efficiency and effectiveness (18, 36-38). Non-adherence to timely and completeness of data in surveillance and reporting systems, causes problems in data analyzing. This happens because of slowness in non-electronic reporting system, long time answering the laboratory tests, reporting overlap with the responsibilities of other individual`s and assuming that the disease been reported by anybody else (39). Preparing manuals, guidelines, standards and protocols for reporting diseases and updating them, specifying the responsibilities and identifying duties and skills of staff about disease reporting and surveillance system can assist the staff in carrying out assigned tasks and make better accuracy of data in the system (24, 29, 36). These activities should be considered in our country while modifying the reporting system. Data collection, data analysis, and feedback to the reporting levels are the main items and functions of the disease reporting and surveillance system (40, 41). Due to the sudden outbreak of some communicable diseases, creating warning and quick response teams to design appropriate intervention programs and simulation exercises of epidemics is disease reporting and surveillance system requirements.

Staffs play a vital role in providing quality services (10). Shortages in human resources, high workload of the person who is responsible for disease reporting and not appointing a substitute leads to lack of reporting motivation. In some cases, there are no standard and defined processes for communicable disease reporting system from high level reporting sources or they are complex and have little flexibility to change (30, 37). Appoint a trained person for reporting, determining the specific process, using harmonized and simplified reporting methods and create incentives (material or spiritual) could improve the reporting system.

Lack of knowledge and skills of service providers is one of the main problems and obstacles. There is always a need to educate others to interact with the objectives of public health programs (9, 13, 42, 43).

In most countries, disease-reporting systems has a weak infrastructure and rules and the data on this are not used in planning and program prioritization (10, 30, 37). Therefore, policies and rules related to disease reporting and surveillance system should be revised in all parts of the health system including private sector and military, which should be involved in the disease, and reporting system. In addition, using appropriate technologies and planning matrix this system should be strengthened (3, 10, 35, 44, 45). Bulletins can be used for dissemination and exchange of information and sharing the best practices for combating communicable diseases in both paper and electronic forms (35).

One of the main problems that the various studies are not considered enough is monitoring and evaluation of the disease reporting system. A good reporting system should have a proper monitoring program that could quickly identify problems of the system and show the process of removing the problems.

Conclusion

Disease reporting systems has similar problems in the globe. Change, improvement, updating and continuous monitoring of the reporting system are very important. Although the disease reporting process in different regions can be different; however, timeliness and completeness are two major principles in system design. Therefore, detailed explanations of duties and providing appropriate instructions are important points in integrating an efficient reporting system.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication, redundancy, etc.) were strictly controlled by the authors. Ethical approval was not required for this literature review.

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